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STRATEGIC PLAN FOR AN EGYPTIAN VILLAGE:
A POLICY ANALYSIS OF
THE LOSS OF AGRICULTURAL LAND IN EGYPT

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Abstract

Egypt, commonly known as “Land of Civilizations”, is reputed worldwide for its distinct 7,000-year-old record of civilization and immense wealth of knowledge (Egypt State Information Service, 2008a). Egypt is the most populated country in the Middle East and the second most populated country in Africa. The population of Egypt is rapidly increasing. Its population was 59 million in 1996, and had increased by around 10 million people by 2006 (CIA, 2008). Currently, the estimated population growth is at 1 million people per year (CAPMAS, 2008).

A basic challenge in Egypt is the impossibility of increasing its cultivable land to an amount that would sustain its increase in population (Tarver, 1994). Since the majority of the territory of the country is covered by desert, the population is forced to live and work in a limited area, i.e., around the Nile, in the Delta or around the Suez Canal. In most reports about Egypt’s spatial development, the following phrase can be found: “95% of the population lives on 4% of the land area” (World Bank, 2006d).

This research is focused on developing a simple method to improve Egypt’s ability to accommodate population growth and preserve agricultural areas. To start with, the problem is identified at the national level. Then, one Egyptian village is chosen for detailed analysis as a case study, giving special attention to the current and future size and composition of its population. After forecasting the population size and composition of the village in 2016, the additional needs of the village to manage population growth are investigated in terms of housing and services. Based on the additional needs, current land use, current zoning law and local residents’ preferences, recommendations are given to the village for modifying its zoning so that physical development can take place while preserving its agricultural areas and local heritage. Finally, the problem is explored at the national level by extrapolating this specific village’s population growth to all Egyptian villages, identifying the problems that are likely to occur at a national level and suggesting directions national policy might take to alleviate them.

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Table of Contents

List of Figures

List of Tables

1. Chapter 1: Introduction

1.1 Background

Egypt, commonly known as Land of Civilizations, is reputed worldwide for its distinct 7,000 year-old record of civilization and immense wealth of knowledge (Egypt State Information Service, 2008a). Egypt, officially named the Arab Republic of Egypt, is located at the center of three old world continents: Africa, Asia and Europe. It overlooks the Red and Mediterranean Seas, as well as the Suez and Aqaba Gulfs (Egypt State Information Service, 2008a). Egypt has borders with Sudan in the south; Libya in the west; the Mediterranean Sea in the north and the Red Sea, Palestine and Israel on the east and northeast. Its total area is about 386,900 square miles (1,002,000 square kilometers) with an estimated population of 76,000,000 in 2008 (CAPMAS, 2008).

Egypt is the most populated country in the Middle East and the second most populated country in Africa. The population of Egypt is rapidly increasing. Its population was 59 million in 1996, and increased by around 15 million people by 2006 (CIA, 2008). Currently, the estimated population growth is at 1 million people per year (CIA, 2008).

A basic challenge in Egypt is the impossibility of increasing its cultivable land to an amount that would sustain its increase in population (Tarver, 1994). Since the major territory of the country is covered by desert, the population is forced to live and work in a limited area. These areas are located around the Nile, in the Delta or around the Suez Canal. In most reports about Egypt's spatial development, the following phrase can be found: "95% of the population lives on 4% of the land area" (World Bank, 2006b).

1.2 Problem statement

Due to the rapidly increasing population in Egypt and lack of available housing, the residential areas of the cities/villages are encroaching on the agricultural areas, and these are shrinking (El-Hefnawi, 2005). Some experts and institutions estimated a total loss of 1.35 million feddan of prime agricultural land

during the period of 1952 to 2002 (El-Hefnawi, 2005). Since agricultural activity contributes considerably to Egypt's GDP, it is important to manage and control the loss of agricultural areas caused by urbanization while meeting the housing demand of the communities (El-Hefnawi, 2005).

Typically, urban areas are unable to accommodate new inhabitants without extending their territories (Kasarda et al, 1993). The amount of territory extended should be enough to continue satisfying the basic needs of citizens. Basic needs are directly related to human development and are concerned with providing access to the essential elements of life such as: food, clothing, shelter, health care (including clean water and sanitation), education, employment and the right to participate in decisions about the future (Stewart, 1985).

Public policy planning is needed to maintain the quality of life (Kasarda et al, 1993). No matter to what extent and direction a city expands, government has to meet the basic needs of its citizens (Kasarda et al, 1993). Furthermore, government has to make sure that the environment will not be degraded due to the city's growth (Kasarda et al, 1993). A city's growth should not have harmful impacts on the environment.

The Egyptian government is aware of this problem and is trying to control urbanization through the use of different tools (Egypt State Information Service, 2008b). One of the tools applied by the government is zoning law, which regulates land use all over Egypt. Mainly, the law draws the boundaries of the cities and villages and identifies clearly those areas that can be used for building purposes (residential, commercial and industrial) and those that should be used for agriculture. The zoning takes population increase for the coming 15 years into consideration. During this period, no modifications in zoning regulations may be made. The currently valid zoning law was approved in 1985. However, its revision was delayed and the revision implemented only in 2005. During the revision process, actual land use and the expected population growth for the next 15 years are taken into consideration. The actual land use is

investigated with the help of existing maps and a database supported with aerial photographs, surveying site visits and focus group interviews among local residents. (El-Hefnawi, 2005)

The objective of this research is *to develop and recommend an efficient policy to manage and control the loss of agricultural areas in one specific village caused by urbanization due to population growth*. The objective will be achieved with the help of a case study and a forecast study.

The aim of the case study is to raise awareness at the national level by gathering information about agricultural land loss and agricultural land management in Egypt and providing guidance for one specific village on how to manage population growth and preserve cultural heritage while maintaining the balance between agricultural and residential land use.

1.3 Research questions

To provide guidance, the following research questions were set up:

Central research questions:

What measures could be taken to accommodate population growth by 2016 in a specific Egyptian village, while preserving its agricultural zones and local heritage?

What implications does this have for national policy?

Other research questions:

What are the consequences of agricultural land loss due to urbanization, giving special attention to Egypt?

What is being done at local, governorate and national levels in Egypt to ensure the balance between agricultural and residential land use?

What is the current state of the village under study?

What additional needs in terms of housing, services and infrastructure will occur due to the change in the size and the composition of the village's population by 2016?

What is the order of magnitude of these needs at the national level?

1.4 Expected outcome

Based on the 1985 zoning law, actual land use, expected population growth, additional basic needs and local residents' preferences, recommendations will be given to one specific village about how to balance the demand for agricultural and residential use due to population growth. The village needs to be prepared with a strategic plan so that as its population increases, it will be continuously able to satisfy the basic needs of its residents while preserving both its rural characteristics, agricultural areas and local heritage. Recommendations will include how the village should modify its zoning and where it could provide additional housing and services in order to accommodate population growth while maintaining the village's character.

Finally, the research will explore the seriousness of the problem if all Egyptian villages were to experience the same population growth as this specific village. It will be assumed that this village is a representative village of Egypt, and all of the 4632 Egyptian villages can expect the same population growth, and accordingly the same additional basic needs demanded. It will be described what this demand would mean for the country.

2. Chapter 2: Literature review

In order to understand the full context of the research undertaken, a literature review about Egypt was necessary. This literature review consists of three sections. As the system of land ownership and land use in Egypt is completely different than in the United States, it is important to start by defining some basic land use terms. These terms will help later on in the village analysis. Accordingly, in section 2.1 the basic land tenure system, types of development and types of land uses in Egypt are described.

The section 2.2 clarifies the need for this research. It provides detailed information about agricultural land loss due to population growth in Egypt. This section defines informal development, lists its causes, estimates the extent of agricultural land loss due to informal developments, and lists the impacts of agricultural land loss. It also describes the process of agricultural land loss in Egypt. Finally, policies and political parties at national, governorate and local level responsible for preserving and controlling agricultural land are also introduced.

The third and final section (2.3) of the literature review analyzes how three different countries manage preserving agricultural land. The United States of America was chosen because of its high annual population increase, while the Netherlands and Great Britain were chosen because of their high population densities. The case studies are included to provide help in the development of recommendations.

2.1 General information

2.1.1 Basic land tenure system in Egypt

Egypt has a complicated administrative system, which is the result of the country's long and complex history (El-Hefnawi, 2005). Legislation regarding the ownership and control over land was considerably

influenced by ancient customs, Islamic laws, and finally by French and British legal systems. Currently, the following five main types of land tenure exist in Egypt:

- Trust or Waqf land:

  This consists of properties for charitable or religious purposes, which are usually administered by the Ministry of Waqf (El-Hefnawi, 2005). Such land is usually transferred through lease (World Bank, 2006b).

- Encroachment (Wad Al Ayad):

  The civil code (No. 131 of 1948) makes it possible for the possessor or user of a plot of land to gain ownership of that land if it is occupied, peaceful, unchallenged and uninterrupted for 15 years and if the owners don't assert their rights during this period (El-Hefnawi, 2005).

- Private land (Mulk horr):

  This is registered with the local district office of the land registration division, owned by private persons or companies and can be transferred freely (World Bank, 2006b).

- Public or State land (Amlak Amiriya)

  The State’s public domain is registered as state property to serve a public purpose, and can not be alienated under any circumstances (World Bank, 2006b).

  The State’s private domain can be alienated through sale, lease or Takhssiss (i.e., the transfer ownership conditional upon meeting certain criteria, such as keeping the land use unchanged and paying the remaining installments of the land price) (World Bank, 2006b).

The inheritance of this diverse land tenure system and the Egyptian governments` hesitance to touch these old and outdated policies are the main reasons why land management has become a very complicated issue in Egypt (El-Hefnawi, 2005). The large majority of land in Egypt is public or State-owned desert land, which is, for the most part, undeveloped (estimated to be 90 – 95 % of the national territory) (World Bank, 2006b).

2.1.2 Types of urban development

Forbes (1998) divides urban development in Egypt into three groups according to its legality and standard as follows: formal good standard, informal good standard and informal bad standard.

"Formal good standard" areas were developed legally; using, for instance, a zoning code and building regulations that were respected during building. A zoning code divides an area into zones reserved for different purposes such as residential, commercial and industrial (Forbes et al, 1998). Building regulations control the location of buildings in relation to approved plans, street layouts, building height and quality (Forbes et al, 1998). With "informal development" neither is zoning code applied, nor are building regulations met (Forbes et al, 1998). Informal developments can be further subdivided according to the existence or lack of standards. Easily accessible agricultural land usually has a high standard as its structures are built for middle income groups. Informal developments with poor standard includes buildings, which have poor water supply or a lack of sewerage or street paving and lighting, or a lack of services such as educational and recreational facilities or police, ambulance and fire-fighting facilities (Forbes et al, 1998). Figure 2-1 is an example of an informal settlement without any infrastructure.

Figure 2-1 Example of informal settlements with poor standard

Source: El-Hefnawi, 2008

Informal settlements were neglected by public officials until the early 1990s; consequently, there are only few consistent or credible data regarding the number and size of informal settlements in Egypt (World Bank, 2006a). Table 2-1 shows an unofficial estimate of the population of urban areas and their proportion living in informal settlements, according to some governorates of Egypt in 1996.

Table 2-1 Population of informal settlements in urban areas, 1996

	Informal areas		**Total urban population**	**Informal as percentage of total urban population**
	Number	**Population**		
Cairo	79	2,437,988	6,774,000	35.99%
Giza	32	1,398,000	2,332,000	59.95%
Kalubia	60	686,350	1,494,071	45.94%
Alexandria	40	1,162,750	3,284,668	35.40%
Fayoum	28	99,853	425,400	23.47%
Bani Suif	46	144,770	458,225	31.59%
Menia	30	273,000	558,366	48.89%
Sohag	34	381,180	675,983	56.39%
Qena	8	22,700	72,311	31.39%

Source: World Bank, 2006a

The World Bank (2006a) differentiates four categories of informal developments according to land tenure:

- Housing built on illegally-owned/occupied land, including squatting on State/public or privately-owned land,
- Housing built on legally-owned land that was illegally converted from agricultural to urban use,
- Housing built on legally-owned land without a land subdivision permit and
- Housing built outside of the urban boundaries without planning permission.

According to Forbes (1998), informal buildings are located mainly on privately-owned agricultural land because an owner can easily subdivide the land and sell it. Desert land is basically owned by the government and is allocated to different uses through different agencies. Although some agencies have

the power to develop and sell the desert land, it is more difficult to acquire desert land than agricultural land (Forbes et al, 1998). Informal settlements on agricultural land include 80% of all types of informal settlements in Egypt (World Bank, 2006a). Table 2-2 reflects the case of Cairo in 1996 and shows that in Cairo 81.6 % of the informal buildings were built on private agricultural land.

Table 2-2 Extent of informal residential areas in Cairo in 1996

Houses built informally in Cairo	**Net Surface Area (km^2)**	**Percentage (%)**
A1 On Private Agricultural Land	105.5	81.6
A2 On Core Village Land	3.5	3.0
A3 On Government Agricultural Land	4.2	3.3
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 et al, 2006

2.1.3 Land use

Land use in Egypt is divided into agricultural land use, desert land, urban land use (which can be residential, commercial, office, etc or a mixture of these land uses) and vacant areas (Forbes et al, 1998). The urban land use can be further divided into formal and informal areas. In the case of formal urban lands, the conversion from agricultural or desert land to urban areas has been planned as mentioned above.

Formal urban land use mainly means that commercial activities occupy ground floors and the rest of the floors are reserved for residential land use (Forbes et al 1998). In planned areas a considerable amount of space is also reserved for recreation and social facilities.

Informal urban land use mainly means residential land use, although the ground floor is occupied by shops and workshops (Forbes et al 1998). Informal lands often lack social and recreational facilities, space for circulation, etc.

Vacant lands are extremely sensitive and require special attention. Originally, they are zoned as agricultural areas, but they are surrounded by informal urbanized areas. The vacant land might become a threat, since it can easily become a repository of solid waste, or an opportunity, since it can provide room for social and recreational developments (Forbes et al, 1998).

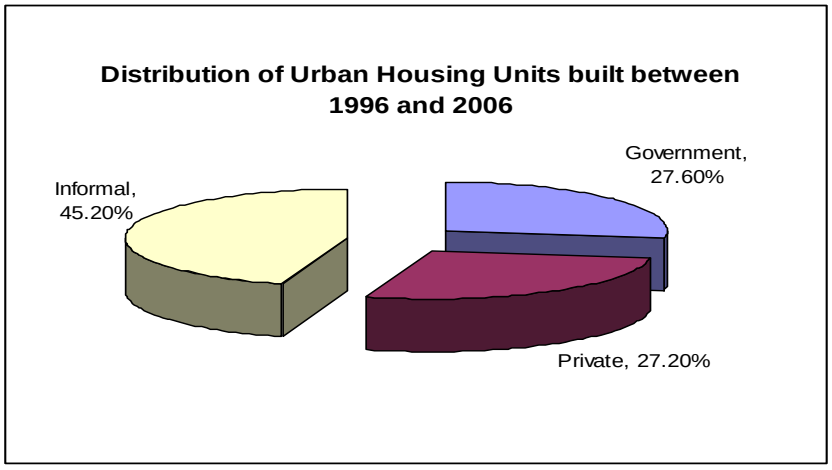
2.1.4 Factors leading to the spread of informal developments

The literature identifies several factors leading to informal encroachment in agricultural areas of Egypt. Based on El-Hefnawi (2005), El-Hefnawi et al (2001) and World Bank (2006c) reports, the following list was set up:

- Expensive private sector housing stock, shortage of public sector housing stock

  The private sector offers expensive housing because private firms and individuals have to cover their expenses due to the high increase in construction costs and building materials and expensive land prices (El-Hefnawi, 2005). The public sector is unable to provide enough housing stock due to financial reasons (El-Hefnawi, 2005). Figure 2-2 shows the distribution of urban housing units built by different actors between 1986 and 1996.

Figure 2-2 Distributions of urban housing units built 1986 – 1996 by sector



Source: World Bank, 2006c

- Lack of affordable mortgage system

  The mortgage regime in Egypt started in 2001. Since mortgages can be applied only toward formal housing and the interest rates are high, only families in the highest two deciles of income distribution can afford it (World Bank, 2006c). In 2005, the number of units financed by mortgages was small, and this means only hundreds of units nationwide (World Bank, 2006c).

- Rent control

  Around 50% of existing dwelling units in Egyptian towns remain under rent control with absurdly low rents set in the 1950s and 1960s (World Bank, 2006a). Although rent control was abolished in 1996, the fixed rental contracts signed before 1996 remain valid. This means that these units are out of the market for the decades, since the rental contract can be inherited once by offspring of the original renter (World Bank, 2006a).

- High price of agricultural land

  The high price of land and housing forces the urban poor to live on polluted and illegally occupied lands such as cemeteries or agricultural land. Furthermore, selling agricultural land after subdivision has become more attractive income than the agricultural returns on that land (El-Hefnawi, 2005).

- Cumbersome permit processes

  Hernando De Soto, in his research entitled “Dead Capital and the Poor in Egypt” stated that acquiring formally a piece of land on which to build a dwelling unit and then registering the property following legally established procedures, requires the individuals carry out 77 bureaucratic procedures in 31 different public and private offices, all of which could take 6-14 years (El-Hefnawi, 2005)

- Inefficient form of development of desert land

  Although there is plenty of desert land, much of the more accessible areas is already allocated to different uses such as military installations, co-operatives and private developments (El-Hefnawi, 2005). Furthermore, new cities offer housing alternatives only to middle and high income people

because only these people are able to afford the high transportation and infrastructure costs (El-Hefnawi, 2005).

- Institutional bottlenecks

  There are several actors at different levels responsible for urban development and planning and protection of agricultural land, but coordination among these parties is missing (El-Hefnawi, 2005). Consequently, it happened that even after the directorate of agriculture banned development on agricultural land, engineering departments were issuing building licenses on agricultural land as well as construction infrastructure connections to buildings that are in violation of the ban (El-Hefnawi et al, 2001).

- Limited human, financial and other resources

  It is nearly impossible to monitor and take severe actions against violations, especially since the number of employees working in the agricultural land protection department is low (El-Hefnawi, 2005). Furthermore, these employees can not be expected to do their work properly since they are underpaid and forced to work under harsh conditions. Officials also declared that the lack of basic equipment such as bulldozers prevented them from carrying out their duties to monitor and demolish violations (El-Hefnawi et al, 2001).

In addition, there are other social and political reasons which lead to agricultural land loss. To summarize, low income people start to build illegally on agricultural areas because they can not afford the available private housing, and they can not find available public housing (El-Hefnawi, 2005). Low income people are further encouraged to build illegally since the government does not enforce the planning and building codes.

2.2 Agricultural land loss

2.2.1 Level of agricultural land loss

It is difficult to identify exactly how much agricultural land has been lost in the past 50-60 years in Egypt. Experts at different national and international institutes have different estimates regarding the yearly agricultural loss between 1965 and 2000 as it is shown in Table 2-3.

Table 2-3 Yearly agricultural land loss in Egypt (thousand acres)

	Yearly agricultural land loss in thousand acres		
Researchers	**1965 – 1972**	**1973 – 1983**	**1984 – 2000**
El Bakri B (1992)	50		
PADCO (1982)	20 – 25		
Zanaty M. (1995)	44		
National Ministry of Agricultural		60 – 70	25

Source: Table was prepared by researcher based on El-Hefnawi's report (2005)

El-Hefnawi (2005) identified several different reasons for agricultural land loss. These are urbanization, an increase of underground water level, salinity of the agricultural land, and the scraping of land for brick-making. The total agricultural land loss in Egypt between 1965 and 2000 is estimated to be around 1.3 million feddan (e.g., 1.35 million acres) (El-Hefnawi, 2005). It is estimated by El-Hefnawi (2005) that 50 - 60 % of this loss was caused by urbanization. Figure 2-3 shows an informal settlement extending on agricultural land.

The Egyptian National Specialized Committee (2003) not only estimates the agricultural land loss between 1952 and 2002 but also provides scenarios for potential agricultural land loss in the future. According to the "optimistic scenario – white scenario", the sum of the total reclaimed and old land (i.e., delta land) will not decline, and the Egyptian government, if it succeeds in reforming its agricultural protection policies, will not experience the problem with the current intensity (El-Hefnawi, 2005).

According to the "pessimistic scenario - black scenario", by year 2080, Egypt will lose all its old land and will be dependent on reclaimed land (El-Hefnawi, 2005).

Figure 2-3 Example of encroachment on agricultural land

Source: El-Hefnawi, 2008

2.2.2 Impacts of agricultural land loss

Agricultural land needs to be controlled and managed as it has serious impacts on the country's socio-economic, physical and environmental background. These impacts are summarized in Table 2-4.

The loss of agricultural land means the loss of employment, and the loss of agricultural products. People originally employed by agriculture, face difficulties in finding new jobs. The government faces additional expenses due to increased unemployment, closing old drainage systems and providing infrastructure for the new development (El-Hefnawi, 2005).

The new houses attract people from villages, which leads to weird social problems within the city since the rural immigrants transfer their behavior, traditions and way of living to the urban areas (El-Hefnawi, 2005). The result is ruralized urban areas.

Informal buildings contribute to a great extent to the deterioration of living conditions. Informal builders' main aim is either profit maximization or house ownership. They do not pay attention to providing green areas, open spaces; room for paved roads, infrastructure; places for recreation, social facilities, etc. Consequently, informal settlements are often unhealthy, high-density areas, which lack basic urban services (El-Hefnawi et al, 2001).

Since informal developments are not planned in advance, they contribute considerably to environmental degradation through air, water, soil and noise pollution (El-Hefnawi, 2005).

Table 2-4 Impacts of agricultural land loss

Socio-Economic impacts	**Physical impacts**	**Environmental impacts**
Increasing unemployment	Deterioration of living conditions	Air pollution
Increasing poverty	Unhealthy, high-density areas	Noise pollution
Closing down drainage systems	Lack of infrastructure	Water pollution
Ruralization of urban areas	Lack of basic urban services	Soil pollution
Urbanization of rural areas (without services)	Irrational buildings	Poor solid waste management
	Lack of living space	Environmental degradation
	Lack of green and open space	
	Overcrowdness	

Source: Table prepared by author based on the work of El-Hefnawi (2005), El-Hefnawi et al (2001), Kamal et al (2001), Forbes (1998)

2.2.3 Process of agricultural land loss

The process of constructing private residential buildings on agricultural land has its roots in the 1960s, when farmers decided to subdivide their land and sell it in small pieces (Sims, 2003), usually advertising through word of mouth or through informal brokers or simsars (World Bank, 2006c). During this period,

government did not impose any prohibition against this process (World Bank, 2006c). After 1974, the number of constructed informal buildings increased dramatically due to the government's open door policy and the increasing number of Egyptian laborers returning from the Gulf countries (El-Hefnawi, 2005). In the 1980s and 1990s, government authorities realized that informal extension on agricultural land needed to be controlled. During this period, laws were passed to completely ban any developments on agricultural land. By 2004, it was realized that development does not need to be banned but managed and controlled.

The following sequence of events was identified in the process of agricultural land loss (based on El-Hefnawi, 2005, World Bank, 2006c and Forbes et al, 1998):

- The real estate agents or land brokers bought agricultural land in the peripheral areas of cities and villages. They subdivided land illegally leaving no space for services or infrastructure connections. The results are pieces of land, with areas of 150-300 m^2.
- Similarly, there are small landlords who subdivided their own plots into a huge number of land parcels ranging between 60 and 100 m^2.
- Real estate agents, land brokers and landlords started selling their lands mainly to middle income people, who are working in the Gulf area and are suffering from the non-affordability of housing units in Egypt, or to rural immigrants.
- New landowners started to build on the land adding additional floors gradually according to their financial capabilities.
- Depending on the original irrigation and other natural systems within the agricultural land, the shape of the land and the street width are different. These newly built-in areas lack all kind of services (sanitation, drinking water, health care facilities, police, infrastructure, etc.).
- In some cases, the contractor could buy more than one piece in order to construct bigger projects (i.e., private universities, entertainment centers).

- Once the buildings are illegally built on the agricultural land, there is a demand for legal building permission and infrastructure connections. Since providing building permission and infrastructure connections takes time, many temporary connections are built illegally, causing further problems. See Figure 2-4.

Figure 2-4 Example of an informal settlement lacking infrastructure

Source: El-Hefnawi, 2008

The best feddan of land sold for agricultural purposes in the Nile Valley may fetch up to LE 120,000 ($5.71 per m^2), whereas the same land subdivided and sold for building purposes will command not less than LE 350 per m^2 ($70 per m^2) in 2005 (World Bank, 2006c). Consequently, the incentive to convert agricultural land to urban use is extremely high (World Bank, 2006c).

2.2.4 Beneficiaries of agricultural land loss

Land brokers and real-estate agents benefit financially from converting agricultural lands into informal residential districts (El-Hefnawi, 2005). Their sole aim is profit maximization. They have extensive knowledge about the location of available and attractive agricultural land, and are familiar with the existing regulations and how to take over the land. Finally, they enjoy a strong, informal relationship with

local officials. Small farmers tend to sell their land after subdivision in the hope of temporary financial stability.

Prospective customers are often low-income households (60 % of the total population) (El-Hefnawi, 2005). Since these customers have limited financial means to satisfy their housing needs, the most affordable and available way to solve their housing problem is illegal building on agricultural areas (El-Hefnawi, 2005).

Table 2-5 Stakeholders and their roles during encroachment on agricultural land

Stakeholders	**Roles**
Owner-builders	Subdivide and sell their land, retaining a plot for their house; Organize construction; Deal with local authorities; Incrementally build their house according to need and savings; Rent vacant spaces/units until needed by family members.
Brokers/informal sub-dividers	Act as intermediaries between buyers and sellers of the land; Buy land from small owners and subdivide it for their interest.
Contractors	Build large buildings in short time and achieve fast profit; Deal directly with sub-dividers or owner-builders.
Community Based Organizations and local leaders	Organize the community to pressure local authorities to provide the settlement with basic infrastructure; Organize self-help efforts to provide basic infrastructure and services, working with professional contractors; Represent communities in negotiations with government to acquire basic rights, especially through lobbying and political manipulation.

Source: World Bank, 2006a

All above mentioned actors could not benefit from the encroachment of agricultural land without the support of public officials. These officials support the actors either directly through the administrative

bottlenecks or indirectly through the double role played by them, aiming to share the financial benefits of agricultural land subdivision (El-Hefnawi, 2005). The role of each stakeholder during the informal development process is shown in Table 2-5.

2.2.5 Actors involved in agricultural land protection

This section is based on Dr Ayman El-Hefnawi`s work. He identified actors at national, governorate and local levels responsible for urbanization and agricultural land protection during his research, conducted between March and April 2000. During this period he conducted several interviews with local officials and experts.

The Ministry of Agriculture is responsible for protection of agricultural land, and the decrees of this ministry are important policies to control urbanization and agricultural land protection. (El-Hefnawi, 2005) The ministry has its independent organization for agricultural land protection. This organization is supposed to coordinate between central and local governments since it has local branches at governorate level. In reality the power is centralized in the main branch in Cairo (El-Hefnawi, 2005).

The Ministry of Housing, Utilities and New Communities is responsible for physical planning in Egypt. Master planning is the traditional tool used by the ministry to protect agricultural land; however, these master plans are rarely implemented (El-Hefnawi, 2005). This ministry also has its specialized organization, called The General Organization for Physical Planning. This is the organization, which defines the boundaries of cities and villages in coordination with the local authorities at the governorate, district and village levels (El-Hefnawi, 2005).

The Egyptian Environmental Affairs Agency regards agricultural land as a natural resource that must be preserved for the coming generations. Although it has only one department responsible for land protection

and soil quality, it is a very powerful agency and plays an important role in raising awareness about the importance of preserving agricultural land (El-Hefnawi, 2005).

The Ministry of Interior must submit a report to the governor before demolishing any violation (El-Hefnawi, 2005). According to the Prime Minister's Military Decree no 1/1996, "three partite committee" in each governorate is formed by one representative of the agricultural directorate at the local level, one representative of the executive local authority and finally one representative of the local police office (El-Hefnawi, 2005). Although the task of this committee is to demolish any buildings constructed illegally on agricultural land, the committee lacks financial means, equipment, full legal authority, support, etc. to do its work efficiently (El-Hefnawi, 2005).

The Ministry of Justice should be responsible for supporting the implementation of agricultural protection laws. Due to the lack of financial means and resources, local courts are overburdened. Consequently, they rarely issue sentences of prison against farmers (El-Hefnawi, 2005).

The governor is the head of the governorate. He/she issues local decrees, which complement the laws and ministerial decrees (El-Hefnawi, 2005). The governors have a crucial role to preserve agricultural land. One group of governors believes that implementation of the laws is the only way to preserve agricultural land, while the other believes that there should be some balance between the preservation of agricultural land while meeting the demands of the community and, hence, there is a crucial need for policy reforms (El-Hefnawi, 2005).

The Directorate of Agriculture and its branches at the local level are responsible for monitoring encroachment on agricultural land (El-Hefnawi, 2005). However, this body regularly fails to fulfill its responsibilities, due to centralized power and a lack of financial means, equipment, and updated maps. Furthermore, they are forced to work under old and outdated norms (El-Hefnawi, 2005).

The executive local councils are responsible for implementation at the local level. They also lack financial means, equipment, knowledge and experience to fulfill their duties (El-Hefnawi, 2005). The Physical Planning Department is partly responsible for issuing building licenses. The Amlak Department registers land at the governorate level. The department is unable to work efficiently and precisely since it is not computerized (El-Hefnawi, 2005).

Agricultural cooperatives act at the village level. They struggle to do their work precisely and efficiently due to the lack of computerized information and financial problems (El-Hefnawi, 2005). Furthermore, they have a strong loyalty to their communities; they tend not to take severe actions against the violators (El-Hefnawi, 2005).

Table 2-6 Problems faced by informal developers and ways to overcome them

Competent authority	Type of problem	Solutions used by developers
Local authorities	Building on agricultural land; Clearance records; Difficulty to obtain building permit; Record road works.	Compromise records work and payment form LE 2000; Payment of bribes and/or use of influence; Contractors building work at night.
Police	Record road works.	Payment of bribes and/or use of influence; Construction at night.
Utility companies	Difficulty in obtaining electricity; Difficulty of access to water; Absence of a network of sewage.	Obtained from neighbors; Illegal connection to main lines; Payment of bribes and/or use of influence to enable access to infrastructure.

Source: World Bank, 2006a

El-Hefnawi introduced not only parties at different levels responsible for controlling agricultural land, but also drew attention to reasons why these parties in some cases are unable to work efficiently. The majority of landowners face problems with local authorities during the building process (World Bank, 2006a). Table 2-6 highlights some of these problems and their "solutions".

2.2.6 Policies to control agricultural land loss

Egypt has several laws and documents, as well as ministerial and governor's decrees, which aim at preserving agricultural land. In the first part of this section, the most important decrees and laws will be introduced, which formerly controlled developments on agricultural land, but which were abolished in the last 5 years or are about to be abolished in the near future. In the second part, the new law, which will protect agricultural land once it is in force, will be introduced briefly.

The Prime Minister Military Decree No 1/1996 was issued to prohibit development on agricultural land (El-Hefnawi, 2005). According to this decree, someone who violates the law could be punished with a fine between 10,000 – 15,000 LE ($2,000 – $3,000) or could be sent to jail for 2 to 5 years (El-Hefnawi, 2005). This law was abolished in September 2004.

Since 1966, the Egyptian government has been interested in protecting agricultural land. Several laws were issued to achieve this aim, Law No 53/1996 and Law No 116/1983 to give some examples. Furthermore, the Ministry of Agriculture proclaimed several ministerial decrees. Most of these laws are aimed solely at protecting agricultural land regardless of the reasons behind the development.

In 2004, Law No 116/1983 became the main law protecting agricultural land. Accordingly, any building constructed over agricultural land or any community initiative taken to divide such land for the purpose of building was totally prohibited (El-Hefnawi, 2005). However, there were some exemptions, such as land areas falling within city borders, land areas isolated according to the aerial photo of 1985 and approved by

Ministry of Agriculture and Ministry of Housing, Utilities and New Communities and, finally, land areas on which the government built public utilities after the Ministry of Agriculture's approval (El-Hefnawi, 2005).

Law No 3/1982 determined that economic, social and environmental criteria should be taken into consideration during urban planning. Accordingly, each city and village must have detailed comprehensive plans. These plans should be prepared through a participatory approach and should be revised every five years (El-Hefnawi, 2005). Several ministerial and governor decrees were issued to enable urban planning departments at the governorate level to prepare comprehensive plans.

Due to the ineffectiveness of these laws, the number of informal settlements dramatically increased. Figure 2-5 shows an informal settlement being built in this period. The Egyptian government realized that a new and more efficient law was required, and Law No 119/2008 is expected to replace all the old laws, which are directly dealing with buildings. This 119/2008 will be solely responsible for controlling and managing developments on agricultural land in Egypt. This law is the result of a 10-year-long discussion in the Ministry of Housing, Utilities and New Communities, in the Shoura Council and in the Parliament (El-Hefnawi, 2008). The law has four chapters as follows: planning for urban development, preservation of buildings with cultural and architectural importance, building laws and protection and maintenance of housing buildings. The main points of the law are summarized in the following paragraphs.

The Law Nr 119/2008 encourages a shift in the tools of urban planning from traditional master plans to strategic plans. The former used to be mainly physical land use plans, while the latter one is rather an action plan, including socio-economic and environmental issues, while focusing on local economic development and environmental management, and promoting public private partnerships and stakeholder participation (El-Hefnawi, 2008).

Figure 2-5 Example of construction of an informal settlement

Source: El-Hefnawi, 2008

The law also aims at setting up a National Council for Urban Planning and Development. This council will consist of officers and experts, both from the public and private sectors, headed by the Prime Minister (El-Hefnawi, 2008). It will approve general regulations and governorate, regional and national strategic urban development plans, among others (El-Hefnawi, 2008).

The law emphasizes the necessity of participatory planning at local levels. It also declares the duties of the General Organization for Physical Planning (GOPP) and its regional centers as they will remain responsible for urban planning. They will be responsible for developing and adjusting urban policies, preparing guidelines, monitoring and guiding the preparation of local plans, encouraging participatory planning and monitoring urban development, etc. (El-Hefnawi, 2008). The seven urban planning centers at the regional level are supported to become the decentralized arms of GOPP. As decentralized bodies, they will be provided with the required technical support so that they will be able to cooperate directly with the governorate and local authorities (El-Hefnawi, 2008).

The law also differentiates how to handle slums, informal settlements, downtown areas, industrial zones and historic urban areas, and it sets operational procedures accordingly (El-Hefnawi, 2008).

To summarize, in the past it was intended to ban any developments on agricultural land; today the aim is rather to manage and control developments on agricultural land.

2.3 International examples

This section describes briefly how three different countries in the world, namely United States of America, the Netherlands and Britain, try to preserve their agricultural land. The United States was chosen for two reasons. First, its agricultural sector provides a large amount of food for both domestic and international markets. Second, its agricultural land is endangered by continuous sprawl. Both the Netherlands and Britain have significant agriculture. As the major area of these countries is already built in, urban land uses compete for agricultural lands.

2.3.1 United States of America

The United States has a population density of 28 persons per square km and about 2.5 acres of farmland per person (Alterman, 1999). Due to a food surplus and ample land, farmland preservation gained public support only in the late 1970s and early 1980s in the US (Alterman, 1999). In 1981 the US Department of Agriculture and the Council on Environmental Quality published their National Agricultural Lands Study, which was the first report estimating the loss of agricultural land in the US. However, there was a difference of opinion about the figures the report contained, and significant doubts about their reliability. In the 1980s, there was a strong growth in agricultural land preservation policies. After the late 1980s, the focus shifted to evaluating the effects of farmland preservation (Alterman, 1999).

Nearly three million acres of agricultural land were converted in the US from 1967 to 1975, about 75 percent to urban and transportation uses (Mandelker, 2008). Between 1982 and 1992 a further four million acres of prime land were converted and the rate of loss is continuously increasing (Mandelker,

2008). Currently, the US loses over 100,000 acres of farmland each year (Mandelker, 2008). The worst case scenario predicts that the US will become a net importer of food within 60 years due to the decreased amount of available agricultural lands (Mandelker, 2008). Sprawl, extensive self-incorporation and annexation powers that local governments have are the main reasons for the loss of agricultural land in the US (Mandelker, 2008). Approaches to the protection of agricultural land are affected by four significant factors: a tradition of local control, a deep respect for private property, a federal constitutional limit on extensively public infringement on private property and the use of relatively weak approaches to land use control (El-Hefnawi, 2004).

Traditionally, the national government's involvement in farmland preservation has been weak (Alterman, 1999). The attempt to get a federal Land Use Act approved was aborted in the late 1970s (Alterman, 1999). The US Farmland Protection Policy Act of 1981 requires that projects initiated by the federal government minimize farmland conversion, although it leaves private land unregulated (Alterman, 1999). The Farms for the Future Act was proposed in 1990, which could have been efficient if it had been enacted (Alterman, 1999). Since farmland is not protected at the federal level, this can lead to the conclusion that farmland preservation is not seen as a national problem in the US (Alterman, 1999). In the US, farmland preservation takes place at local and state levels. Land use policies are locally developed, exchanged, strengthened or rejected until successful ones gain national recognition and their use spreads all around the country (Alterman, 1999).

Land-use controls that directly regulate farmland conversion such as exclusive agricultural zoning are rarely used in the US despite their potential effectiveness (Alterman, 1999). Rather, the applied US tools focus on the economics of farmland conversion (Alterman, 1999). The economic incentives and disincentives frequently used at the local level are property or other tax relief programs, 'right to farm' laws (providing farmers with immunity from lawsuits related to causing a nuisance), minimum lot size

(aiming to render farming lucrative and urban development difficult), 'agricultural district program' (a kind of package of economic incentives), and transfer of development rights, etc.

A further problem in the US is the 'takings issue'. There is a constitutional limitation on regulations such as development rights under which the courts can decide to be unconstitutional and be equivalent to a taking of property without just compensation, also called eminent domain (Alterman, 1999). In the '50s, eminent domain was extensively used throughout the country to obtain lands for governmental purposes (build a road network; eliminate "blighted" neighborhoods, etc). However, frequently eminent domain was used inappropriately. Due to its past controversial history, using eminent domain was limited both at state and federal level. The 'takings issue' limits the government's ability to preserve the agricultural land in the US as it can lead to long and fierce battles in court.

2.3.2 The Netherlands

The Netherlands is a small country with the highest population density in the European Union, 382 persons per square kilometer. The needs of urban areas have, since the 1960s, led to accelerated conversion of farmland to built-up land, reaching a dangerous rate by the 1970s (Alterman, 1999). However, the Netherlands managed to maintain more than half of its land area in agricultural use with very high yields and high income from exports despite high competition for land and environmental hazards to soil and water quality (Alterman, 1999).

Surprisingly, the Netherlands does not have legislation that regulates farmland conversion but regulation is integrated into the overall land use planning structure (El-Hefnawi, 2004). The Dutch rely on a strong tradition of urban containment and on the Dutch national planning system, which is strong and is used to guide regional and local plans (Alterman, 1999).

Planning has a long history in the Netherlands. In 1901, the first Housing Act was enacted. It was further discussed in the Physical Planning Act enacted in 1961 (Alterman, 1999). In the Physical Planning Act, most municipalities are asked to prepare detailed, binding structure plans and bestemmingsplan (designation plans) (Alterman, 1999). The designation plan is a detailed land use plan similar to a zoning plan and a site plan (Alterman, 1999). These plans are set up after carefully reviewing and analyzing the areas.

Furthermore, development permission in the Netherlands is not a right; consequently, public authorities can prevent developments while being immune from 'taking' claims (Alterman, 1999). A farmer, whose land is acquired by a municipality, is entitled to both compensation for loss of the physical land and compensation for loss of income (El-Hefnawi, 2004).

2.3.3 Britain (England and Wales)

Britain is also a relatively small country with high population densities, for example, 240 persons per square kilometer. The British aim at achieving balance between urban areas and the surrounding countryside (Alterman, 1999). The country's farmland and countryside preservation are handled in applying a variety of development policies and land use controls, and this is shaped by social norms (Alterman, 1999).

The British planning system is decentralized, and the responsibility for planning belongs to the local authorities; however, the national level has a 'veto' right (El-Hefnawi, 2004). In a nutshell, British planning institutions include elected local authorities (districts and counties) and the Secretary of State for the Environment, who heads the national Department of Environment (Alterman, 1999). The local authorities prepare local plans by district and structure plans by county. These plans are suggested 'to be taken into account' before granting planning permission (Alterman, 1999). The secretary has extensive powers to reverse, if needed, local decisions after reviewing them in detail and hearing appeals (Alterman,

1999). Planning authorities must also be in contact with the Minister of Agriculture before approving any physical developments.

During conversion, each stakeholder puts less emphasis on agricultural productivity and more emphasis on the environmental value of agricultural land and its protection for its own sake (Cullinworth, 1994). Furthermore, they also aim to achieve an urban structure, which provides infrastructure efficiently while it preserves countryside beauty (Alterman, 1999). Farmland preservation is not targeted directly. There is no 'taking issue' in Britain either, since development permission is not a right (Alterman, 1999).

2.4 Summary

Table 2-7 below summarizes the analysis in regard to agricultural land preservation. The USA is continuously fighting agricultural land loss, which is estimated annually to be 100,000 acres. The Netherlands and Great Britain successfully slowed down the extent of agricultural land loss to an acceptable rate but continue fighting for agricultural preservation. Protecting agriculture remains an important issue in each country although the reasons behind preservation are different. The USA's aim is to prevent sprawl in general but especially sprawl on agricultural land. The Netherlands is concerned about food loss; while Great Britain is not only concerned about food loss, but also puts emphasis on preserving the rural landscape.

The US uses a variety of different tools for agricultural land protection; consequently success varies accordingly. The Netherlands and Great Britain reached success in protecting agricultural land by using zoning and building permits. It is concluded that a national strategy with local enforcement and supervision is required to successfully manage agricultural land.

Table 2-7 Summary of the case studies related to agricultural land protection

Countries	Planning system	Tools used for protection	Why agriculture is important	Level of implementation	Extent of success
Netherlands	Strategic planning	Zoning	Food	National but relies on local level for enforcement	Highly successful
Britain	Strategic planning	Building and development permits	Food and preserve rural landscape	Local	Very successful
USA	Agricultural planning	Various	Prevent sprawl, retain farms	Local, state	Mixed results

Source: Adapted from El-Hefnawi, 2004 and Alterman, 1999

In Egypt, the amount of agricultural land has already decreased to a critical level. Additional loss of prime agricultural land in Egypt will further decrease food, income and available jobs. Since more than 50% of the agricultural land is lost due to population growth, the situation needs to be managed. The national government has already taken steps to reduce population growth rate by providing better education and raising awareness. The national urban population growth rate has already decreased considerably, while the national rural population growth rate decreased only slightly. For the time being, the government also needs to satisfy the additional population's basic needs, including housing and services. If the population's housing need is satisfied, no informal encroachment will take place. The government might use a variety of tools to satisfy housing needs such as providing more public housing, reducing the costs of private housing, providing a mortgage system, reducing the price of agricultural land, strategic planning at national level, enforcing zoning locally, etc.

Since this is a critical situation for Egypt, an in-depth approach is needed to provide better zoning. One specific village was chosen for this purpose. As a part of the national Egyptian strategic plan a local strategic plan is conducted for this village. This includes the study of its current situation and its zoning code. In the following chapters, the strategic plan is conducted starting with the methodology of updating the currently valid zoning code; followed by the analysis of the village, and the forecast of population and its needs.

3. Chapter 3: Methodology

The previous chapters identified a national problem, i.e., agricultural land loss caused by population growth. Furthermore, it assumed that the problem can be investigated and analyzed in detail at village level. If the problem is solved at local level, recommendations can be given at the national level as well. As already mentioned above, the aim of the research is to give recommendations to a specific village, while raising awareness at the national level. To achieve this aim, case study and forecasting study were chosen for the methodology.

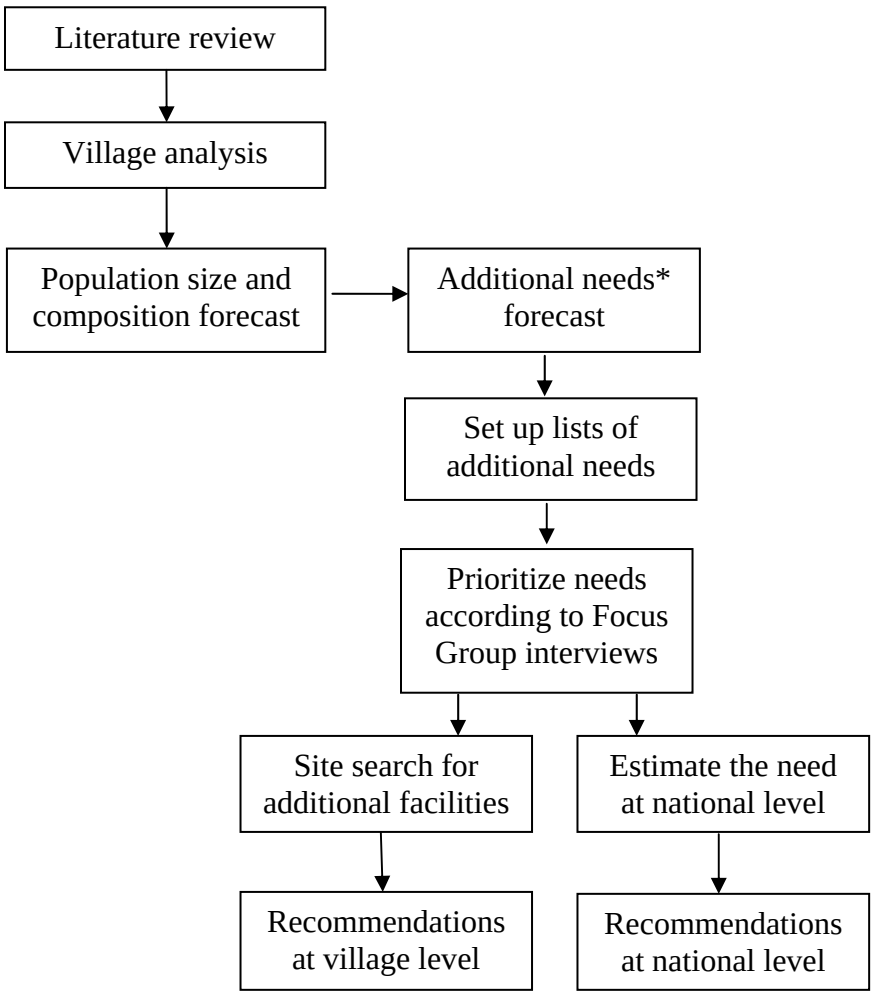
Section 3.1 describes **case study** in general, including its history, strengths and weaknesses. It also gives guidance on how to choose one specific case and how the specific village was chosen for this thesis in section 3.1.1. As part of the case study an extensive **literature review** was carried out. The literature review was carried out to gain additional knowledge about the problem and justify the need for the research. Its main points are listed in section 3.2, while the results of the literature review can be read in chapter 2.

Next, an **exploratory analysis** took place investigating the current situation of the case / village. This included qualitative information about the village such as its location, history, economy, etc., and quantitative information about its population, housing and services as it is detailed in section 3.3. Minutes of focus group interviews were also analyzed to better understand the local residents' real needs and their assessment regarding the current quality of life. Details of focus group interviews can be found in section 3.3.1. The type of data collected for the analysis is listed in Appendix 4 and the data itself is described in chapter 4.

Then, the steps of the **forecasting study** are described in sections 3.4 to 3.6. Here, the cohort component technique is introduced, on which the population forecast is based. The steps, advantages and

disadvantages of the technique are described, and it is explained why this technique was chosen. After the population was forecasted, the potential needs due to population growth were forecasted to 2016. Two lists were set up about the anticipated activities to be done in each category of housing and services. Finally, based on the results of analysis and forecast, **the site search** took place, aiming at identifying the best locations for the required units and facilities. This section lists the characteristics of such locations.

Figure 3-1 Flow chart for case study process



*additional needs equal housing and services needs

Source: Author, 2009

3.1 Case study

The case study method attempts a systematic investigation of an event or set of relevant events with the specific aim of describing and explaining a phenomenon (Yin, 2002). Briefly, the case study method is a detailed examination of one specific case. The focus of the case study lies in current or recent events. Due to financial and time constraints, researchers usually use either a large number of samples (=cases) and analyze them using only a limited number of variables or one specific case which is analyzed in detail. By focusing on only one case, a researcher can gain a deeper understanding about what is happening and why (Yin, 2002). Consequently, a researcher can give exact and in-depth recommendations.

The use of the case study originated in the early 20th century, when it was widely used in the fields of sociology, anthropology, medicine, and journalism (Becker et al, 2005). Since it started, the effectiveness of case study has been questioned. The arguments against it are that it is unscientific and biased due to its subjectivity. Despite continuous criticisms, many scholars support case study and claim it can be provide valid, reliable and generalized results if used properly (Yin, 2002). Becker et al (2005) see the flexibility of the case study method as an advantage. Accordingly, the method aims at discovering an issue, and it lets a researcher start with broad questions, which he or she narrows down as the project progresses. A further advantage is that the case study can act as a bridge between theory and practice because it allows researchers to compare their observations with quantitative results obtained through other methods of research (Becker et al, 2005).

Table 3-1 summarizes the strengths and weaknesses of case study in general. The author is convinced that all the weaknesses can be avoided by designing the case study well and applying its techniques appropriately.

Table 3-1 Strengths and weaknesses of case study

Strengths	Weaknesses
Focus on one specific case provide deeper understanding of the case	Focus on one specific case makes it uncertain to generalize the results
Mainly qualitative data	Subjective
Act as a bridge between theory and practice	Unscientific
Flexible as it allows the use of multiple source and techniques	Easily can lead to bias results if used inappropriately
Applicable in real life, contemporary and human situation	

Source: Yin, 2002

According to Yin (2002) there are three different types of case studies: explanatory, exploratory and descriptive. Explanatory cases are suitable for doing causal studies where the aim is to explain and discover the background forces (Yin, 2002). Descriptive cases require that the investigator begin with a descriptive theory and can be used to study in detail one specific case or several parallel cases and then compare to them (Yin, 2002). In exploratory case studies, data collection may be undertaken before the research question and hypotheses are put as this information may influence the objective of the research (Yin, 2002). According to Stake (1995), there are also intrinsic, instrumental and collective case studies. Depending on the type of the case study, the specific case analyzed can be extreme, critical or paradigmatic (Yin, 2002).

Exploratory case study was chosen as a method for this research as it aims at analyzing one specific village (case) in depth, while giving special attention to two variables, namely housing and services. The chosen village will be described, including its history, location, local administration (i.e., responsible bodies for implementing policies regulating the village's development), actual land use and zoning regulations, environment, economy (such as job opportunities), population (its size, composition,

education and employment), housing and services (such as schools, health and sport facilities, communication centers, security services, etc.).

The steps of the case study according to Yin (2002) are to:

- Determine and define research questions,
- Select the cases and determine data gathering and analysis techniques,
- Prepare to collect the data,
- Collect data in the field,
- Evaluate and analyze the data and
- Prepare the report.

Yin (2002) and Stake (1995) identified six different data sources, which the case study method uses. These data sources, as well as their advantages and disadvantages can be seen in Appendix 1. For this research, documents, archival records, minutes of focus group interviews, direct observations and physical artifacts are used as described in detail below.

Table 3-2 Strengths and weaknesses of this case study

Strengths	**Weaknesses**
Use of both primary and secondary data	Difficulty of choosing the representative case
Mainly qualitative data	Subjective
Use of different techniques as part of case study: Literature review, analysis, forecast, site search	Mainly practical, less theoretical
Applicable in real life, contemporary and human situation	Sensitive regarding drawing national recommendations based on local results
Local detailed analysis	

Source: Author, 2009

Table 3.2 summarizes the strength and weaknesses of this specific case study. By well designing the case study, the author believes to have eliminated the main weaknesses but some weak points can not be avoided as seen in Table 3-2. However, the strengths of the study override the weaknesses.

3.1.1 Case selection

Special attention must be given to the case selection procedure. Random sampling in this research can not be applied since the specific case must be typical, average and representative. Random sampling might result in a case located in the desert, which do not have typical, average and representative characteristics. The village chosen as the case study should be representative of Egypt in terms of socio-demographic characteristics. The village should be an average size one according to the Egyptian national average. Accordingly, the governorate where the village is located should be located in the Nile valley, Delta or North or East Coast as 95 per cent of the population live there. However, the four entirely urban governorates (Alexandria, Cairo, Port Said and Suez) should be excluded, as the population growth is proven to be higher in the villages than towns. Luxor, the self-governing city and the frontier governorates (New Valley, Matrouh, Red Sea and Sinai) are not suitable for this research, either.

That is, while choosing the governorate, the following factors are taken into consideration:

- Mixture of urban and rural areas,
- High proportion of rural areas in the governorate,
- Availability of prime agricultural land in the governorate,
- Being surrounded by more developed governorates and
- Being representative of the national level regarding socio-demographic characteristics.

3.1.2 Selection of Fayoum Governorate

There are several factors, which supported choosing Fayoum Governorate for the analysis. First of all, the governorate's population composition is similar to that of the country. Secondly, the governorate has a strong and varied economic base, including fishing, tourism, industry and agriculture. However, the main

income originates from agricultural activity, and agriculture offers jobs for a considerable number of people. The governorate owns a wide and extensive canal system, which connects agricultural fields to Lake Qarun and the Nile. Thirdly, the governorate shows great promise in accommodating future urban growth supported by potential economic growth as it offers plenty of historical places and a lake for recreational purposes. This potential is supported by the proximity of Cairo (i.e., 1 - 1.5 hour drive). Finally, the research work has been greatly facilitated by the available wealth of information.

3.1.3 Selection of Shakshouk Village

There are several factors, which supported choosing Shakshouk Village for this analysis. First of all, the continuous population growth and high birth rates result in a changing composition of the population, which leads to additional needs in the village. Secondly, the village's economic base is supported by several industries such as fishing, the salt and mineral industries and agriculture. Agriculture offers jobs for a considerable number of people, including children. These jobs need to be protected. Thirdly, the village is close to historical places, recreational places (Qarun Lake) and Cairo (a 2 to 3 hour drive). Qarun Lake is especially important in the future of the village as the lake can generate a considerable amount of income to the village by becoming a tourist destination or through fishing. If this opportunity is used, the village can expect rapid increases in population, income and physical development in the near future. Finally, the research work has been greatly facilitated by the available wealth of information.

3.2 Literature review

In order to understand the full context of the research undertaken, a literature review is necessary. The literature review consists of four sections. As the system of land ownership and land use in Egypt is completely different than in America, it is important to start by defining some basic land use terms. These terms will help later on in the village analysis. The second section clarifies the need for this research. It provides detailed information about agricultural land loss due to population growth in Egypt. The third section of the literature review analyzes how different countries control and preserve agricultural land

efficiently. Finally, in the last section of the literature review, the current state of the chosen village/governorate and the country is investigated.

3.2.1 Data availability

The author does not know the Arabic language, and so this chapter is based only on English sources written by either international or Egyptian experts. Because many Egyptian researchers write their publications both in English and Arabic, the sources in English also summarize a lot of Arabic language sources, which is easily accessible.

3.3 Exploratory analysis

The aim of the exploratory analysis is to become familiar with the local circumstances. All factors which are believed to have influenced the village's present and future are taken into account. This analysis starts with the general introduction of the country, followed by brief overview of the governorate and ends by providing detailed information about the village.

The general introduction of Egypt includes information about its location, climate, economy, including unemployment, water supply and last but not least population. The governorate overview is somehow more specific but follows the same trend. It starts by identifying location and topography; economy, including supporting industries; its water supply; and finally the population. The village level data collection and analysis is the most extensive one. At village level not only current population was investigated but also population changes and trends since 1976. Additionally, the household size, the socio demographic characteristics and education level of the population was also analyzed. Finally, the quality and quantity of housing stock and services (such as educational facilities including schools and libraries, recreational facilities including youth club and parks, emergency facilities including hospitals, police and fire stations.

Google Earth and Geographic Information System (GIS) are used to prepare maps, showing the location of the village and governorate.

3.3.1 Focus group interviews

The Egyptian Government is sponsoring and conducting focus group interviews to investigate local residents' needs and preferences regarding future developments. Several focus group interviews are taking place in each village, and each group focuses on only one specific field (such as housing, services, infrastructure, environment, economy, etc.) (El-Hefnawi, 2005).

The nominal group technique is used during these focus group interviews. This technique is a decision making method for use amongst groups of many sizes that want to make decisions quickly, as by a vote, but with everyone's opinions taken into account (as opposed to traditional voting, where only the largest group is considered) (Dunnette, et al, 1963). Each participant is asked to identify issues the community faces, such as concerns related to the village's future, potential and positive characteristics. This approach is known as a SWOT analysis. It collects specific information about **s**trengths, **w**eaknesses, **o**pportunities and **t**hreats related a specific field (such as housing, infrastructure, etc.) of the village. Then, residents list solutions to the specific issues. After listing all solutions in different areas, participants are asked to rank them according to importance.

During the focus group interviews, the following steps are used:

1) Introduction,
2) Generation of individual ideas in writing,
3) Expressing ideas,
4) Group discussion for further clarification and
5) Ranking.

3.3.2 Data availability

Both primary and secondary data, required for the exploratory data collection, is available. Statistical data was collected from internet sources and libraries, while qualitative data was acquired through site visits and from previous researches.

Regarding the focus group interviews, the organizers of the focus group interviews have a license from the responsible Egyptian authority to conduct them. The author of this thesis has not participated in conducting the focus group interviews but has access to the minutes and reports consisting of their results. Based on the minutes and reports, no individual focus group interview participants can be identified. Consequently, no approval is needed from the Institutional Review Board (IRB).

3.4 Current population and projection

The population of the village chosen is forecasted for 2016 using the cohort component technique. It is not enough to know whether the population will increase or decrease and to what extent. It is also vital to investigate how the composition of the population changes in order to assess the need for educational facilities, transportation, health and welfare services, employment, etc.

The cohort-component projection technique projects both the size and the composition of a region's population. This technique is based on three essential factors that influence population changes (Klosterman, 1990). Population can change only if someone is born, dies or migrates in or out of the area (Klosterman, 1990). Consequently, fertility, mortality and migration are the factors which are taken into account during the analysis. The projection also differentiates death and migration rates based on sex and age.

Death, birth and migration are independent from each other. Each of them changes in different ways at different times and in different locations. It is assumed that death rates are low for children and gradually increase with age (Klosterman, 1990). Death rates are usually higher for males than females (Klosterman,

1990). Both death rates and fertility rates are generally higher in the countryside than in urban areas. Migration is considerably influenced by economic changes (Klosterman, 1990).

To summarize, cohort-component models disaggregate the population into uniform age, sex and racial groups or cohorts and deal separately with the three components of population change (Klosterman, 1990).

The cohort-component technique was chosen because it uses the past population size and adjusts it to the future, taking into account birth, death and migration rates related to sex and age separately. Giving special attention to these rates increases the reliability of the forecast. Most other projection methods use only past population trends for a forecast. A further advantage of this technique is that it not only forecasts the size of the population, but it also forecasts the composition of a future population. This composition is important to assess future housing and services needs.

As with all forecasting methods, the cohort-component technique needs reliable past data in order to provide a reliable future forecast. Since the cohort-component technique assumes that the components of demographic change (birth, death and migration) will remain constant during the projection period, it is vital to consult with local officials about potential future changes. Local officials have knowledge about potential future events (such as plant closures and residential developments), which can significantly influence birth, death and migration rates in the region.

3.4.1 Data availability – population census

Egypt is one of the few developing countries with a long history of population censuses. The modern and regular censuses began in 1882 (Tarver, 1994). According to Presidential Decree 2915 of 1964, the Central Agency for Public Mobilization and Statistics (CAPMAS) is the official agency in Egypt for

providing population data amongst other statistical data. CAPMAS conducts a nation-wide census every 10 years. The results of the 2006 census were announced on 15th May 2008.

Both national (such as Egypt's State Information Service, national public and private consultant agencies) and international agencies (such as the US Census Bureau, World Bank, UN Habitat) use CAPMAS data for their population projections. Consequently, the population projections of this thesis are based on the census database of 1996 conducted by CAPMAS (the 2006 database was not available free of charge).

3.4.2 Data required for population forecast

The population data of 1996 by sex (i.e., male and female) and age (using 5 year cohorts) serve as a base for the cohort component projection technique. These data at village/governorate and national level were collected from CAPMAS through the US Census Bureau's International Department.

3.4.2.1 Mortality component

Age-specific survival rates are needed for each cohort. The survival rate is the probability that a person will survive during a 5-year period between t and t+1 (Klosterman, 1990). The surviving population becomes the population of the next higher cohort at t+1 (Klosterman, 1990). The surviving population from the first cohort at time t becomes the population of the second cohort at time t+1, the surviving population from the second cohort becomes the population of the third cohort, and so on (Klosterman, 1990). For example, the population which is born at time t and survives the 5 year interval will also be 5 years old at time t+1 (Klosterman, 1990).

3.4.2.2 Survival calculations

For all cohorts except the first and last: $P^{t+1}_{n+1} = P^{t}_{n} \times s_{n,n+1}$

For the last cohort, assuming there are 21 cohorts $P^{t+1}_{21} = (P^{t}_{20} \times s_{20,21}) + (P^{t}_{21} \times s_{21,21})$

Where P is the population,

$s_{n, n+1}$ is the probability of surviving from cohort n to cohort n+1,

t is the year, for which the population is forecasted and

n is identifier of the age-specific cohort.

The age-specific survival rates at the national level for 2006 were calculated from the Life Tables provided by the US Census Bureau's International Department as seen in Appendix 2. In the database, nqx represents the probability of dying between age t and t+1 (Vazquez, 2003). Consequently, the survival rate is 1 minus the probability of death.

3.4.2.3 Fertility component

To forecast the population in cohort n, the number of annual live births to women in cohort n (B_n) and the age-specific fertility rates ($f_{n,0}$) are needed (Klosterman, 1990). Accordingly, the number of children born to women in cohort n in a year is equal to the average female population for the projection period multiplied by the appropriate age specific fertility rate (Klosterman, 1990).

$$B_n = PF^{t,\,t+1}{}_n \times f_{n,0}$$

Where B_n is the total number of birth in year n

$PF^{t}{}_n$ is the average female population in cohort t for the projection period n and

$f_{n,t}$ is the probability that a women from cohort t in period n will give birth

Age-specific birth rates per thousand people at national levels for 2006 are published at the US Census Bureau's International Database website and shown in Appendix 3. To calculate the age-specific fertility rate in 5 year cohorts, the age-specific birth rates were divided by 1,000 and multiplied by 5 (Please see Appendix 3 for details).

3.4.2.4 Sex ratio

Total births in a projection period, B_T can be divided into male births, $B_{m,}$ and female births, B_f, by applying the estimated proportion of male births, p_m and female births, p_f, respectively (Klosterman, 1990). These proportions are generally computed from national data on the sex ratio (SR) at birth, that is, the number of male births, B_m, per 100 female births, B_f (Klosterman, 1990).

$B_T = B_T \times p_m + B_T \times p_f$

where $p_f = 100 / (100+SR)$ and $p_m = SR / (100+SR)$ and

$SR = B_m / B_f \times 100$

A sex ratio of 100 indicates an equal number of male and female births. A sex ratio larger than 100 indicates an excess of male births and a sex ratio of smaller than 100 indicates an excess of female births (Klosterman, 1990). The US Census Bureau's International Department provided the sex ratio of 105.00 % for Egypt.

3.4.2.5 Migration component

Since all kinds of migration (urban-rural / rural-rural) are very low in Egypt, for the purpose of this research, it is assumed that no migration takes place. It is assumed that the population growth of a village solely depends on the survival rates and high birth rates and is not influenced by migration.

3.4.2.6 Population pyramid

Based on the results of the projection, a population pyramid is built for graphically illustrating the expected age and sex composition of the population in 2016 in the selected village. The population pyramid consists of horizontal bars representing the population in each age group, displayed in ascending order from youngest to oldest (Klosterman, 1990). The bars to the left of the vertical axis represent the male population in each age interval; the bars to the right represent the female population (Klosterman, 1990).

The result of the population forecast for the governorate and the specific village was shared with local experts, who were asked to validate the forecast. Since local experts have in-depth knowledge and experience about the village, they could adjust the forecasted population data to provide a more reasonable picture about the village's future population. The future composition of the village was used to assess the future needs for housing, services and infrastructure.

3.5 Housing and service needs

This part of the study consists of three stages. First, the current situation of housing and services elements was assessed in the village. The assessment includes the quality and quantity of the items listed below. Second, quantitative analysis of the future needs of housing and services was carried out based on the results of the population forecast. Third, two lists of suggested activities were set up. These lists cover housing and services.

Housing stock

- Compare the number of units of housing stock to the number of households, noting vacant units, the quality and any special characteristics (if any) of the houses as well.
- Forecast housing stock needs based on expected population growth:

  Forecasted housing units =

  (Population in 2016 - Population in 2006) / Average household size,

  assuming the average household size remains the same and the housing demand is met in 2006

  OR

  Forecasted housing units =

  Population in 2016 / average household size – available housing units in 2006

Educational institutes (e.g., elementary, secondary and high schools)

- Compare the density of classrooms to the national target, which is a maximum of

  40 pupils per teacher per classroom. Attention must be paid to the number of school-aged children who are not enrolled in school.
- Forecast future needs based on expected population growth

  Required classrooms =

  School aged children in 2016 / 40 – available classrooms in 2006

Health care services (e.g., health care units, public and private hospitals, emergency units, hospitals, pharmacies)

- Existence of above units and their ability to serve the community.
- Forecast future needs based on expected population growth

Social, cultural, sport and recreational facilities (e.g., community centers, libraries, clubs, playgrounds, athletic halls)

- Existence of above units and their ability to serve the community. According to the Ministry of Social Issues, there should be one social unit per 10,000 people.
- Forecast future needs based on expected population growth

  Facility needs in 2016 =

  Forecasted population in 2016 / 10,000 – existing facilities in 2006

Religious facilities (e.g., churches, mosques)

- Existence of above units and their ability to serve the community.
- Forecast future needs based on expected population growth

Communication centers (e.g., post office, phones)

- Existence of above units and their ability to serve the community.
- Forecast future needs based on expected population growth

Security services (such as police, firefighter stations)

- Existence of above units and their ability to serve the community. For the purpose of this research ability is defined as the proportion of residents and units of the village, which are covered by mentioned services.

- Forecast future needs based on expected population growth.

This part of the study is based on existing data, including census data, aerial photographs, site visits and Geographic Information System (GIS) databases.

3.5.1 Data availability

CAPMAS has an extensive database that holds housing, services and infrastructure data, including a GIS database. Both the General Organization for Physical Planning and the UN Habitat have access to these databases. Both agencies validate the CAPMAS databases by comparing them with aerial photographs and by making site visits. Furthermore, local residents are asked to validate the database during focus group interviews. Since the datasets come from an official source and are validated in different ways, the author of this thesis assumes that these datasets are reliable. Consequently, they are used as a base for forecasting future needs. Appendix 4 provides a list of data that need to be collected.

3.6 Site locations

After future needs are quantified, potential location sites are identified. Although, the main aim is to reduce building on agricultural land to the minimum level, there are other important objectives, which need to be taken into account when locating units. Some of these objectives can be found below. These objectives are further discussed in the next chapter.

Residential units:

- Identify potential areas such as desert land, agricultural pockets, vacant lands,
- Identify poorly built houses for potential demolition and rebuilding and
- Examine the potential of vertical extensions.

Please find flow diagram about steps in Appendix 5.

Educational facilities:

- Aim at maximum coverage of school aged population in walkable distance and
- Investigate potential upgrade of existing facilities.

Health care facilities:

- Aim at accessibility, maximum coverage of population, giving special attention to the location of elderly people and
- Investigate potential upgrade of existing facilities.

Social, cultural, sport, recreational and religious facilities and communication centers:

- Aim at maximum coverage of population and
- Investigate potential upgrade of existing facilities.

Security facilities:

- Aim at maximum coverage of population and real estate.

3.7 Conclusion

Table 3-3 summarizes the methodology chapter by reviewing the strengths and weaknesses of the chosen methodology. Although there are a number of weak points in the thesis research, the author believes she did make the necessary steps to eliminate their negative consequences.

Table 3-3 Strengths and weaknesses of chosen methodology

Strengths	Weaknesses
Literature review supports the need for research and the methodology	Language barriers
Use of international case studies / best practices provide additional support for the methodology	Prove the representativeness of the case
Both primary and secondary data is collected	Reliability of population data: different agencies have different 'current population estimates'
Wide variety of techniques used for data collection	Forecast is based on assumptions
In-depth analysis	Population forecast is based on 1996 Census
Both the population size and composition is forecasted	Lack of local fertility / mortality / migration rates
For the housing and services forecast the Egyptian local standards are used	Relative subjectivity of site locations
Local residents' preferences are taken into account	
Availability of literature in English	

Source: Author, 2009 partly based on Yin, 2002

This chapter described the methodology used for the research. The calculations used for the quantitative analysis and forecasts based on the steps described in section 3.3 can be found in the Appendix 7-9. The results of exploratory case study are introduced in chapter four, which provides information about the current situation at village / governorate and national level. Based on the results of chapter four, the forecasting is done in chapter five.

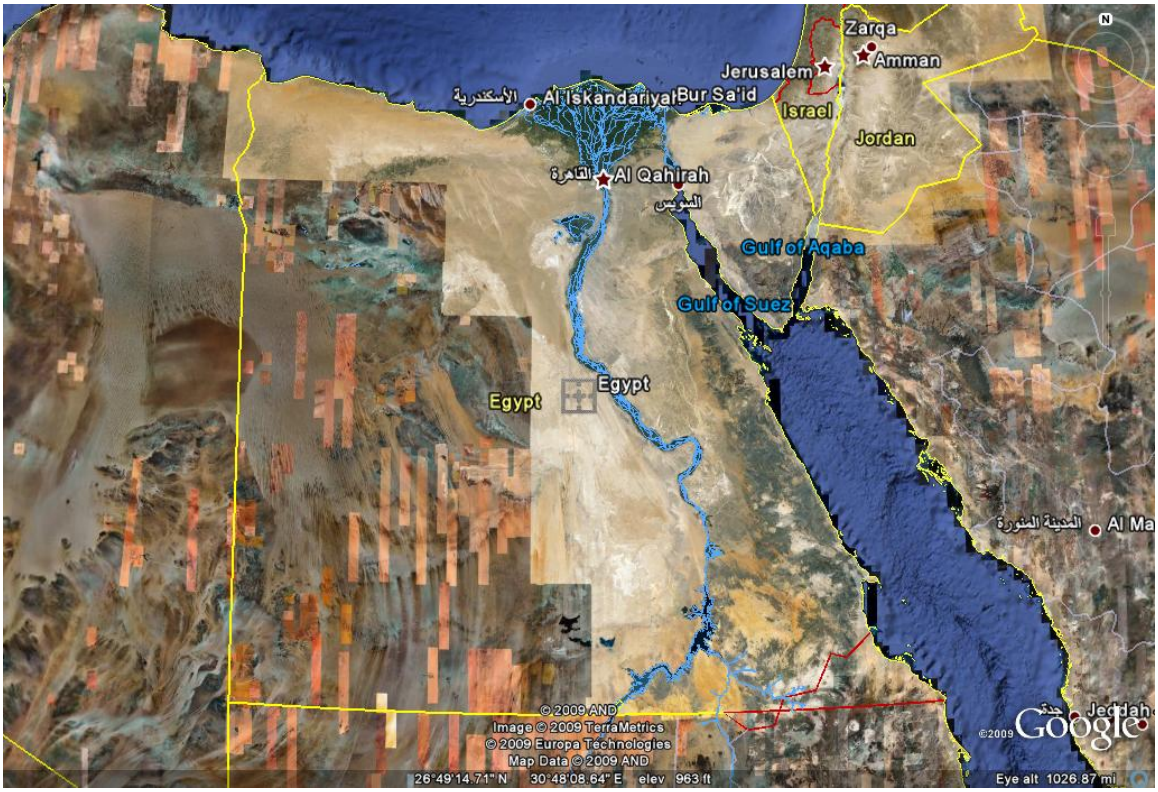
4 Chapter 4: Data

Chapter 4 intends at sharing all the data collected during the research. As so, it starts by introducing Egypt in section 4.1. The general introduction of Egypt includes information about its location, climate, economy, including unemployment, water supply and last but not least population. Section 4.2 contains the governorate overview, which is somehow more specific but follows the same trend. It starts by identifying location and topography; economy, including supporting industries; its water supply; and finally the current population. The village level data collection is the most extensive one and can be read in section 4.3.

4.1 Egypt

Egypt, commonly known as Land of Civilizations, is reputed worldwide for its distinct 7,000-year-old record of civilization and immense wealth of knowledge (Egypt State Information Service, 2008a). The country, officially named the Arab Republic of Egypt, is located at the center of three old world continents: Africa, Asia and Europe. It overlooks the Red and Mediterranean Seas, as well as the Suez and Aqaba Gulfs (Egypt State Information Service, 2008a). Egypt has borders with Sudan in the south; Libya in the west; the Mediterranean Sea in the north and the Red Sea, Palestine and Israel on the east and northeast. Its total area is about 386,900 square miles (1,002,000 square kilometers) with an estimated population of 76,000,000 in 2008 (CAPMAS, 2008).

Figure 4-41 Egypt as seen in Google Earth



Source: Google Earth, 2009

The capital of Egypt is Cairo, the largest city in the Arab world and Africa, with an estimated population of 7.787 million and a total area of 772 square miles (2,000 $km^{2)}$ in 2006 (Egypt State Information Service, 2008a). Greater Cairo is a rare phenomenon of a third world mega-city where, since the 1980s, net in-migration has almost stopped, and, currently, the metropolis's expansion is fuelled by natural increase and the incorporation of surrounding rural populations (Sims, 2006). Egypt is divided into four major parts: Nile Valley and Delta (less than 4% of the total area of the country), Western Desert (68 % of Egypt's total area), Eastern Desert (28 % of Egypt's total area) and Sinai (6 %) (Egypt State Information Service, 2008a).

Most economic activity takes place in the fertile Nile Valley. Services contribute 45.1%, industry 41.1% (textiles, food processing, tourism, construction) and agriculture 13.8 % (cotton, rice, corn, wheat, fruits,

vegetables, sheep, goats, cattle) to the national GDP (CIA, 2008). Egypt possesses a huge wealth of major minerals, including oil, phosphate, iron and manganese, and the major products of stone quarries are represented by granite, basalt, marble, limestone and sand; glass is manufactured (Egypt State Information Service, 2008a).

The unemployment rate was estimated to be around 9% in 2007 (CIA, 2008). At the national level, those living below the nutrition-based poverty line were estimated at 17% in 2000 and 19.5% in 2005 (CIA, 2008). The highest concentrations of the poor are in the rural areas of Upper Egypt (World Bank, 2006c).

Egypt lies within the dry tropical regions, except for the northern parts that lie within the warm moderate regions, with a semi-Mediterranean climate characterized by hot dry summers and moderate winters with little rainfall, potentially heavier along coastal areas (Egypt State Information Service, 2008a).

Egypt's depends on three fresh water resources for its water supply, namely surface water from the Nile, rain and storm water and subterranean water, as well as some other sources (Egypt State Information Service, 2008a). For the year 2005/06, Egypt used 69.7 billion cubic meters of water: 85 % was used for agriculture, 9.5% for industry and 5.5% was used as potable water (Egypt State Information Service, 2008a).

The Nile provides around 80 % of the water supply (Egypt State Information Service, 2008e). For this reason, there are several valid Nile cooperation protocols, which protect the Egyptian share of the Nile. For example, a 1959 Agreement signed by Egypt and Sudan protects Egypt's right to 48 billion cubic meters of water a year and Sudan's right to 4 billion cubic meters of water a year (Egypt State Information Service, 2008e). The establishment of the High Dam in Egypt and the Roseires Reservoir in Sudan were suggested in this agreement (Egypt State Information Service, 2008d). According to it, the two countries share the loss of water due to spill or evaporation and also distribute any excess water

between them (Egypt State Information Service, 2008d). The Cairo Cooperation Framework of July 1993 is one of the agreements signed by Ethiopia and Egypt to protect Egypt's share of water, since 85 % of Egypt's water originates in Ethiopia (Egypt State Information Service, 2008e). According to the framework, each country agreed not to implement water projects that would harm the interests of other, to protect Nile waters, to respect the provisions of international law, and to consult over projects likely to increase the flow of waters and reduce waste (Egypt State Information Service, 2008e). An agreement concerning the Equatorial Plateau, from where 15 % of Egypt's Nile water originates, was signed by Uganda, Kenya, Tanzania, Sudan and Egypt.

Egypt is the most populated country in the Middle East and the second most populated country in Africa. The population of Egypt is rapidly increasing. Its population was 59 million in 1996, and it had increased by around 20 million people by 2006 (CIA, 2008). Currently, the estimated population growth is at 1 million people per year (CAPMAS, 2008). According to the 2006 census, the population in urban areas increased by 40.22% and currently stands at 30,949,689. Meanwhile, the population in rural areas rose by 64.22% to 41,629,341 in the same period (Egypt State Information Service, 2008b).

4.1.1 Administrative divisions of Egypt

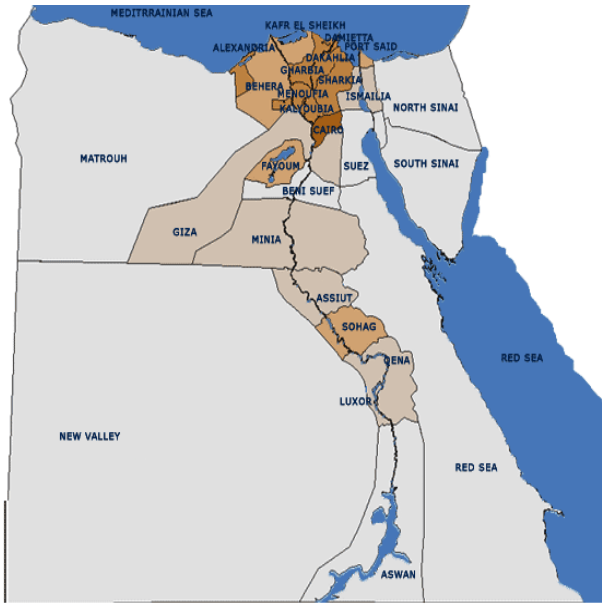
In Egypt, urban areas are defined by administrative means and not by demographic or quantitative criteria as in other countries (Tarver, 1994). Accordingly, urban areas are the four urban governorates, agglomerations which have been declared "cities" and have a city council, the capitals of all the governorates and the capitals of marakezes (World Bank, 2006c). This definition has no relation to the size or the agglomeration's population or its importance as an urban area (World Bank, 2006c)

The local government framework in Egypt was initially laid out in Law no. 52 of 1975 and enacted in 1979 in Law no. 43 (Sirry, 2002). Accordingly, Egypt has a five-level administration system. These are,

the governorates (or Muhafazah), regions or agglomerations of cities and villages (or Markaz), cities (or Madina), villages (or Qaria) and districts, usually within the cities (or Hay) (Sirry, 2002).

Egypt's first-level (top-level) administrative division is called Governorate (or Muhafazah). Currently, Egypt is divided into 28 governorates, including 213 cities and 4632 villages, besides Luxor, which is a self-governing city (Egypt State Information Service, 2008b). The area and population density of the governorates vary. Governorates can be either urban or a mixture of urban and rural. Governorates can also consist of only one city as is the case for Cairo and Alexandria. The head of the governorate is the governor, who is appointed by the president of Egypt (Egypt State Information Service, 2008b). Figure 4-3 shows the governorates of Egypt.

Figure 4-2 Governorates of Egypt

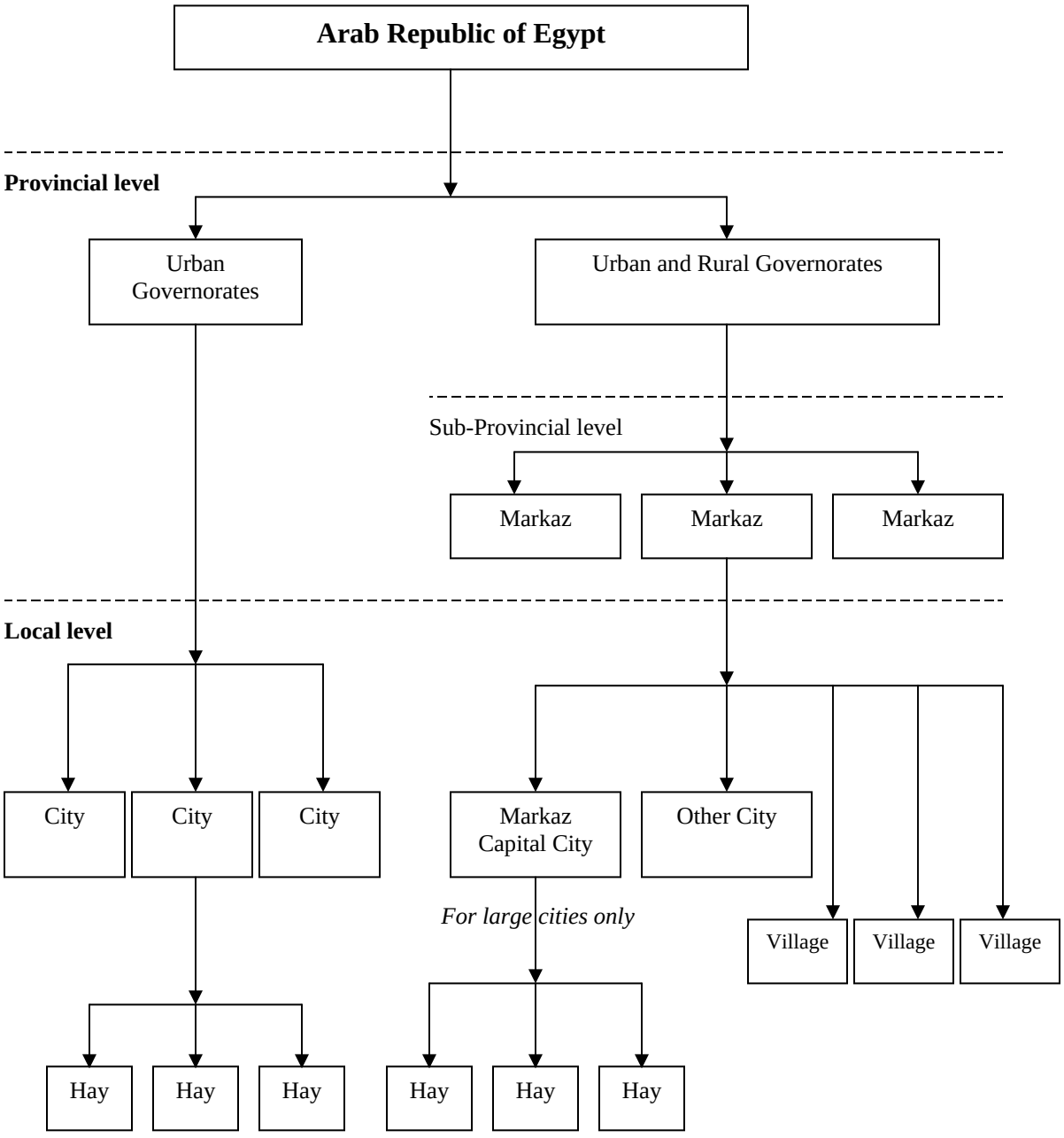


Source: CIA, 2008

Governorates are further divided into regions (or Markaz). Regions have a capital city and other cities and villages. The regions are governed by the head of the region, who is appointed by the Prime Minister of Egypt (Egypt State Information Service, 2008b). Each region consists of at least one city. Large cities are

typically subdivided into districts, which is the lowest level of local government (Sirry, 2002). There are no general definitions for a district that prescribe its size, population, political or economic circumstances. Each district might be further divided into smaller entities or neighborhoods (called Qism, which can further be broken down into Shiyakhat) that act as the basic administrative units for civil affairs and for the delivery of such services as policing (Sirry, 2002). Figure 4-4 summarizes the local government framework in Egypt.

Figure 4-3 Local government framework in Egypt



Source: Redrawn by the author based on Sirry, 2002

Note: The diagram has been simplified at village level. In reality, villages are organized into Local Village Units, each of which consists of a main village surrounded by satellite villages (Sirry, 2002).

4.2 Fayoum Governorate

Fayoum Governorate is a green oasis that lies in the middle of the desert, in the West of the Nile and is located in the North Upper Egypt Region that encompasses Fayoum, Bani Swaif and Menia Governorates (IDSC, 2007). The governorate has borders with Cairo Governorate on the northeast, Giza Governorate on north / northwest and Bani Swaif Governorate in the southeast. Fayoum city is the governorate's capital. The governorate has special characteristics since it is not only a valley, but a delta and a lake as well (IDSC, 2007). The emblem of the governorate as seen in Figure 4-5 displays the famous water wheel of Fayoum, the Qarun Lake in the north of the governorate, which is surrounded by a yellow frame representing the desert around the governorate (IDSC, 2007). The green land in the symbol refers to the precious agricultural land of the governorate, and, in the background, Egypt's flag is visible as well (IDSC, 2007).

Figure 4-4 Emblem of Fayoum Governorate

Source: IDSC, 2007

The governorate's total cultivated area cover 444,264 acres (428,000 feddans) and is famous for cultivating fruits including grapes, figs and mangoes, as well as other traditional crops such as wheat, cotton, rice, maize, sugar beets and sunflowers (IDSC, 2007). There are two industrial zones in the governorate, covering around 3,220 acres (3,100 feddans) of area (IDSC, 2007). Fayoum Governorate also contains important tourist attraction sites, which combine natural, rural, coastal and desert environments (IDSC, 2007). Among the monuments, Pharaonic, Greek, Roman, Coptic and Islamic ones can be found (IDSC, 2007).

Figure 4-5 Fayoum Governorate as seen in Google Earth

Source: Google Earth, 2009

The total area of the governorate is 6,068 km^2 (2,343 square miles), which is 0.6 % of Egypt`s total area (IDSC, 2007). The governorate includes 6 Marakezes, 6 cities, 61 rural local units annexed by 162 villages as well as 1428 hamlets (IDSC, 2007). As seen in Figure 4-6, a considerable amount of the governorate's territory is covered by desert. The total populated area is 1,856 km^2(716 square miles) (IDSC, 2007) According to the preliminary results of the 2006 census, the population is 2.5 million; 22.5 % of which lives in urban areas and 77.5 % in rural areas (IDSC, 2007).

4.3 Shakshouk Village

The main entrance to the village lies on the northern side, on the Cairo / Fayoum highway. The highway goes through the village from north to south, where the southern entrance can be found, leading to Telet Village. This road ensures the connection of Shakshouk to the cities and main villages of the governorate. The road is paved at an average condition with a width of 6-8 meters (20-27 feet). There are several secondary roads in the village connecting Shakshouk to nearby villages.

Figure 4-6 Shakshouk as seen in Google Earth

Source: Google Earth, 2009

Shakshouk Village's local council is one of the seven local councils belonging to Ebshway Markaz in Fayoum Governorate. It does not have any other villages depending on it but has nine farms. Till 2002, Shakshouk belonged to Abu Ksah's local council. They were separated, however, in order to increase the financial resources of Shakshouk and improve its services.

The village has a strong economic base. Due to the proximity of Qarun Lake, fishing is the main source of income, while agricultural (traditional corps like wheat, corn, onion, etc.) and mining (salt and minerals) activities further strengthen the village's economy. It is important to note that most inhabitants of Shakshouk Village work in the village.

Table 4-1 shows the educational level of the community. As most villages in the countryside of Egypt, Shakshouk also experiences high rates of illiteracy. 72.05% of Shakshouk's 10 year or older population is illiterate. The illiteracy rate is considerably higher among females than males. Only 7 % of Shakshouk's population reaches the average or above average educational level.

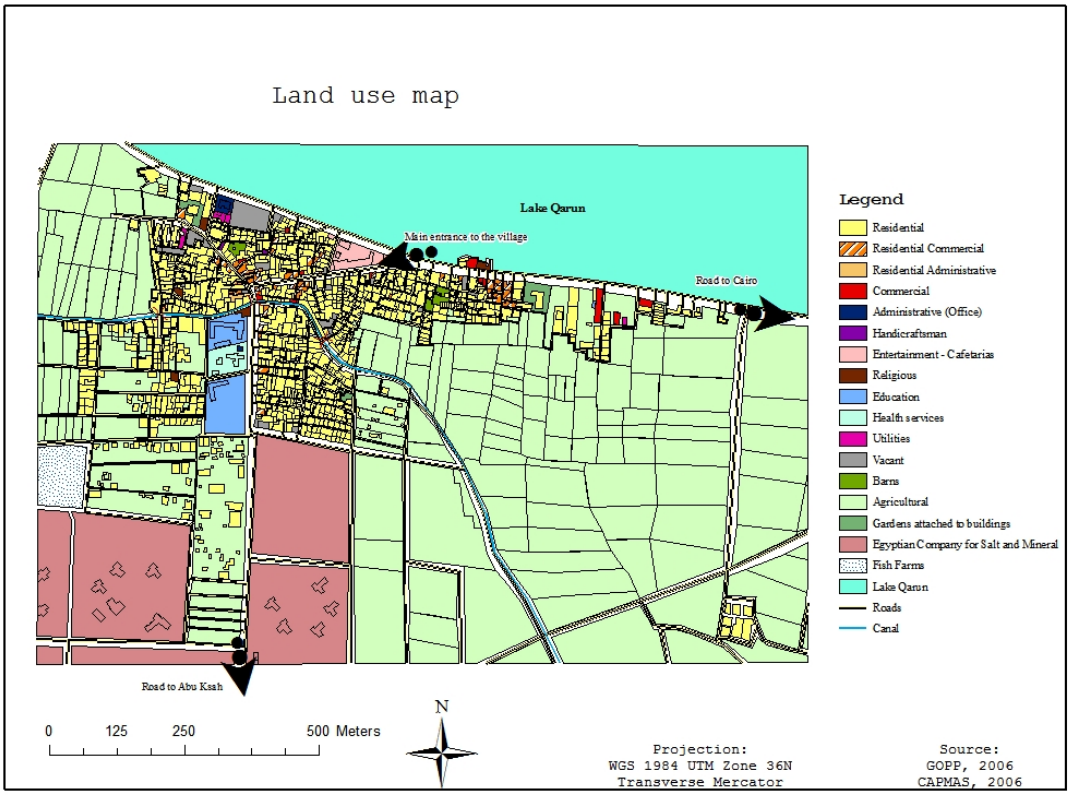
Table 4-1 Inhabitants of Shakshouk and their educational achievements in 1996

	Number of inhabitants (10 year or older)			**Percentage**		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**
Illiterate	3110	4614	7724	56.26	88.90	72.05
Reads and writes	999	273	1272	18.07	5.30	11.86
Elementary	499	123	622	9.03	2.40	5.80
Less then the average	282	71	353	5.10	1.30	3.29
Average	490	75	565	8.86	1.40	5.27
Above average	55	19	74	1.00	0.40	0.70
Undergraduate degree	90	17	107	1.63	0.30	1.00
Graduate degree	3	0	3	0.05	0.00	0.03
Total	5528	5192	10720	100	100	100

Source: Author based on GOPP, 2006

The area of Shakshouk is about 74 feddans (77 acres). Residential area takes 33.8 feddans (35 acres); roads and urban gaps cover 23.37 feddans (24 acres); private and vacant land occupy 1.8; agricultural pockets take up 3.11 feddans and, finally, the salt and mineral industries lay on 7.4 feddans (7.7 acres). The industry is located on the south, the prime agricultural land on the east, and the Qarun Lake on the north, as shown in Figure 4-7. The majority of the village's land is privately owned.

Figure 4-7 Land use map for Shakshouk



Source: Author based on CAPMAS and GOPP database, 2009

5 Chapter 5: Analysis

This chapter starts with introducing changes in population size and composition in Egypt, Fayoum Governorate and finally Shakshouk village. In section 5.2 the attention shifts to the quantity and quality of current housing stock, followed by services in 5.3 and finally the focus group interview results provide information about the local resident' opinion about current and future state of the village.

5.1 Population

Although the size of Shakshouk's population has been increasing, the population growth rate has been slightly decreasing since 1976 as seen in Table 4-1. The population growth rate between 1976 and 1986 in Shakshouk was 152 %, which is considerably higher than the average growth rate in rural markaz (134 %), urban markaz (130 %), total markaz (134 %), rural Egypt (132 %) or nationally (132 %). Shakshouk's population growth rate decreased to 137 % between 1986 and 1996, although it remained above average at all levels. Table 5-2 shows the average household size. Accordingly, in Shakshouk it is around 5.24, which is higher than any average in the country.

Table 5-1 Population increase of Shakshouk between 1976 and 1996

	From 76 to 86 (%)	**From 86 to 96 (%)**
Shakshouk	152	137
Rural Markaz	134	126
Urban Markaz	130	121
Total Markaz	134	125
Rural Egypt	131	126
Urban Egypt	132	119
Total Egypt	132	123

Source: Author, based on GOPP, 2006

Table 5-2 Average household sizes in 1996

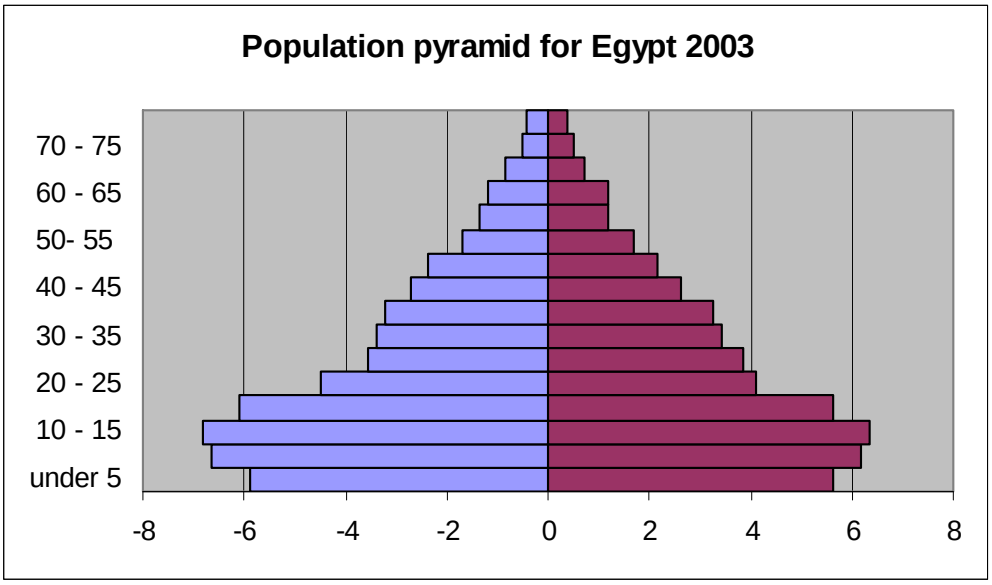
	Number of inhabitants	Number of households	Average household size
Shakshouk	16,396	3,125	5.24
Urban markaz	41,972	8,296	5.05
Rural markaz	194,069	37,266	5.21
Total markaz	236,041	45,562	5.18

Source: Author based on GOPP, 2006

Figure 5-1 shows the population pyramid of Egypt according to 5-year cohorts in 2003. Assuming that the current population trends will continue, the following statements can be made.

The population pyramid shows that government needs to be prepared and take steps in order to satisfy basic needs such as schools, hospitals, social centers, etc. for the citizens. First of all, the proportion of people above 60 years is considerably lower than the proportion of people between 40 and 60 years old. This indicates that government needs to provide additional places at hospitals and social centers in the next 10-15 years due to the increased number of retiring people. Secondly, the proportion of people who will start working in the next 5-10 years (those currently 15 to 25 years old) is higher than the proportion of people who will retire in the next 5-10 years (currently between 50 and 60 years old). This means additional needs for jobs. Thirdly, the proportion of people who will enter university in the next 10 to 15 years (currently they are between 5 and 20 years old) is much higher than the current number of university places. Lastly, the increasing population means additional housing with additional needs for services such as water, electricity, police, ambulance, etc.

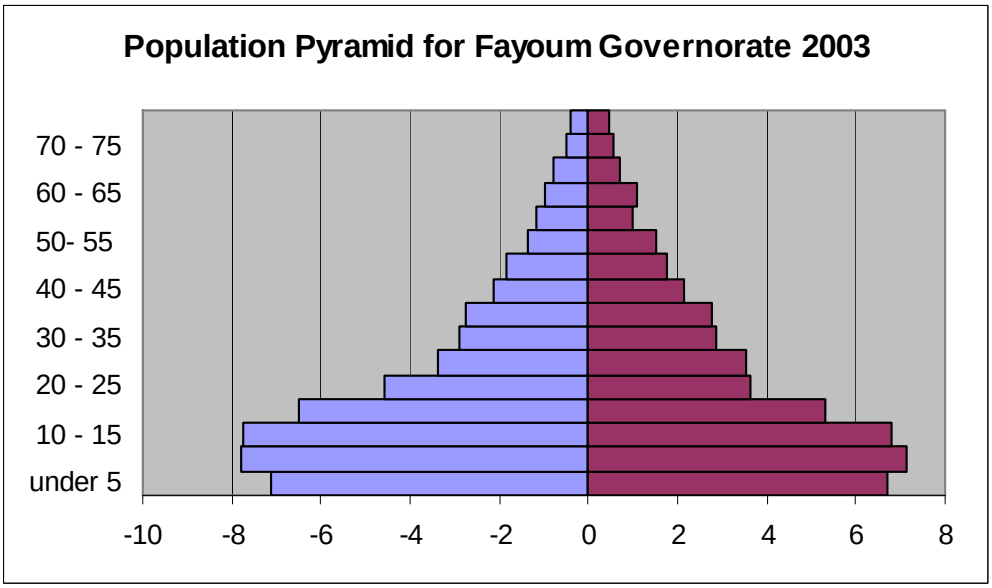
Figure 5-1 Population pyramid for Egypt for 2003



Source: Author based on US Census International database, 2009

Figure 5-2 shows the population pyramid for 2003 for Fayoum Governorate, which is very similar to the Egyptian national one, although it is a little bit wider at the bottom, which is due to the higher population growth caused by higher birth rates at rural governorates (IDSC, 2007).

Figure 5-2 Population pyramid for Fayoum Governorate, 2003



Source: Author based on US Census International Database, 2009

Figure 5-3, the population pyramid for Shakshouk, also reflects the village's higher birth rate, since its population pyramid is even wider than Fayoum Governorate's or Egypt's. As Shakshouk's population pyramid is based on 1996 data, and not on 2003 as Fayoum Governorate's and Egypt's pyramid, it is not visible that the lowest cohort (0-5 years old) is smaller than the previous one (5-10 years old).

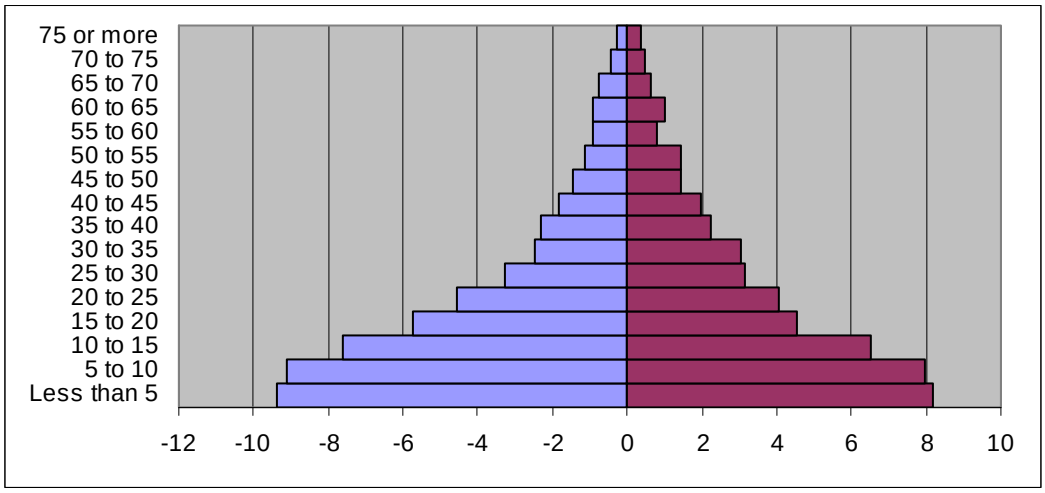
In 1996, the proportion of children less than five years old is 17.6% of the total population; the proportion of the population in the age of basic education is 31.2%; while the proportion of the working force aged 15-60 years is about 49.2%.

The high proportion of children between 0 and 15 years old, 48.7% of the total population of the village, provides a population pyramid, which is very wide at the bottom. This width is caused by high birth rates, which might be due to the low level of education (i.e., people give birth in order to have more workers in the agricultural fields).

The proportion of the category, which is expected to enter the workforce in the next 5 to 10 years (i.e., those aged between 5 and 20 years), is relatively high at 31.2%, which might lead to an increased supply of manpower in the future. Due to the high number in this category, the baby boom is also expected to continue even if the birth rates decrease. The labor force (15 to 60 years old) currently represents approximately 49.2% of the total population of the village, but it is expected to further increase in the coming years.

The age group which is more than 60 years old is about 6.6% of the total population of the village, which is relatively low. It is expected to rise slightly in the near future due to an improved standard of health services and is expected to rise considerably in the next 20 to 40 years when the baby boomers reach retirement age.

Figure 5-3 Population pyramid, Shakshouk, 1996



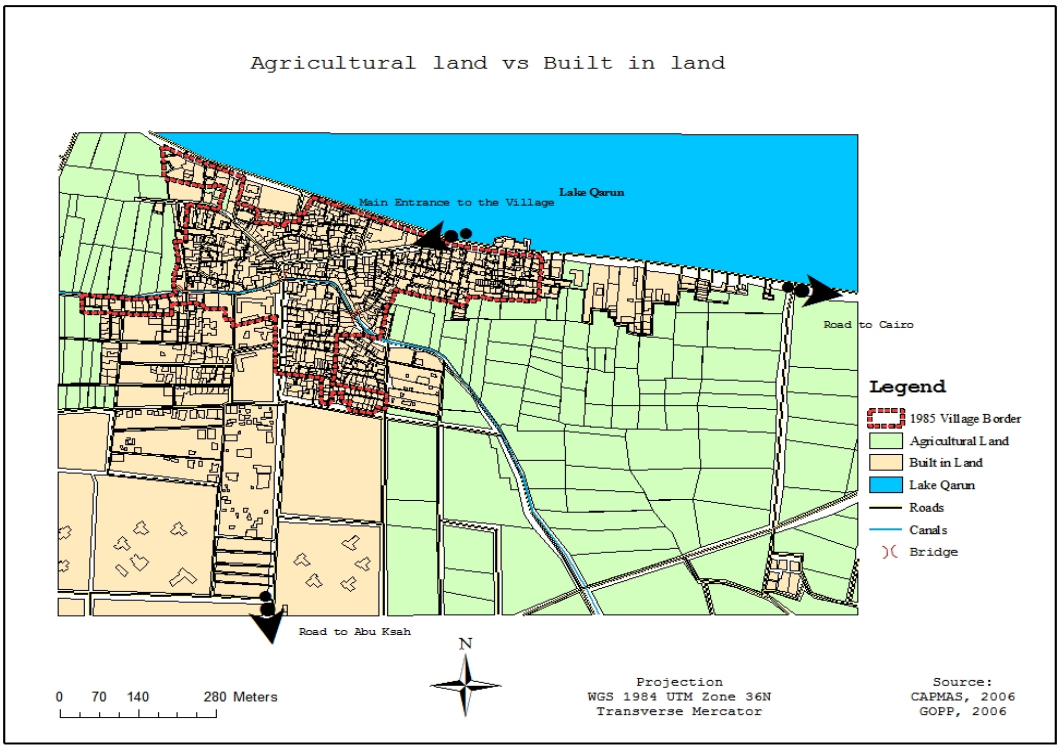
Source: Author, based on CAPMAS's 1996 Census database (see Appendix 6)

5.2 Housing

Figure 5-4 shows the village border in 1985 and the village size in 2006. As it can be detected, since 1985, a considerable amount of agricultural land has been lost due to the expansion of the village.

Around 2.87 % of all the residential units could be demolished and rebuilt due to their poor condition. However, as part of the rebuilding, vertical extension could take place as well. The tall buildings, with three or more floors, can be found around major routes and at the outer fringe. They account for around 6 % of the total housing. Most of the buildings in the village, 90 %, have one or two stories. If these buildings are good structures, they might be able to accommodate vertical extension. Clay buildings (3.3 % of the residential building areas) and huts (0.9 % of the residential building areas) also require special attention due to their sensitivity. The average piece of residential land in Shakshouk is around 120 square meters (1,292 square feet), while the average piece of residential land in rural Egypt varies between 130 and 150 square meters. In the case of clay buildings, this number can be as low as 98 square meters (1,054 square feet).

Figure 5-4 Agricultural land versus built in land in Shakshouk



Source: Author based on CAPMAS and GOPP database, 2009

Currently, the village's housing market has a limited stock, and it mainly consists of expensive residential units. There is no market for rental housing; ownership is highly preferred. However, it is difficult to become a house owner in Shakshouk since there are no affordable, low cost housing units for sale.

The existing residential units do not have any specific characteristics, which would need to be taken into account at construction of new buildings. However, it is strongly recommended to apply sustainable measures when constructing new residential units. Hassan Fathy (Steel, 1997), also known as the Architect for the Poor, is a well-known Egyptian architect, who has developed a model about sustainable housing valid for the low-income people living in the Sahara region. His model takes into account climatic and public health conditions, as well as available craft skills and affordable materials. In his

work, he not only gives guidance on how to design independent sustainable houses, but also on how to design sustainable towns.

5.3 Services

The education system in Egypt is slightly different from the one in the United States. Children when they are four years old enter elementary schools. The education in these schools lasts for six years. After successfully completing the elementary school requirements, secondary school follows for three years. After secondary school, pupils can decide either to go to high school or enter so-called higher technical education. Both options take 3 years. However, students must graduate from high school to enter universities. The national target for classroom density is 40 students per classroom at all levels. Schools are overcrowded despite the fact that around 15 to 20 per cent of the school aged children do not attend schools.

There is one health care unit, two private cliniques and two pharmacies in the village, which do satisfy the needs of current Shakshouk. The police and fire stations fail to cover all the residential units in the village due to scattered housings as seen in Figure 4-05. The village completely lacks facilities offering social, recreational and social services.

5.4 Focus group interviews

Since the village's future depends on the community living in the village, the community's residents had the opportunity to express their opinions through focus group interviews. During these interviews, the results of current analysis were introduced, a list of suggested activities to improve the current situation was provided, and the necessity and importance of each alternative activity was explained. However, the community could set up a priority list based on its preferences disregarding the experts' advice.

As can be seen from Table 5-3, the community was not concerned about the lack of housing, despite the current housing shortage. Furthermore, the community expressed its need to build new religious facilities,

although the current religious facilities cover the current and even the future needs. According to the focus group interviews, residents of Shakshouk are more concerned about having enough religious and entertainment facilities than any basic service such as housing or expansion of education, health and security.

Table 5-3 Suggested projects prioritized by residents

Issues	Goals	Alternative activities, projects	Priority
Urban expansion	Use of urban capacities to absorb residential expansion	New zoning for the village	-
Housing	Provide adequate housing	Provide affordable residential housing Establishing new residential areas outside agricultural zone Demolishing and rebuilding poorly built buildings Densifying buildings to absorb population increase (vertical increase)	- - - -
Services	Improve educational services	Construction of religious institute Increase number of classroom for elementary and secondary education Construction of high school and higher technical education school	1 4 -
	Improvement of health services	Provide village hospital	-
	Provide security services	Buy fire track Provide emergency unit	3 -
	Improvement of entertainment services	Construction of youth services Construction of library Construction of club Construction of community center	2 - - -

Source: Author based on GOPP, 2006

6 Chapter 6: Forecast

After the village analysis was done in chapter four, the forecasting can take place. The forecasting is based on the 1996 population pyramid shown in Figure 4-10. This chapter first describes the challenges faced during population forecasting. Then, the results of the population forecast are shown in a population pyramid. Based on the results of the forecasted population and the current analysis, the housing and services forecast follows in section 6.2 and 6.3 accordingly. In section 6.4 a list is set up, containing houses and buildings for various services which are recommended for construction. Finally, potential site locations for additional housing and service facilities are identified in section 6.5.

6.1 Population forecast

Data manipulation was required for the population forecast due to the absence of some data. Population data of 1996 were available at village, governorate and national level, but survival and birth rates were available only at national level. Forecasting the village's population using national survival and birth rates would result in an underestimated village population since the population growth rate was always higher at local level than at national level as was shown in Table 4-1. The high population growth rate at village level is mainly due to high birth rates, which are most probably caused by the lower level of education (GOPP, 2006).

Two options were identified to forecast population. According to the first option, the population could be forecasted at national level. For this process, national population data from 2006 and national survival and birth rates from 2006 could be used for the forecast. Then, the forecasted population could be distributed among all the villages and cities. In this case assumptions must be made regarding how to divide the forecasted population among different villages/cities. The assumptions should not only reflect the distribution of population size but also the composition.

According to the second option, Shakshouk's population data from 1996 and manipulated national survival and birth rates from 2006 could be used for the forecast. As already mentioned above, the village's population growth rate has always been above the national average. However, when the national population growth rate decreased, the village data reflected the same decrease by time period.

It could be assumed that survival rates at village level equal the survival rates at national level, while birth rates at village level equal national birth rates from previous periods, such as 1976 or 1986. Accordingly, a forecast could be made using Shakshouk's population data from 1996, national survival rates from 2006 and old national birth rates from 1986. A forecast could be also made using Shakshouk's population data from 1996, original national survival rates from 2006 and manipulated national birth rates from 2006, which means that the national birth rates were multiplied by a number.

According to CAPMAS estimates, the village's total population was around 22,906 in 2006 and it should be around 26,800 in 2011 and 30,500 in 2016 (GOPP, 2006). The forecast of this study should lie around these numbers as well.

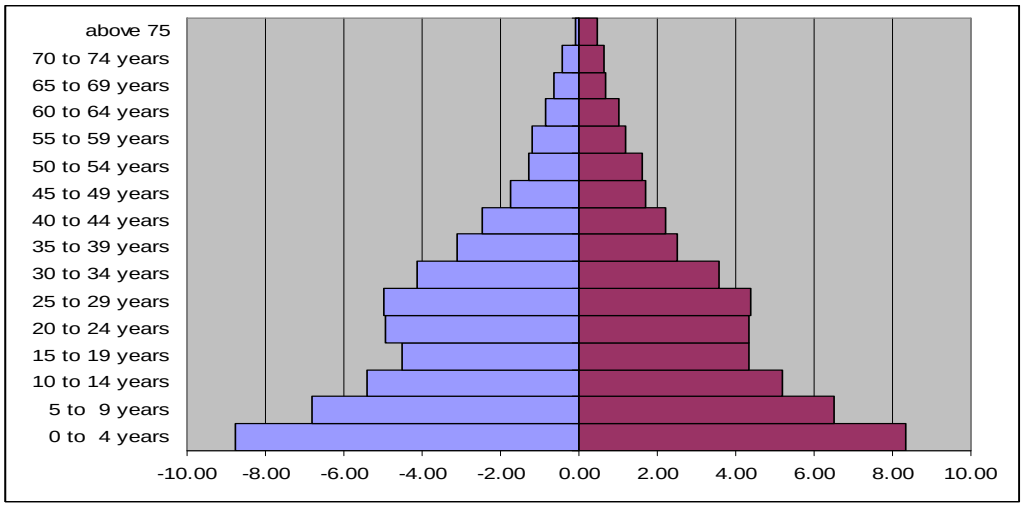
For the purpose of this research, it was assumed that the survival rates at village level correspond to the survival rates at national level from the same period, 2006, while the birth rates at village level correspond to 1.8 times the national birth rates from 2006. Using this method, the estimated population is 21,597 in 2006, 25,280 in 2011 and 29,736 in 2016.

The mentioned population forecast lies on the assumptions that every influencing factor remains unchanged. Accordingly, no war, depression, natural disastear will take place.

The results of the population forecast, including the calculations, can be found in the Appendix 7-9, while the population pyramid of 2016 can be seen below in Figure 6-1. Accordingly in 2016, the proportion of

children less than five years old is 17.1 % of the total population; the proportion of the population in the age of basic education is 23.9 %; while the proportion of the working force aged 15 to 60 years is about 54.2 %.

Figure 6-1 Population forecast for Shakshouk, 2016



Source: Author, 2009

The high proportion of children between 0 and 15 years old, 41.04 % of the total population of the village, provides a population pyramid, which is getting wide at the bottom. However, it is important to note that the population in 2016 will be less wide at the bottom than it is currently.

The proportion of the category, which is expected to enter the workforce in the next 5 to 10 years (i.e., aged between 5 to 20 years), continues to remain at a high level; its proportion is 32.7%. This means the available manpower will continue to increase. Due to the high number of participants in this category, the baby boom is also expected to continue, even if the birth rates decrease.

The labor force (15 to 60 years old) currently represents approximately 54.2 % of the total population of the village. This means a slight increase compared to the current state. This increase is expected to continue.

The age group, which is more than 60 years old, is about 4.8% of the total population of the village, which is relatively low. It is expected to rise slightly in the near future due to an improved standard of health services, and it is expected to rise considerably in the next 20 to 40 years when the baby boomers reach retirement age.

The population pyramid not only shows how the composition of the population is expected to change in the near future, but it also refers to additional needs for services such as hospitals, health care facilities for the elderly; jobs and homes for the work force and, finally, schools and educational facilities for children, which will be analyzed below.

6.2 Housing forecast

Assuming the housing supply just satisfies the housing demand in 2006, the housing need can be forecasted as 'Total population forecast in 2016' minus 'Total population in 2006' divided by the average household size = (29,736-21,597) / 5.25 = 1,550. Accordingly, the village would need 1,550 housing units by 2016 due to population growth; assuming housing supply was met in 2006 and the average household size remain the same.

Some of the housing need could be satisfied by building on available vacant land and by vertical extension, and the rest could be achieved by zoning new residential areas in the desert, following the natural extension. This will be discussed further below under section 6.4. 'Location search'.

6.3 Services forecast

Elementary education, children between 5 and 9 years old

In 2006, approximately 2,018 students sat in a total of 43 classrooms in the five elementary schools located in the region. This means a density of 46.92 students per classroom (=2,018/43). However, the density would have been 61.3 students per classroom (=2,636/43) if all the 2,636 school-aged children

would have attended elementary school. Unfortunately, in 2006, around
23 % of the children aged between 5 and 9 years old did not attend any school.

The number of 5 to 9 year old children is expected to increase further to 3,954 by 2016 in Shakshouk (see Appendix 9). To achieve a density of 40 students per classroom and assuming all elementary school aged children are in elementary school, at least 99 classrooms (=3,954/40) are needed. This means 56 new classrooms have to be added by 2016 to satisfy the need. If it is assumed that only 77 % of the children attend school, the additional classroom requirement would be 33 (=3,954*0.77 / 40- 43).

Secondary and higher education, children between 10 and 15 years old
In 2006, there were 2,762 children aged between 10 and 15 years old. However, only 2,366 students attended secondary school in 53 classrooms, which meant a classroom density of 44.6 students per classroom. It must be investigated why only 85 % of the children are enrolled at secondary school. If only 85 % of the children will be enrolled in 2016 as well, 14 (=3,153*.85/40-53) classrooms are needed to reach the 40 per class standard. If it is assumed that all secondary school aged children will attend secondary schools, 26 additional classrooms (=3,153/40-53) are required to be constructed.

The village does not offer any high school education, although in 2006 there were 480 high school students. They could have occupied 12 classrooms (=480/40) in Shakshouk. The village also lacks a higher technical education facility. In 1996, there were around 1,090 students, who could have been served by 27 classrooms (=1,090/40) in Shakshouk.

There is one health care unit, two private clinics and three pharmacies in the village. The village lacks an emergency unit and a hospital. The health care unit could be upgraded to a village hospital since the village’s population is well over 20,000. The number of police and fire stations could be increased as well to ensure better coverage.

The village completely lacks cultural and social services at all levels. There is no library, cinema, theatre, museum, community center, club, etc. There is a youth center in the village; however, it does not operate. The youth center could be improved by enlarging and increasing the number of athletic fields, playgrounds, etc. To satisfy the Ministry of Social Issues' standards, 2 social units (community centers) could be constructed. The village has enough facilities serving religious purposes.

This section examined whether the existing supply is able to meet the existing and the forecasted demand. Table 6-1 shows the facilities, which would be required to be built in order to satisfy the current and future needs of the village. The table also mentions how much area each unit would need according to Egyptian national standards.

Table 6-1 Recommended units and their areas

Type of units / facilities	Number of units required	The required area (m^2)	Priority
Housing	1,550	154,185.23	1
Elementary school	2	3,150	2
Secondary school	1	3,150	3
High school	1	2,100	4
Higher technical education	1	8,400	2
Village hospital and emergency unit	1	1,400	1
Cultural and social units	2	2,800	4
Police and fire station	1	1,400	3

Source: Author based on GOPP, 2006

It is very difficult to provide a priority list since all the above mentioned units are very important to the village's future. Perhaps, however, the most important issues to address are housing, medical and educational services. The first two are required to increase the village's current quality of life, while the third is necessary to ensure the village's future.

6.4 Location search

The location search focuses only on units, which were identified above as high priority (1 or 2) by the author or the local residents. Accordingly, new locations were identified for the following:

- 1,550 houses
- 1 mosque
- 1 village hospital
- 1 youth club
- 2 elementary schools

6.4.1 Housing units

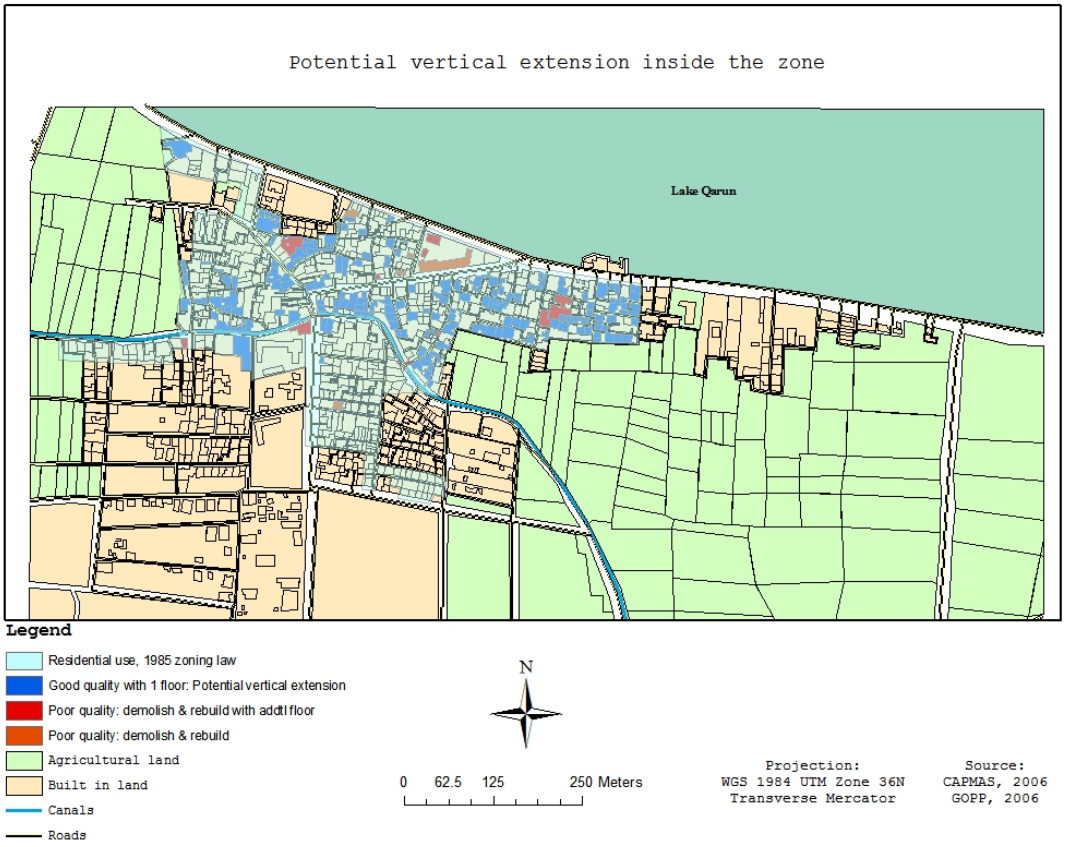
Based on the criteria identified in the flow chart shown in Appendix 5, ArcGIS was used for locating additional apartments. The site search was divided into two categories, namely inside and outside the current residential zone. First, the houses and areas located inside the currently valid zoning code were analyzed, and then the houses and areas outside the zoning code were studied.

Inside the currently valid zone there exist 624 houses. Since this part examines the option of densifying the village, the existing situation of the road and service network needs to be taken into account. Local standards require that the maximum height of the houses can not be taller than 1.5 times the street width (HBRC, 1994a). Since the arterial roads inside the village are narrow (around 4 meters), the maximum height of the houses can be no more than 6 meters, which means a maximum of two floors (HBRC, 1994a).

A potential vertical extension might take place on 176 houses, which are in good condition and have a maximum of one floor. It could be investigated whether one more floor can be added to these houses. Sixteen buildings are recommended for demolition due to their poor quality as they do not much the minimum Egyptian requirement standards (see HBRC, 1994b). Ten of these buildings originally had 1 floor, and 6 had 2 floors. The rebuilding might result in 2 floor buildings, providing 10 additional units.

Accordingly, with the help of vertical extension, a maximum of 186 (176 + 10) additional units can be gained. Please see Figure 6-2 below for their location.

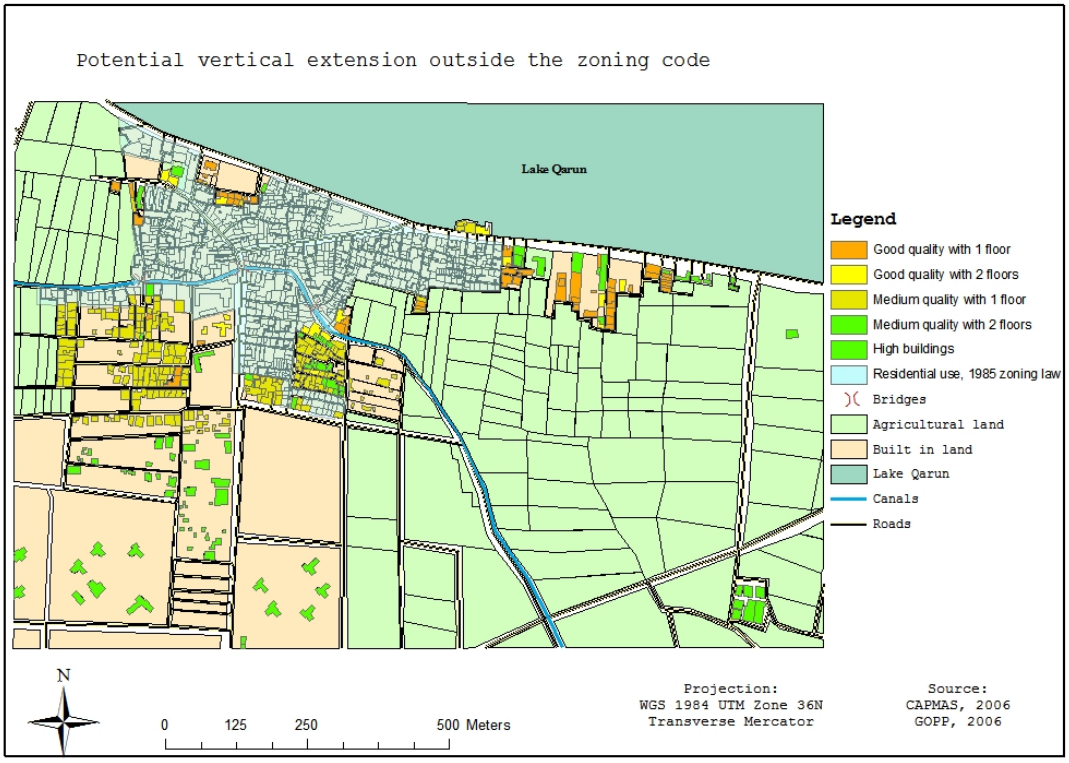
Figure 6-2 Potential vertical extension inside the zone



Source: Author based on CAPMAS and GOPP database, 2009

Regarding houses located outside the current residential zone, Figure 6-3 shows the quality of housing and the number of floors. Surprisingly, no building was identified for demolition due to its low quality. This is due to the fact that the people, who build illegally, are probably wealthy and powerful. That is why they invest in good quality housing. All the buildings (390) are recommended to be included within the new zone, and 74 (55 good quality and 19 medium quality) of them are suitable for vertical extension. See Figure 4-14 below for details.

Figure 6-3 Potential vertical extensions outside the zoning code



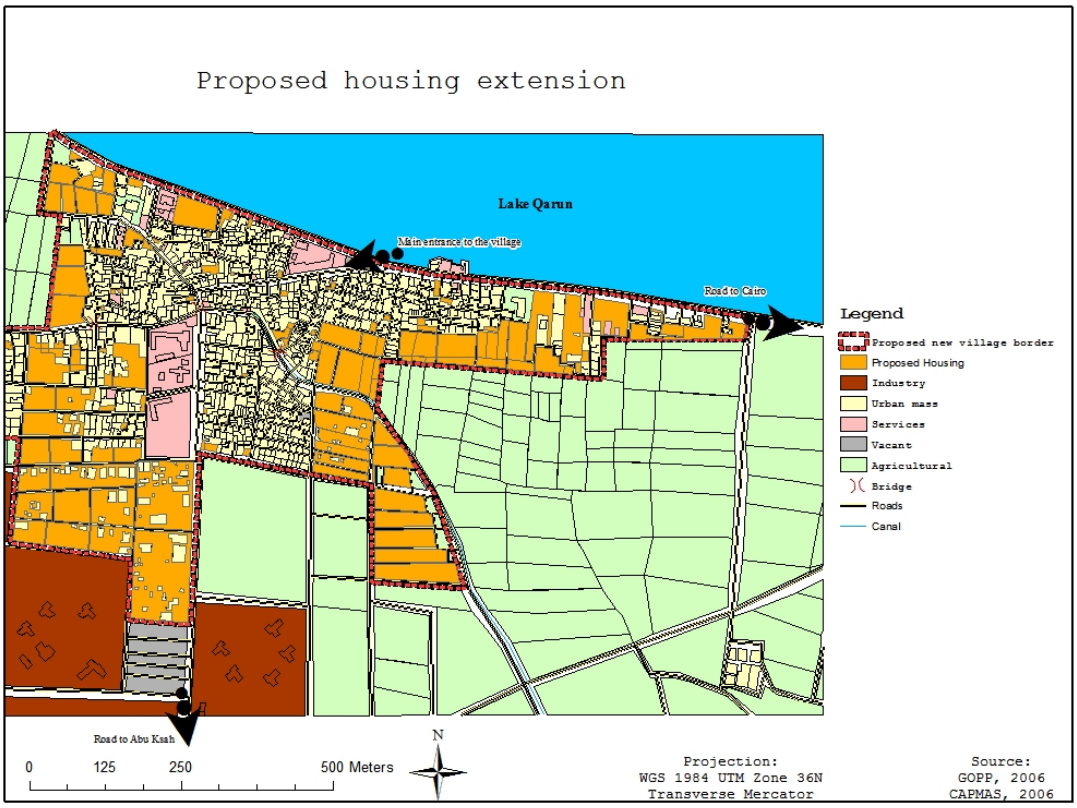
Source: Author based on CAPMAS and GOPP database, 2009

In the process of identifying the potential residential expansion, the natural extension of the village was given high priority. Currently, agriculturally zoned areas surrounding the village, on which houses were already built illegally, were identified as a potential residential area. Due to population growth, the village border needs to be extended. If the borders are not redrawn, illegal buildings on agricultural land will continue, leading to sprawl and scattered developments, which considerably endanger the agricultural activity. Figure 6-4 shows the proposed extension.

Accordingly, 36.7055 feddan (38.1 acres) would be available for new housing. As mentioned above, an average house in the village is built on 120 square meters (1,292 square feet) of land. If only single family houses were built, there would be a need for 36.8 feddan (120 m^2 * 1,290 houses = 154,800 m^2 =

38.25 acres = 36.8 feddan). Since houses with 2 or more floors are encouraged to be built, the designated 36.7055 feddan should be enough for the extension.

Figure 6-4 Proposed housing extensions



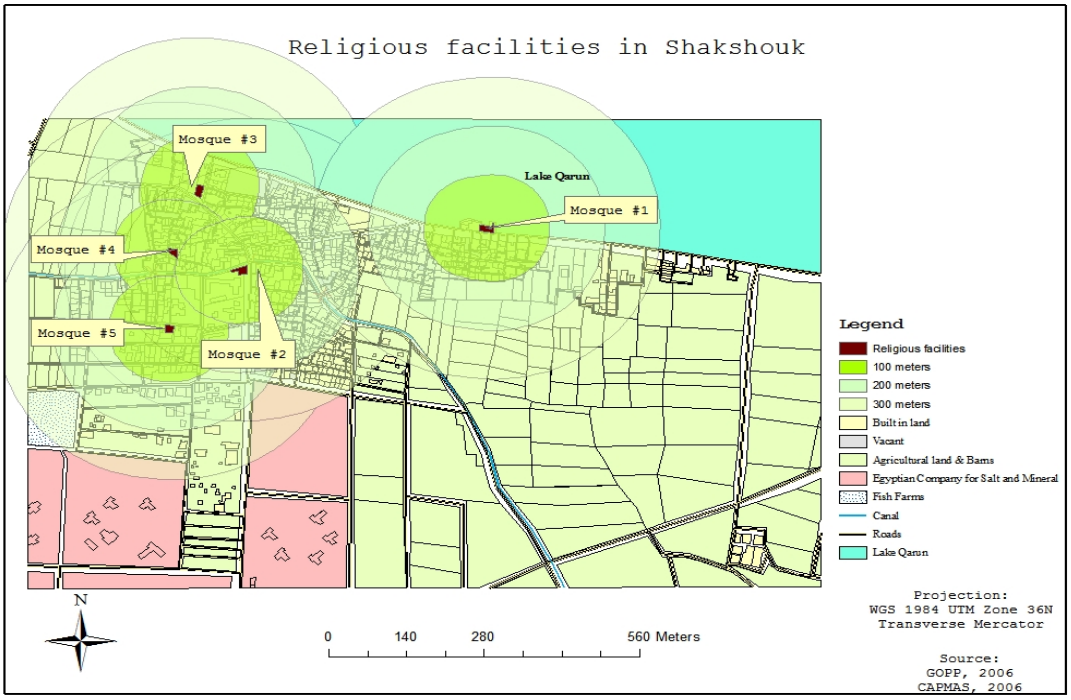
Source: Author based on CAPMAS and GOPP database, 2009

6.4.2 Services

Religious institution

Although the village has plenty of mosques, the local residents would like to see more. The necessity of the mosque was not argued by the author but accepted based on local residents' opinions. Currently, there are five mosques in the village, two on the west side, one on the northwest, one on the east and one in the middle of the village. Due to the high number of mosques and their scattered locations, every household has access to at least one mosque in walking distance (max 500 meters = 545 yards). Figure 6-5 below shows the locations of the five mosques and buffers of 100, 200 and 300 meters (=109 / 218 / 327 yards).

Figure 6-5 Religious facilities in Shakshouk



Source: Author based on CAPMAS and GOPP database, 2009

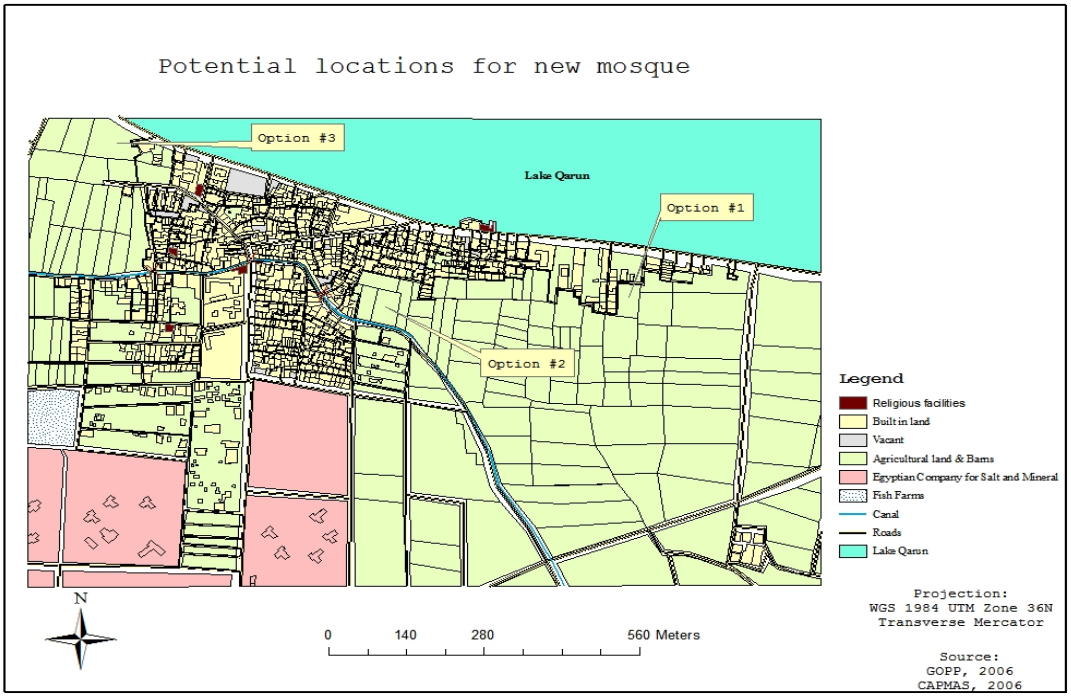
Since the existing mosques were mainly privately built, they are small in size. The proposed government funded mosque would be a large one. Three alternative locations were analyzed for the mosque, as shown in the Figure 6-6. Table 6-3 shows the advantages and disadvantages of each alternative.

Table 6-2 Advantages and disadvantages of potential mosque sites

	Location	Advantages	Disadvantages
1	**East side**	There is only one mosque on the east side	Low population density Might encourage sprawl Low accessibility
2	**City Center**	High population density Central location	Low accessibility
3	**Northwest side**	High Accessibility Scenic view due to the lake Might stop further sprawl West side is unsuitable for agriculture	Located at the side of the village

Source: Author based on above GIS maps

Figure 6-6 Potential locations for new mosque

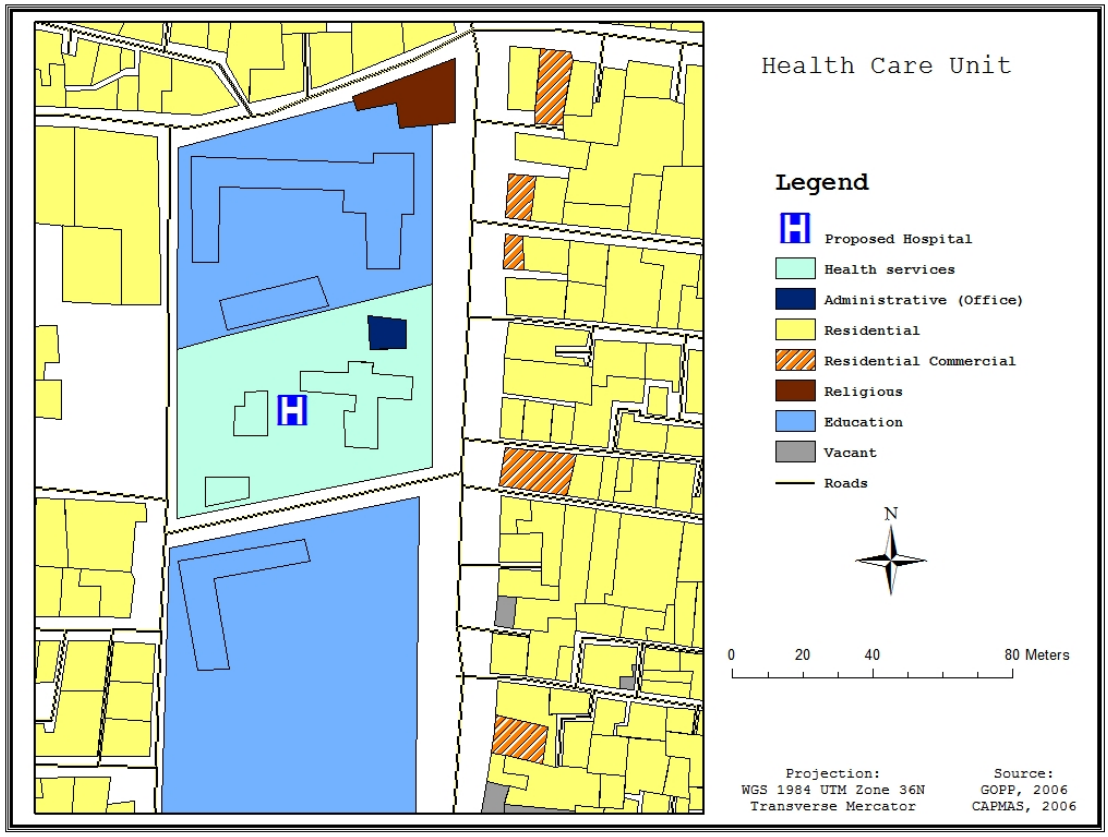


Source: Author based on CAPMAS and GOPP database, 2009

Village hospital

The plot on which the existing health care unit is located was designed to accommodate a future extension. It is strongly recommended to transform the existing health care unit to a village hospital in the current location since it is centrally located and highly accessible both for the local residents and for the residents from the surrounding villages. In addition, the land is available, and the plot is surrounded by wide roads for emergencies.

Figure 6-76 Health care unit / Village hospital

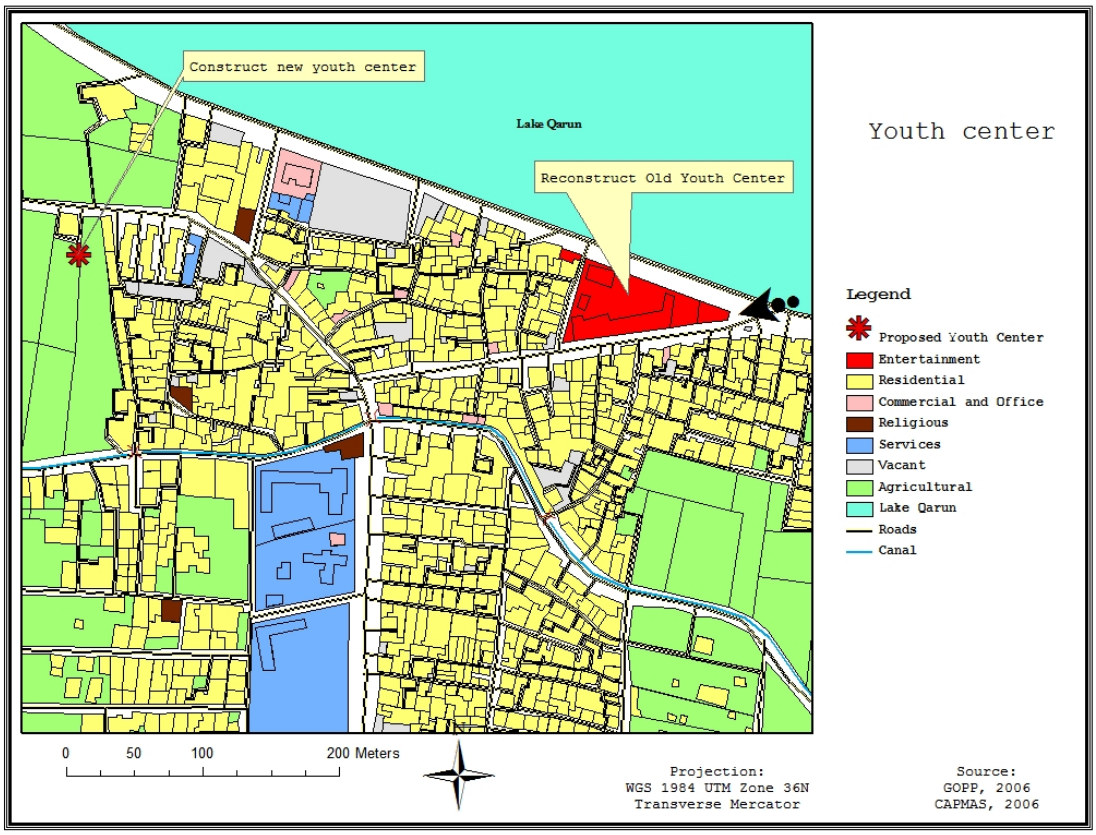


Source: Author based on CAPMAS and GOPP database, 2009

Youth center

There is some publicly owned land to the west, which could accommodate the new youth center. However, reconstructing and reopening the old youth center at its old location to the north is also highly recommended due to its high accessibility.

Figure 6-6 Youth center

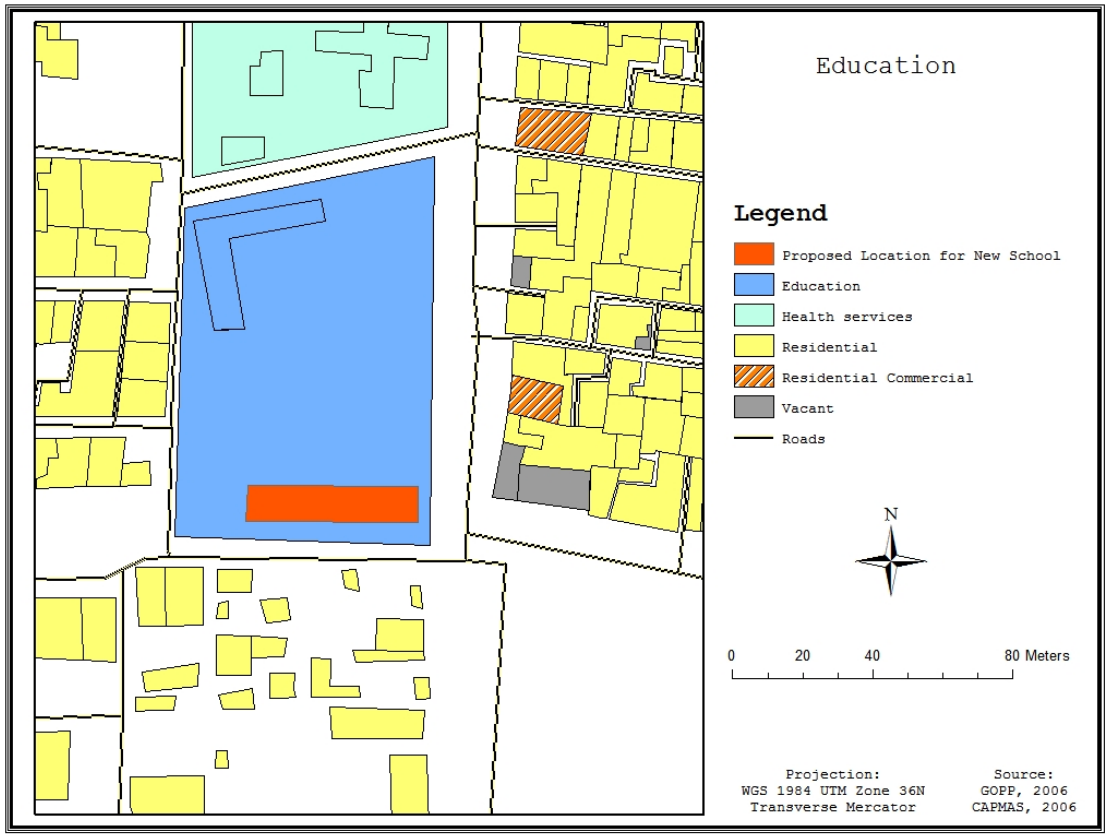


Source: Author based on CAPMAS and GOPP database, 2009

Elementary school

The plots on which the existing elementary schools are located were designed to accommodate future extension. It is strongly recommended to add 40 additional classrooms to the existing school or build two new school buildings (20 classrooms each) at the current location. The current location is centrally situated and highly accessible both for the local residents and for the residents from the surrounding villages. Furthermore, the land is available, and the plot is surrounded by wide roads. Alternatively, the vacant land east of the plot is also available for development.

Figure 6-7 Elementary school

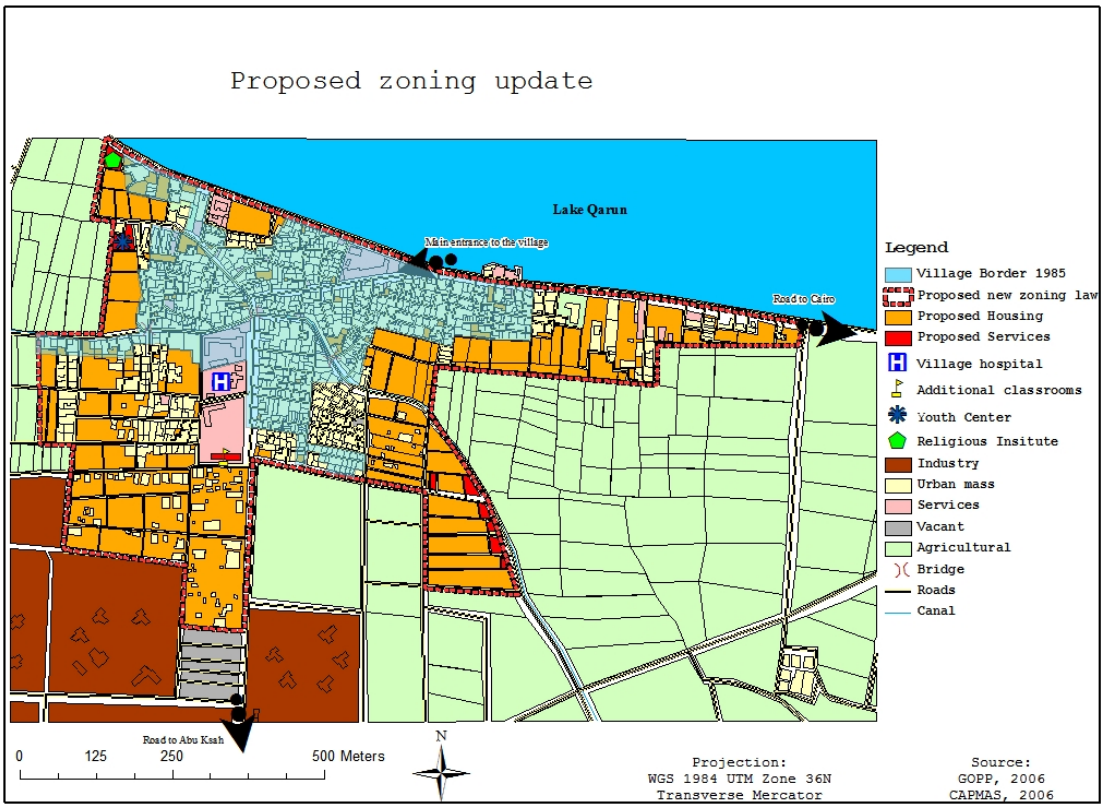


Source: Author based on CAPMAS and GOPP database, 2009

6.5 Proposed zoning update

Figure 6-10 shows all the high priority updates and their suggested locations. All the proposed changes would increase the size of the village dramatically. It means that the new village border would be three times as big as the original village border from 1985. However, it is important to note that this increase provides the housing and some basic services needed for population increase that occurred between 1986 and 2006 in addition to that which might occur between 2006 and 2016.

Figure 6-8 Proposed zoning update



Source: Author based on CAPMAS and GOPP database, 2009

7 Chapter 7: Conclusion

This research was concerned about agricultural land loss due to population growth in Egypt. By focusing and analyzing in details one specific village, it was believed that methods can be identified to manage population growth, agricultural land loss and the conflict between them at local level. As the specific village was chosen to be a representative one, the study intended to extrapolate the local results and draw recommendations at national level as well. Accordingly, the study had two main research questions, one targeting local and one targeting national issues. Both main research questions were supported by a series of sub research questions.

1) What measures could be taken to accommodate population growth by 2016 in a specific Egyptian village, while preserving its agricultural zones and local heritage?

The literature suggests numerous different measures to be applied for preserving agricultural land. This research chose three international case studies and analyzed how preservation was achieved in these cases. The examples were carefully chosen. The Netherlands and Britain were chosen due to their relatively high population density, their lack of freely buildable land and the importance of agricultural activities in these countries. The third case study, the USA was chosen because it has vast agricultural lands with excess agricultural production. The case studies confirmed that zoning and strategic planning can be efficient tools in both preserving agricultural land and managing physical developments. If these tools are applied appropriately and complemented with local enforcement, they could protect both agricultural land and local heritage while providing room for physical improvements.

a) What are the consequences of agricultural land loss due to urbanization, giving special attention to Egypt?

Table 2-4 listed a series of irreversible socio-economic, physical and environmental consequences of agricultural land loss. From financial point of view, the most important consequences are the loss of

employment, and the loss of agricultural products. For people originally working in agriculture it is difficult to find a job and it often takes a considerable amount of time. If the new job is in a non-agricultural field, training might be necessary, which extends the period spent with unemployment. At the same time, the government also faces additional expenses. They have to increase the import of agricultural products as the amount of locally grown products decreases. Closing old drainage systems and providing infrastructure for the newly and mainly illegally developed suburbs also put additional financial burden on the government.

These unplanned illegal suburbs often lack any infrastructure (sewage system, water network, open spaces, pavement, etc.) which results in deteriorating both the quality of life and the environment. The environmental degradation is often irreversible and priceless.

b) What is being done at local, governorate and national levels in Egypt to ensure the balance between agricultural and residential land use?

Section 2.2.5 listed the actors, while section 2.2.6 listed the policies responsible for managing the competition between agricultural and residential land use at different levels. At national level the General Organization for Physical Planning was identified as the most active actor controlling physical developments on agricultural land. However, its activity has just become more efficient recently. Although numerous local actors were identified in the research, none of them could be mentioned solely as an important actor. In general, the lack of resources (such as financial means, equipment, updated maps) prevents local actors to do their work.

As the section 2.2.5 described the aim of the actors recently shifted from banning to managing and controlling physical developments on agricultural land. This aim is also reflected in the policies. The latest law (119/2008), which is the result of a 10-year long discussion among key stakeholders, already

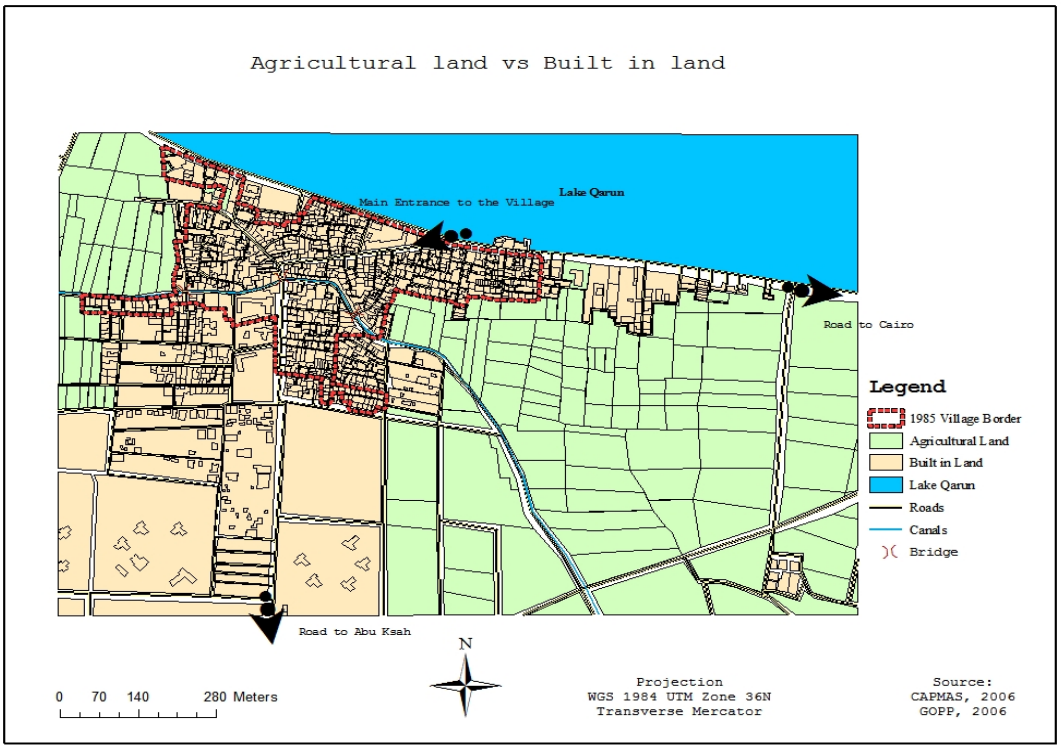
emphasizes that preserving local heritage and providing room for extension is as important as preserving agricultural land and some trade off is inevitable.

c) What is the current state of the village under study?

Figure 7-01 clearly shows that the population overgrew the village border, set up in 1985. As the number of inhabitants and number of houses increased in the villages, the quality of services deteriorated due to lack of extensions. No additional classrooms were added to the schools, and not any additional police / fire / emergency stations were constructed, etc.

Further analyzing the village showed that the population is continuously increasing despite the fact that the extent of population growth started to decrease nationwide. The annual expected population growth in the village of Shakshouk continues to be around 25 percent, which means that the competition for land between agricultural and residential land use is expected to continue.

Figure 7-1 Agricultural land versus built in land



Source: Author based on CAPMAS and GOPP database, 2009

d) What additional needs in terms of housing, services and infrastructure will occur due to the change in the size and the composition of the village's population by 2016?

Cohort component technique was used to forecast the population size and composition. Based on the population forecast, housing and services needs were also forecasted. This study identified a number of physical developments needed in Shakshouk Village. Namely 1,550 houses, 5 schools, 1 hospital, 1 cultural and social unit, 1 police station, 1 fire station and 1 religious institution. These improvements are needed to maintain and upgrade the quality of life and ensure the village's bright future.

Since the local residents chose the construction of a religious facility and a youth center as their top priorities, the study suggests building those as well. However, it would be interesting to analyze the ethical issues raised by the difference of opinions between experts and local residents regarding the

details of a strategic plan. As mentioned in section 4.5.3, the residents' main concern was to build a new religious facility despite the fact that every household has access to at least one within walking distance. Residents completely ignored the advice of experts regarding constructing more houses, and educational and health facilities, which are essential for the village's future. This situation raised the question about the experts' responsibility regarding how to set up a final list. Should they completely ignore the residents' demand? Should they influence residents to support the experts' list? If yes, what methods are experts allowed using, and to what extent are they allowed intervening?

2) What implications does this have for national policy?

a*) What is the order of magnitude of these needs at the national level?*

It is expected that the population will increase not only in the village of Shakshouk but in all the settlements throughout the country. As mentioned in section 4.1.2 the population of Egypt was 79,000,000 in 2006 and is currently increasing with an estimated 1 million capita yearly.

Table 7-1 shows the physical improvements, which would be needed for construction in the villages of Egypt, assuming that the village of Shakshouk is a representative village and all the 4,632 villages in the country will follow the same population trend in the next 15 years and will have the same demand for physical improvements.

Table 7-1 Required physical improvements in the villages of Egypt

Improvements	Number of improvements required	The requires area (acres) *
Housing	7,179,600	176,479
Elementary school	9,264	7,211
Secondary school	4,632	3,605
High school	4,632	2,404
Higher technical school	4,632	9,615
Cultural and social units	9,264	3,204
Police and fire station	4,632	1,602
Religious facility	4,632	982
Village hospital and emergency unit	4,632	1,602
Youth center	4,632	1,156

* Source: GOPP, 2006

Source of Table: Author, 2009

According to Table 7-1, carrying out all the improvements would require 207,860 acres to be added to the area of villages in a 15 year period. If all these improvements take place on agricultural land and are distributed evenly in the next 15 years, it would mean an annual 13,857 acres of agricultural land loss in Egypt. This number is very high compared to the 25,000 acres, which was the annual agricultural land loss in Egypt between 1984 and 2000, reported by the National Ministry of Agriculture (see Table 2-4).

It is important to note that the forecasted data do not contain any areas demanded by the infrastructure (such as additional area required by extension of the road network, sewage and water lines and facilities, landfills, etc), business, environment, etc. Furthermore, this amount of land is demanded only by the villages of Egypt and does not include the cities' demands. What's more, houses built on agricultural land illegally without supervision are expected to occupy more area than needed. Illegal houses would be

scattered, which would lead to sprawl, making it impossible to continue agricultural activities in the surrounding areas.

Further agricultural land loss would increase unemployment and poverty. It would decrease the quality of life and would have irreversible effects on the environment as described in section 2.6. Prompt action is needed in the country in order to ensure that above improvements will not take place solely on agricultural land. The law Nr 119/2208, introduced lately, encourages strategic planning and zoning updates, which might be the right action to manage and control physical developments on agricultural land in Egypt. Three case studies were analyzed and showed that zoning and strategic planning can be successful tools in preserving agricultural land. Besides, it is recommended to revise and simplify the use of building and development permits in Egypt. As the British case showed, applying these permits can be very successful in preserving agricultural land if applied properly.

As mentioned in section 2.9, in the literature review, several departments involved in preserving agricultural land in Egypt are overloaded with work. The lack of financial means, human and office resources, knowledge, equipment and so on makes the life of these agencies tougher. Preparing strategic plans is a long, time and energy consuming process. However, there are several ways to reduce the length of this process. For example, creating a user form with the help of ArcObjects would speed up the process of map preparation by avoiding the tedious, time and energy consuming work. Since all the villages are required to use the same types of maps with the same symbology, by applying ArcObjects a map could be prepared in less than five minutes by 1 to 2 ‘clicks’. The same map in the traditional way using solely ArcGIS requires a few hours and thousands of ‘clicks’. The author strongly recommends preparing a model, using ArcObjects, to facilitate the strategic map preparation process.

Alternatively, there are a couple of other tools, which could be used to complement strategic plans in preserving agricultural land. For example, introducing an affordable mortgage system; revising the rental

market and encouraging house rentals by increasing the rights of homeowners (for example: eliminate rent control) could be useful tools. The latter ones are especially important since the number of vacant houses is considerably high both in the village and in the country.

Community development and education could also be a way to preserve agricultural land. However, the high rate of illiteracy (see Table 4-3) limits the education to community meetings and communicative actions.

As it was emphasized above, it is vital to control physical development on agricultural land. If nothing is done, the agricultural land loss will further increase. Alternatively, there are several methods, which could be applied to ensure the balance between physical development and agricultural land loss. This research mainly analyzed strategic planning and zoning tools and proved their efficiency based on international case studies and a local village analysis. During the research a few additional issues were raised, but not analyzed in details in this thesis despite their importance. These issues are recommended for further research:

- Ethical dilemma raised by the difference of opinions between experts and local residents regarding the details of a strategic plan;
- Analyzing and finding additional methods, which could complement strategic planning and zoning in order to ensure even more efficient agricultural land management;
- Research the applicability of ArcGIS / ArcObjects in facilitating the map creation process for strategic plans and zoning.

This study could help to draw the new boundaries of the village, which should satisfy the local population’s demand till 2016.

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Appendices

Appendix 1 Types of evidence

Source of Evidence	Strengths	Weaknesses
Documentation	• stable – repeated review • unobtrusive - exist prior to case study • exact - names etc. • broad coverage - extended time span	• retrievability - difficult • biased selectivity • reporting bias - reflects author bias • access - may be blocked
Archival Records	• Same as above • precise and quantitative	• Same as above • privacy might inhibit access
Interviews	• targeted - focuses on case study topic • insightful - provides perceived causal inferences	• bias due to poor questions • response bias • incomplete recollection • reflexivity - interviewee expresses what interviewer wants to hear
Direct Observation	• reality - covers events in real time • contextual - covers event context	• time-consuming • selectivity - might miss facts • reflexivity - observer's presence might cause change • cost - observers need time
Participant Observation	• Same as above • insightful into interpersonal behavior	• Same as above • bias due to investigator's actions
Physical Artifacts	• insightful into cultural features • insightful into technical operations	• selectivity • availability

Source: Yin, 2002

Appendix 2 Lifetable by sex and age for Egypt

Year	Sex	A	G	E	nqx	nmx	ndx	lx	nLx	Ex
2006	M	0	-	1	**0.03244**	0.03335	3,244	100,000	97,269	68.77
2006	M	1	-	5	**0.00664**	0.00166	642	96,756	386,047	70.07
2006	M	5	-	10	**0.00215**	0.00043	207	96,114	479,979	66.53
2006	M	10	-	15	**0.00185**	0.00037	177	95,907	479,121	61.67
2006	M	15	-	20	**0.00280**	0.00056	268	95,730	478,022	56.78
2006	M	20	-	25	**0.00362**	0.00073	346	95,462	476,472	51.93
2006	M	25	-	30	**0.00436**	0.00087	415	95,116	474,564	47.11
2006	M	30	-	35	**0.00523**	0.00105	495	94,701	472,316	42.30
2006	M	35	-	40	**0.00718**	0.00144	676	94,206	469,439	37.51
2006	M	40	-	45	**0.01112**	0.00224	1,040	93,530	465,263	32.76
2006	M	45	-	50	**0.02022**	0.00408	1,870	92,490	458,231	28.10
2006	M	50	-	55	**0.03746**	0.00762	3,395	90,620	445,367	23.63
2006	M	55	-	60	**0.06475**	0.01335	5,648	87,225	423,084	19.44
2006	M	60	-	65	**0.10755**	0.02266	8,774	81,577	387,270	15.60
2006	M	65	-	70	**0.16889**	0.03669	12,296	72,803	335,144	12.16
2006	M	70	-	75	**0.29197**	0.06795	17,666	60,507	259,990	9.09
2006	M	75	-	80	**0.42597**	0.10874	18,249	42,841	167,820	6.77
2006	M	80	-	85	**0.58129**	0.16861	14,295	24,592	84,779	4.97
2006	M	85	-	90	**0.73060**	0.25088	7,523	10,297	29,987	3.64
2006	M	90	-	95	**0.84679**	0.35430	2,349	2,774	6,630	2.71
2006	M	95	-	0	**0.92000**	0.47165	391	425	829	2.08
2006	M	100	+	0	**1.00000**	0.59993	34	34	57	1.67
2006	F	0	-	1	**0.02884**	0.02955	2,884	100,000	97,586	73.92
2006	F	1	-	5	**0.00739**	0.00186	718	97,116	386,700	75.11
2006	F	5	-	10	**0.00134**	0.00027	129	96,398	481,595	71.66
2006	F	10	-	15	**0.00105**	0.00021	101	96,269	481,111	66.76
2006	F	15	-	20	**0.00135**	0.00027	130	96,168	480,531	61.82
2006	F	20	-	25	**0.00161**	0.00032	155	96,038	479,814	56.90
2006	F	25	-	30	**0.00196**	0.00039	188	95,883	478,964	51.99
2006	F	30	-	35	**0.00269**	0.00054	257	95,695	477,868	47.09
2006	F	35	-	40	**0.00391**	0.00078	373	95,438	476,325	42.21
2006	F	40	-	45	**0.00654**	0.00131	622	95,065	473,900	37.36
2006	F	45	-	50	**0.01114**	0.00224	1,052	94,443	469,829	32.59
2006	F	50	-	55	**0.02066**	0.00417	1,929	93,391	462,549	27.93
2006	F	55	-	60	**0.03442**	0.00699	3,148	91,462	450,102	23.46
2006	F	60	-	65	**0.06263**	0.01290	5,531	88,314	428,906	19.20
2006	F	65	-	70	**0.10863**	0.02287	8,993	82,783	393,286	15.30
2006	F	70	-	75	**0.19539**	0.04307	14,418	73,790	334,765	11.84
2006	F	75	-	80	**0.28414**	0.06603	16,870	59,372	255,486	9.07
2006	F	80	-	85	**0.43125**	0.11032	18,329	42,502	166,141	6.66
2006	F	85	-	90	**0.59339**	0.17394	14,344	24,173	82,465	4.84
2006	F	90	-	95	**0.74555**	0.26106	7,328	9,829	28,070	3.52
2006	F	95	-	0	**0.85926**	0.36924	2,149	2,501	5,820	2.61
2006	F	100	+	0	**1.00000**	0.50460	352	352	698	1.98

Source: Year 2006 was extracted by author from US Census, International Database, 2008

Appendix 3 Age-specific fertility rates and selected derived measures

	Age – specific fertility rates								Sex ratio at birth (males per females)
Country	Year	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
Egypt	1990	65.2	210.9	227.1	161.6	96.1	42.4	6	1.0500
Egypt	1991	63	207.9	221.9	154.9	88.9	42.9	6	1.0500
Egypt	1992	62.3	205.2	217.9	150	86.2	37.6	6.3	1.0500
Egypt	1993	61.5	202.6	214	145	83.6	32.2	6.6	1.0500
Egypt	1994	60.8	199.9	210	140.1	80.9	26.9	6.9	1.0500
Egypt	1995	58.5	199	209.5	141.8	79.5	26.2	6.2	1.0500
Egypt	1996	56.2	198.1	209	143.4	78.1	25.5	5.5	1.0500
Egypt	1997	53.8	197.1	208.6	145.1	76.7	24.8	4.8	1.0500
Egypt	1998	51.5	196.2	208.1	146.7	75.3	24.1	4.1	1.0500
Egypt	1999	48.2	185.6	201	142.7	72.3	23.2	3.9	1.0500
Egypt	2000	44.9	175.1	193.8	138.7	69.4	22.3	3.8	1.0500
Egypt	2001	43.3	169.9	190.3	136.7	67.9	21.9	3.7	1.0500
Egypt	2002	41.7	164.6	186.7	134.7	66.5	21.5	3.6	1.0500
Egypt	2003	40	159.4	183.2	132.7	65	21	3.5	1.0500
Egypt	2004	38.4	154.1	179.6	130.7	63.5	20.6	3.4	1.0500
Egypt	2005	36.8	148.9	176.1	128.7	62.1	20.2	3.4	1.0500
Egypt	**2006**	**35.5**	**145**	**173.4**	**127.2**	**61**	**19.8**	**3.3**	**1.0500**

Source: Extracted and re-edited by author from US Census International Database, 2008. Available at http://www.census.gov/ipc/www/idb/country/egportal.html , last accessed 06/25/2008

Age-specific fertility rates in Egypt in 2006

Age	Fertility rates
15-19	0.1775[a]
20-24	0.7250
25-29	0.8670
30-34	0.6360
35-39	0.3050
40-44	0.0990
45-49	0.0165

a) 35.5 / 1000 * 5 = 0.1775

Source: Author based on US Census international database of age-specific birth rates, 2008

Appendix 4 List of data collected for the case study

Governorate level

General information including its history, location,

Information about the number of cities, districts, villages in the governorate and

Population size and composition for 1996 and 2006

Source: CAPMAS, Cairo, Egypt

Village level

General information including its history, location,

Existing maps,

GIS: zoning law and actual land use,

Minutes and results of focus group interviews,

Quantitative database, aerial photographs, photographs taken during site visits, which reflects the current situation as follows:

- Size and composition of population, average household size
- Housing stock,
- Educational institutes (e.g. schools, libraries, other),
- Health care services (e.g. emergency rooms),
- Sport and recreational facilities (including community centers),
- Religious facilities (e.g. churches, mosques),
- Communication centers (e.g. post office, phones),
- Security services (such as police, firefighter stations),

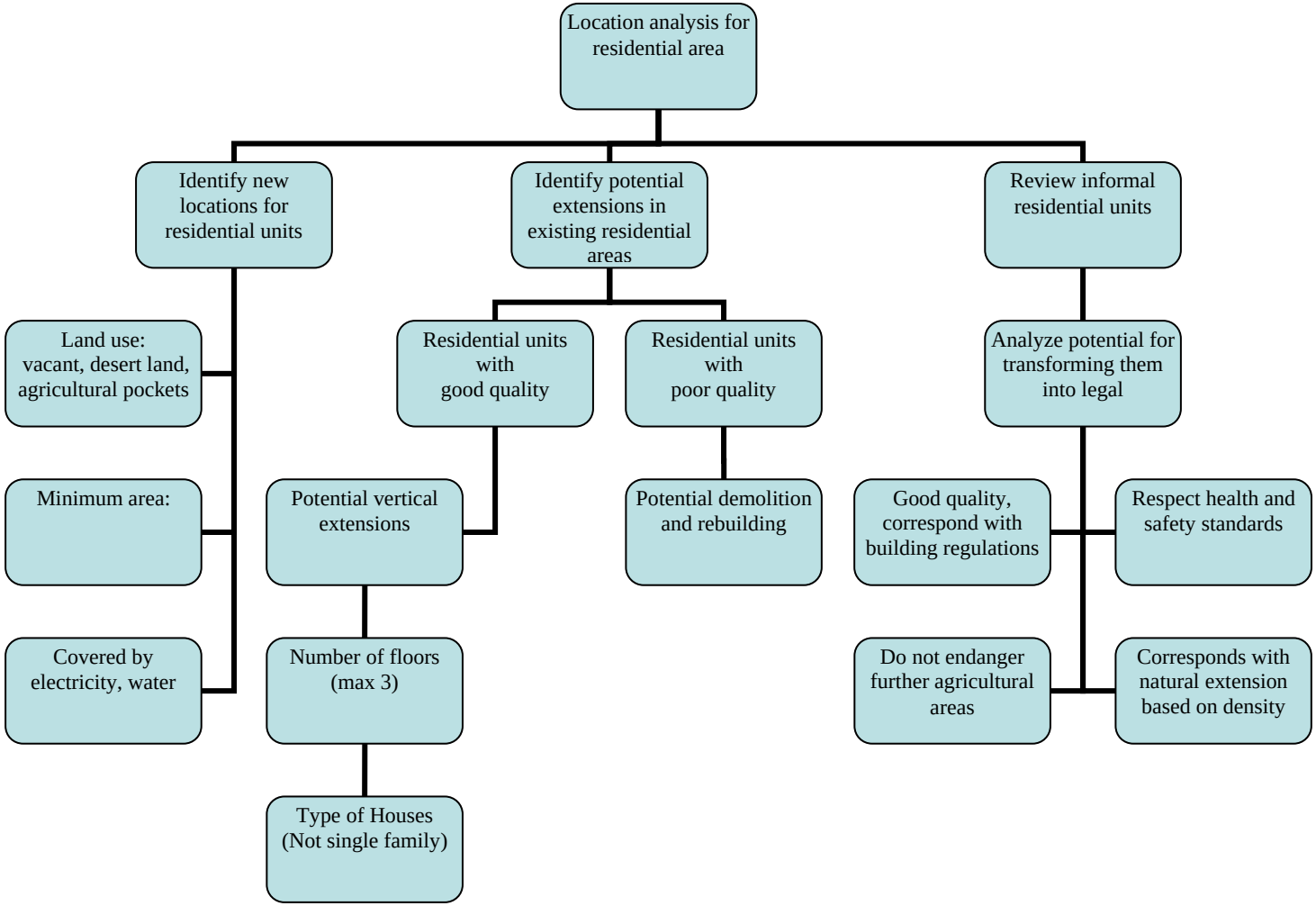
Main source: Ministry of Urban Housing, Cairo, Egypt

Other

Permission of local officials to use the real name of the village in the thesis

Source: Village of Shakshouk / Ministry of Urban Housing, Cairo, Egypt

Appendix 5. Flow chart of location search for housing



Appendix 6 Data for population pyramid, Shakshouk, 1996

Cohorts	Male	Female	Total	% male	% female
Less than 5	1536	1341	2877	-9.37	8.18
5 to 10	1491	1308	2799	-9.09	7.98
10 to 15	1247	1071	2318	-7.61	6.53
15 to 20	941	748	1689	-5.74	4.56
20 to 25	747	664	1411	-4.56	4.05
25 to 30	538	514	1052	-3.28	3.13
30 to 35	402	495	897	-2.45	3.02
35 to 40	379	369	748	-2.31	2.25
40 to 45	297	321	618	-1.81	1.96
45 to 50	239	233	472	-1.46	1.42
50 to 55	189	236	425	-1.15	1.44
55 to 60	150	132	282	-0.91	0.81
60 to 65	148	165	313	-0.90	1.01
65 to 70	128	105	233	-0.78	0.64
70 to 75	75	81	156	-0.46	0.49
75 or more	48	58	106	-0.29	0.35
Total	8555	7841	16396	52.18	47.82

Source: GOPP, 2006

Appendix 7 Population forecast between 1996 and 2001

SHAKSHOUK, 1996	Population			Survival Rate		
Age groups	**Male**	**Female**	**Total**	**Male**	**Female**	**Birth rate**
0 to 4 years	1536	1341	2,877	0.9602	0.9632	
5 to 9 years	1491	1308	2,799	0.9978	0.9987	
10 to 14 years	1247	1071	2,318	0.9982	0.9990	
15 to 19 years	941	748	1,689	0.9972	0.9986	0.3195
20 to 24 years	747	664	1,411	0.9964	0.9984	1.3050
25 to 29 years	538	514	1,052	0.9956	0.9980	1.5606
30 to 34 years	402	495	897	0.9948	0.9973	1.1448
35 to 39 years	379	369	748	0.9928	0.9961	0.5490
40 to 44 years	297	321	618	0.9889	0.9935	0.1782
45 to 49 years	239	233	472	0.9798	0.9889	0.0297
50 to 54 years	189	236	425	0.9625	0.9793	
55 to 59 years	150	132	282	0.9352	0.9656	
60 to 64 years	148	165	313	0.8924	0.9374	
65 to 69 years	128	105	233	0.8311	0.8914	
70 to 74 years	75	81	156	0.7080	0.8046	
above 75	48	58	106	0.2492	0.3477	
	8,555	7,841	16,396			

Proportion of births	
Male	0.512195
Female	0.487805

Total number of children born by 2001

2,741

Shakshouk, 2001	Population		
Age Groups	**Male**	**Female**	**Total**
0 to 4 years	1,404[a]	1,337	2,741
5 to 9 years	1,475[b]	1,292	2,767
10 to 14 years	1,488	1,306	2,794
15 to 19 years	1,245	1,070	2,315
20 to 24 years	938	747	1,685
25 to 29 years	744	663	1,407
30 to 34 years	536	513	1,049
35 to 39 years	400	494	894
40 to 44 years	376	368	744
45 to 49 years	294	319	613
50 to 54 years	234	230	465
55 to 59 years	182	231	413
60 to 64 years	140	127	268
65 to 69 years	132	155	287
70 to 74 years	106	94	200
above 75	65[c]	85	150
Total	9,759	9,031	18,790

a = [748*0.3195 + 664*1.3050 + 514*1.5606 + 495*1.448 + 369*0.5490 + 321*0.1782 + 233*0.0297]*0.512195

b = 1,536*0.9602 c = 75*0.7080 + 48*0.2492

Appendix 8 Population forecast between 2006 and 2011

SHAKSHOUK, 2006	Population			Survival Rate		
Age groups	**Male**	**Female**	**Total**	**Male**	**Female**	**Birth rate**
0 to 4 years	1,682	1,602	3,284	0.9602	0.9632	
5 to 9 years	1,348	1,288	2,636	0.9978	0.9987	
10 to 14 years	1,472	1,290	2,762	0.9982	0.9990	
15 to 19 years	1,485	1,305	2,790	0.9972	0.9986	0.3195
20 to 24 years	1,241	1,068	2,310	0.9964	0.9984	1.3050
25 to 29 years	935	746	1,681	0.9956	0.9980	1.5606
30 to 34 years	741	662	1,403	0.9948	0.9973	1.1448
35 to 39 years	533	512	1,044	0.9928	0.9961	0.5490
40 to 44 years	397	492	889	0.9889	0.9935	0.1782
45 to 49 years	372	365	737	0.9798	0.9889	0.0297
50 to 54 years	288	315	603	0.9625	0.9793	
55 to 59 years	225	226	451	0.9352	0.9656	
60 to 64 years	170	223	393	0.8924	0.9374	
65 to 69 years	125	119	245	0.8311	0.8914	
70 to 74 years	110	138	248	0.7080	0.8046	
above 75	17	105	122	0.2492	0.3477	
Total	11,142	10,456	21,597			

Proportion of births	
Male	0.512195
Female	0.487805

Total number of children born by 2011

4,112

SHAKSHOUK, 2011	Population		
Age groups	**Male**	**Female**	**Total**
0 to 4 years	2,106	2,006	4,112
5 to 9 years	1,615	1,543	3,159
10 to 14 years	1,345	1,286	2,631
15 to 19 years	1,469	1,289	2,758
20 to 24 years	1,481	1,303	2,784
25 to 29 years	1,237	1,067	2,303
30 to 34 years	931	744	1,675
35 to 39 years	737	660	1,397
40 to 44 years	529	510	1,039
45 to 49 years	393	489	881
50 to 54 years	365	361	726
55 to 59 years	277	309	586
60 to 64 years	211	218	429
65 to 69 years	152	209	361
70 to 74 years	104	106	211
above 75	82	147	229
Total	13,033	12,247	25,280

Appendix 9 Population forecast 2016

Total number of children born by 2016
5,097

Shakshouk, 2016	Population		
Age groups	**Male**	**Female**	**Total**
0 to 4 years	2,610	2,486	5,097
5 to 9 years	2,022	1,932	**3,954**
10 to 14 years	1,612	1,541	3,153
15 to 19 years	1,343	1,285	2,628
20 to 24 years	1,465	1,287	2,752
25 to 29 years	1,476	1,301	2,777
30 to 34 years	1,231	1,065	2,296
35 to 39 years	926	742	1,668
40 to 44 years	732	657	1,389
45 to 49 years	523	506	1,029
50 to 54 years	385	483	868
55 to 59 years	351	354	705
60 to 64 years	259	298	557
65 to 69 years	188	204	392
70 to 74 years	126	186	313
above 75	21	137	158
Total	15,270	14,465	29,736