

The dynamics of urban green space in an arid city; *the case of Cairo- Egypt*

A thesis submitted in fulfilment of the requirements of Cardiff
University for the degree of Doctor in Philosophy

By

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Beloved Dad, my first tutor and mentor

(May Allah shed them with his mercy, and may their souls rest in peace)

To my beloved home city, **Cairo**

Abstract

Green spaces are the lungs of any city. Egyptian cities are historically characterized by high densities and compacted urban forms, developed through cultural, religious and climatic factors. In such arid contexts, the golden thread weaving sustainability concepts together is 'greening'. The sustainability challenge facing such cities is finding new and more appropriate ways of greening high density, compact and diverse urban environments.

The main aim of this thesis is analysing the dynamics of green space, by studying both the demand and supply of green spaces in Cairo, a city suffering from bad and worsening health. Addressing the problem requires a sophisticated and realistic analysis of the dynamics of open space provision and consumption. The thesis adopts a mixture of quantitative and qualitative methods and approaches to collecting and analysing data in order to achieve a deep understanding of the reasons behind the city's green space performance problems. The aim is to give a scientific diagnosis of the city's problems as a basis for further attempts to solve and tackle the problems.

The idea for the research reported in this thesis starts from the observations that (a) The amount of green space in Cairo, capital of Egypt, is diminishing through urban encroachment of agricultural land; (b) Recreational green space has historically been provided at a very low level compared to other cities globally and in the region; (c) Much of the green space that is provided - by municipal government or private entrepreneurs – is provided as a club good, enclosed and charged for either by membership fee or entry toll. These observations provide both encouragement and challenge to policy makers aiming to make Cairo more sustainable. The analysis is broadly structured to understand both the supply of and the demand for green space in Cairo. Chapter Six focuses on the mechanisms of supply that have emerged at different times in the city's history. Chapters Seven and Eight explore residents' demands and requirements based on a systematic multi-stage cluster survey of the entire city, stratified for different green space supply institutional and morphological types.

In a city like Cairo, where natural resources are very scarce and opportunities for spending on green infrastructure are very rare, it is pivotal for any new developments to be based on a clear understanding of the situation in the city. This thesis tries to draw the clearest picture yet achieved of urban green space provision in Cairo. It is offered to policy makers, planners, entrepreneurs and investors to help enrich the lives of the future generations of this great and ancient city.

Abbreviations:

ADD	Attention Deficit Disorder
ADHD	Attention Deficit Hyper Disorder
ANGS	Accessible Natural Green Space
ASLA	the American Society of Landscape Architects
CABE	the Commission for Architecture and the Built Environment
CAPMAS	Central Agency for Public Mobilization And Statistics
CCBA	Cairo cleanness (cleaning) and Beautification Agency
GI	Green Infrastructure
GIS	Geographic Information System
GOPP	the General Organization for Physical Planning (Egypt)
GS	Green Space
IKONOS	Is a commercial earth observation satellite, and was the first to collect publicly available high-resolution imagery at 1 and 4 meter resolution.
NPFA	National Playing Fields Association
PPG17	Planning Policy Guidance 17
UA	Urban Agriculture

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Chapter One

Introduction

1-1- Preface

Figure (1-1), shows The Arab Republic of Egypt by map and satellite image. Egypt is one of the most populous countries in Africa and the Middle East and is distinct in the very narrow spatial distribution of its people: the great majority of its estimated 77.4 million live near the banks of the Nile River, in an area of about 40,000 km² where the country's only arable agricultural land is found. The vast areas of Egypt's share of the Sahara Desert are sparsely inhabited and about half of the country's residents live in urban areas, with most of these spread across the densely populated centres of greater Cairo, Alexandria and other major cities in the Nile Delta.

The context for this thesis is Egypt's position as one of the world's most arid countries. The Nile valley occupies less than 4% of the Egyptian territory and more than 90% of the

Egyptian population live along the river, with an average population density of about 1800 person/km² - one of the highest in the world (Shalaby, 2003:2).



Figure (1-1), Egypt's map

Source: Egypt's Wikipedia world map retrieved from <http://en.wikipedia.org/wiki/Egypt>
Google earth, accessed in 18/6/2010

Cairo is by far the largest city in Egypt; it is also the largest metropolitan area in Africa and the eleventh-largest urban area in the world. Cairo¹, depicted in Figure (1-2), like many other mega-cities, suffers from high levels of pollution, traffic problems, overpopulation and lack of services and infrastructure.

Among the most persisting services and infrastructure deficit problems in the city is the severe lack of open spaces in general and green spaces more specifically.

Greening the sand is more costly than greying the green. It costs more per m² to turn sand into green space than to turn green space into buildings. This is true financially, where to reclaim a feddan² of desert land normally costs 45,000–80,000 EGP, which is equivalent

¹ Cairo region consists of three governorates; Cairo, Giza and Qalubeya, however this research for reasons of data gathering restrictions and simplification deals with Cairo city, not the greater Cairo region. It is worth noting that the other 2 governorates share the same characteristics and problems as Cairo city.

² A feddan is the Egyptian land areas unit of measurement, where it is 0.42 of a hectare

to³ (\$8130– \$14455 or £4803-8540), according to a consultant in the Egyptian ministry of agriculture⁴. It is all the more true when the non-financial economic costs are considered.



Figure (1-2), Cairo city satellite image and districts boundaries

Source: IKONOS satellite image, purchased from a private company on October 2007.

This thesis is about the costs and benefits of green space in arid cities. It starts from the observation that the amount of green space in Cairo is relatively very low, and even diminishing in many areas of the city. It also starts from an observation that residents

³ Currency Conversions were calculated using the Yahoo finance currency converter at <http://uk.finance.yahoo.com/currencies/converter>, date of citation 4/8/2009,

⁴ Personal communication

appear not to place a high value on green space, even though it is scarce (otherwise, why would they not press for more green spaces and why would some green spaces remain underused and derelict?). The thesis therefore sets out to investigate demand for green space in the city, asking questions about how people use and value it. It also investigates how green space is provided. In particular, the spatial and institutional patterns of that provision are examined. It aims to develop testable hypotheses about demand and usage; and also about the different patterns of green space provided by different institutional and organisational forms – over both time and space.

1-2- Urban green space definitions, concepts & benefits in brief

The definitions and concepts of urban green space are discussed in detail and further elaborated in chapter three of this thesis, while the benefits are demonstrated in chapter four. However, a brief introduction is appropriate at this stage. As the thesis discusses urban green spaces valuation and usage, it is essential to begin by defining what is meant by urban greening and green space. Recent years have seen the introduction of the concept of urban greening, defined as making and keeping cities ‘greener’ by designing, establishing and managing multifunctional green areas. The urban greening discussion emphasizes that green spaces are no longer seen as ‘luxury goods’ for making cities more pleasant, but rather are part of the basic set of urban infrastructure, providing essential goods and services to cities and towns (Nilsson, et al, 2007). The benefits of green space are reviewed in chapter 4.

Nilsson builds on this, suggesting a more holistic definition, suggesting that green space planning should be: “*embracing the planning and management of all urban vegetation to create or add values to the local community*” (Nilsson, et al, 2007).

Urban green spaces are an important component of the complex urban ecosystem. They have significant ecological, social and economic functions (Bradley, 1995; CABE, 2003; Shafer et al, quoted in Li et al, 2004:326). Li notes that one of the great merits of urban green space is that one person’s use of it does not deprive others from using it or restrict others from enjoying it (Li et al, 2004). Everyone, in principle, can enjoy green spaces

without paying a marginal price. This is true in theory, but as I discuss in chapter 3, not commonly true in practice. In fact, even in temperate or tropical cities, many green spaces face congestion problems which render them something less than the text-book pure public good supplied and consumed with infinite marginal benefits. At the extreme, when an open space is crowded to the point at which an individual cannot move without encroaching on the space occupied by another individual (a very crowded beach or park and seen in the extreme in Mecca during the Hajj) so-called public space is technically reduced to private space. This argument is developed in chapter 3, where green open space is defined simply as green space that is shared by more than one user. The theoretical definitional position taken in the thesis is that green space as a pure public good is space with vegetation that can be used by one person without detracting from the benefit of other users. Green space operating as a local public good is defined as vegetated space co-consumed by more than one consumer, but not the entire population. Most green spaces are like this and this category of green space is also referred to as club good green space. Privately owned green space can be a local public good. So public space is defined at one level on the basis of consumption characteristics rather than ownership.

When measuring green space in Cairo, however, this theoretically pure position is departed from because of measurement constraints. The map of public and private green space in chapter 6 classifies green space on the basis of ownership.

Some of the values and benefits of urban green spaces that can be dissipated with over-use and crowding are summarised in the following:⁵

People with access to attractive parks and natural green spaces might be expected to use those spaces for active recreation - walking, cycling and other sports, with resulting improvements in physical health (CABE, 2003; GLA, 2003; CABE, 2004b:13). Green spaces provide health benefits by enabling people to exercise and relax (GLA, 2003; Li et al, 2004; CABE, 2004c). There is clinical evidence suggesting that green spaces can reduce or prevent obesity.(Tibbats, quoted in GLA 2003). There is increasing evidence that introducing natural features in the urban environment is good for mental health as well as physical health. Natural views of elements such as trees, lakes and colourful flowers can promote a drop in blood pressure and are shown to reduce feelings of stress (Ulrich,

⁵ The vital role and benefits of urban green spaces are demonstrated in more detail in chapter four.

1981;1984;1991; Hartig, quoted in CABE, 2003:7; Chiesura 2003:130). Green spaces can sequester carbon dioxide emissions and produce oxygen. Vegetation purifies air and water, regulates micro-climates and reduces noise (Bolund and Hunhammar, 1999; GLA, 2003). They have cultural and social values beyond their recreational value (Tarrant and Cordell, 2002; CABE, 2004a). Green it seems, is generally good, but does it contribute to sustainability? The following section addresses, the sustainability concepts and the role of urban green space.

1-3- Urban green space and Sustainability concepts

As the level of urbanisation increases rapidly, the world's problems of livelihood, health, environment and life quality are increasing too. These have become urban problems. Several international conventions and agreements have addressed the issue of sustainable urban development, trying to ensure the enhancement and preservation of built environments for coming generations. Principal among these was outcomes of the Rio Conference in Rio de Janeiro in 1992 involving Agenda 21 (Nilsson et al, 2007).

Drawing on a variety of studies of sustainability Jabareen (2006) identified seven significant design concepts which are related to sustainable urban forms and contribute to enhancing the built environment. These are

- compactness,
- density,
- diversity,
- greening
- sustainable transport,
- mixed land uses,
- passive solar design and

When talking about arid countries such as Egypt, the golden thread weaving these concepts together is *greening*. It is an essential basic concept in approaching most of the other concepts. The Egyptian context, like many arid cities in the Middle East, is characterized by high densities, compacted urban form developed through a long cultural heritage and linked to cultural, religious and climatic factors. It is also characterized by mixed land use urban tissue. For many arid cities therefore, it is greening that is the gap. The sustainability challenge facing such cities is to find new and more appropriate ways of greening high density, mixed use, compact and diverse urban environments.

1-4- Urban green space contribution to sustainability

It seems that international efforts to preserve and enhance different natural environments are mainly concerned with large bio-diverse and relatively untouched ecosystems or environments inhabited by human, animal or vegetated species; particularly those that are endangered or threatened with extinction. Much less attention has been paid to that essential type of nature close to where people live and work: the influential type of nature which is a crucial part of the daily human life - small-scale green areas in cities.

There is much scope for researching the contribution of urban green spaces to general sustainability goals. There is also a need to research the specific benefits of urban green spaces. Many reports and commentaries assume certain benefits. Or they assume more green space is always good without being specific about the particular benefits or the particular types of spaces that deliver them. Unconsidered promotion of green space does not necessarily meet the needs of present or future generations. For example, overly generous green space standards can encourage the supply of large spaces that are costly to govern, insecure and of insufficient quality to attract visitors. Their future is probably ultimately with redevelopment. More carefully designed smaller green spaces more attuned to demands may be capable of providing a more longer lasting green townscape. It may be antithetical to many urban design writers, but it may also be that more privately supplied and enclosed green spaces is a route to a sustainable green city (Lee and Webster, 2006). Just look at the suburbs of the typical English city – where bio diversity in private gardens is many times more than the open country side. This is a challenge for urban planners and designers. One hypothesis addressed in chapters 6-8 is the proposition that enclosure tends to increase the quantity and quality of green space supply. While this may be problematic in terms of equity, it may be unambiguously good in terms of ecological objectives. This is discussed in more detail in chapter 4.

So there is a need to be realistic and understand the nature of demand for green space and the costs and benefits of different modes of supply. This is the focus of this thesis.

Detailed attention to the natural components and nature of urban green spaces and how demand and use relate to urban structure is still poor. In many cities – there is evidently a low appreciation of green spaces evidenced by the continuous cuts in the green spaces

budgets of many towns (Tyrvaainen and Vaananen, 1998, quoted in Chiesura 2003:129). Shrinking budgets have deprived the community not only of new green spaces, but also of the maintenance of the existing green spaces, resulting in the diminishing of both quantity and quality of the green spaces and a retardation of the built environment. It is easy to react to such trends by calling for more budget. But there is a more profound job to do first – to understand in a more sophisticated way how urban green spaces work. Only then might it be possible to design sustainable green cities.

The dynamics of green spaces is under-researched but not unresearched. There is a growing body of empirical evidence indicating that the presence of natural features such as urban parks, gardens, forests, green belts with their particular components (trees, water etc) contributes to quality of life in many ways. (CABE 2004). There is evidence to show that community parks, gardens and green spaces bring people together from different ages and cultures, and thus help to create a foster neighbourhood cohesion, identity and social sustainability (Massey, H., quoted in CABE, 2003:13).

At a more detailed scientific level, there is evidence that environmental services such as air and water purification, wind and noise filtering, or microclimate stabilization, provide social and psychological benefits that are of crucial significance for the liveability of modern cities and the well being of urban dwellers (CABE, 2005a; Li et al, 2004). Green spaces, also provide opportunities for children to play freely, make discoveries and develop independently. An urbanising world means that there are generally fewer opportunities than in previous generations for children to experience the natural environment, exercise and fulfill needs for unstructured outdoor recreation (CABE, 2005b).

It is not just the spaces but the vegetation itself that is important. FAO (Food and Agriculture Organization) forestry expert Michelle Gauthier has enumerated the economic benefits of urban trees. Tree cover reduces air temperature, resulting in energy savings for city dwellers, and trees can increase property values and protect roads and buildings against landslide, flood and sand encroachment (FAO, 2006).

An ancient Egyptian wiseman once said:

"The tree which you benefit from its shade has been planted by your ancestors, it is your own responsibility to play your role, and plant another tree for your successors". (Abdelkharim, 2002)⁶

It has been said that '*Green value is part of the journey towards sustainability*' (Davies, 2005:1). No one can prove that urban greening contributes to sustainability because sustainability will, by definition, only be achieved in the future. It is necessary therefore to start with a checklist of factors that can be argued *a priori* to be correlated with the chance of achieving sustainability. The greenness of an urban environment is one of these. Evidence of the benefits for green space is mounting. This is in some ways the starting point – to demonstrate scientifically certain particular benefits that should be preserved for both present and future generations. The crux of the sustainability problem, however, is not only the issue of identifying which benefits to preserve for future consumers, but also understanding why those benefits are currently being depleted and not being renewed. Hence the focus of this thesis is to understand the demand of green space. Most people would assent to the idea that green space is good – for them, their children and their children's children. What we need to know then, is why green space is not being produced in adequate quantities and quality if it is not.

1-5- Urban green space: expressed demand and intrinsic value

The increasing concentration of human populations in cities presents enormous challenges with respect to the supply of infrastructure. Urban green space is a scarce resource for which people, in principle can be expected to have a positive demand for reasons of the benefits. However, it is evident that in many cities, particularly the rapidly growing cities of developing countries, that green space is apparently not valued sufficiently to compete with other urban uses. Although green spaces provide the wide range of benefits, already briefly reviewed, they are often in short supply and of poor quality, (The Environment Division of the Social Programs and Sustainable Development Department of the Inter-American Development Bank, 1997).

⁶ Original text is in Arabic, translation was done by the author.

In addressing this paradox, it will help by starting with the observation that not all of the benefits of green space are immediate and accruing to individuals. We may assume that benefits that accrue to individuals and are experienced immediately will be in demand. If they are in demand, then where there is the economic power to back the demand, they will be supplied by entrepreneurs and by governments. Another starting assumption might be that the benefits from green space are what economists call a normal good – demand for them increases with income. This means two things. First, the higher the income, the more the green space. Green space will be purchased (for example by moving to suburbia). Or it will be demanded from government. Second, lower income families are likely to attach a lower priority to green space in their expenditure and in the use of their time (in lobbying government or self-organising its supply).

But step back from the issue of expressed demand (including revealed demand as in what people actually pay for and/or use and stated demand as in what they say they would pay for and/or use) and consider the ideology of green space and its intrinsic merit. In one sense I have already started to discuss this in identifying its benefits to health and so on and its contribution to sustainable cities. However, there is another dimension to this: the metaphysical and religious value of green space. This will take on different levels and kinds of significance in different cultures. In the United Kingdom, for example, values coming from the Romantic arts movement of the 19th century are undoubtedly important in shaping people's background perceptions and values about open space and greenery. For example, Wordsworth's expressions of the beauty of nature revived cultural references (Gallet, 2005) from the Middle Ages as a source of artistic and architectural interest - rurality as a source of inspiration rather than something economically and socially backward.

In the Middle East, religious visions of paradise have more influence than they probably do in much of the west. In fact the secular Romanticism of the west is consistent with the notions of paradise in many religions – associating paradise and peace with descriptions of greenery, trees, fruits, flowers and rivers. In the holy books, these are wonderful places where believers are rewarded with peace after their lives of faithful worship. So green spaces are a traditional virtue. They are a classic good which people of different cultures have associated with refreshment, peace and reward.

It is hard to think of a disadvantage arising from trees and green space in the modern world (unless it is the opportunity cost lost from not developing green space). In the past, and in some parts of developing world, swampy green spaces may have posed, and may continue to pose, a threat of disease. Singapore was once the swampy mosquito-infested tip of the Malay peninsular. Large parts of its green space have been built over now but it is a city well known for the quality of its public landscape architecture⁷. It is being re-greened on man's own terms if you like. And the wealthy Singaporean people and government are able to invest huge amounts in their greening projects. Green is good where it can be afforded.

In a UK manifesto for better public spaces published in 2004 (CABE, 2004), almost 400 organisation representing more than 4.5 million members pledged support for promoting more and better green spaces. This demonstrates the huge support and the clear valuing and understanding of the importance and benefits of public spaces and parks among British people. For countries like Egypt it raises a number of challenging questions. Is this level of expressed demand for more and better green spaces peculiar to rich countries? Even in rich countries, does it represent the population at large or is it the voice of an active minority coalition of special interests? What is the relationship between demand for more green space and the level of understanding of its benefits? Is there a natural progression of green issue up the political agenda of governments and groups and up the personal agenda of individuals and households as income and wealth increases?

This research is about people and their perception and appreciation of urban green spaces in an arid capital city in a developing country. It takes a holistic approach to understanding the reasons behind the undersupply, misuse and deterioration of public urban spaces and green spaces in these countries. It asks why some green spaces are valued highly and others are not. Why do some work and others not? What distinguishes one type from another? What accounts for the different patterns of green space provision in different parts of the city? What can be learned from studying the institutions that supply and govern green spaces? By asking these questions, the thesis aims to say something non-trivial about the place of scarce green space in making the cities of arid countries more sustainable. It aims to go beyond ideological positions and easy statements about the need for more green

⁷ Personal communication (professor Chris Webster)

point already made: that adjusting green space in such cities is a potentially powerful tool for increasing their sustainability.

1-6- The 'green Cairo' problem: green space scarcity in arid cities

Desertification is an important ecological problem. Scientists in many places in the world are trying to stop deserts encroaching usable land and approaching the boundaries of human settlements. This is a threat and a crisis facing many regions. Every year deserts swallow up new territory comparable in size with Belgium (AridGrow, 2007). Egypt is one of the countries with a desertification problem. As I have noted, over 94% of Egypt's population lives on just 4% of the land, mostly situated along the river Nile Valley and its delta (Shalaby, 2003). The remaining 96% of Egypt's area is desert. In such a context green spaces and green spaces are very precious, especially so in the peripheral areas of the Nile Valley which are suffering desertification.

Egypt is heavily dependent on food imports in order to feed its large and rapidly growing population, as is the case with many countries in the region (FAO, 2006). Although the country is a producer of commodities such as tomatoes, potatoes, grapes and strawberries, only 3.5% of Egypt's landmass, mainly around the Nile delta, qualifies as agricultural land. The Egyptian government places great emphasis on the agricultural sector, underscoring its significant role in the national economy, as it accounts for nearly 20% of total GDP and employs nearly 30% of Egypt's workers (FAO, 2006).

Natural desertification is not the only problem threatening Egypt's green Nile valley. Major cities, especially the capital, are expanding relentlessly, engulfing green fields and natural environments.

Encroached agricultural land and green space is among the most serious urban problems facing Egypt generally and Cairo specifically. El-kadi reports in Raymond (2000) that in 1981, only one year, over 2,921 hectares of best agricultural land was encroached by spontaneous unplanned urban sprawl. These illegal areas, according to El-kadi, provided housing to 1.58 million people at that time. These illegal and unplanned housing developments were characteristic of the 1970s and 80s, and led to many of the problems the city is suffering from today.

Set against the desertification and urban encroachment problem are governments' efforts to green the desert by treating sandy soil at great expense. Steven Stanek reported in the National Geographic magazine in 2008 that:

"In the last decade, Egypt has "reclaimed" roughly a million acres (400,000 hectares) from its arid landscape, according to government officials, who say another 2.4 million acres (million hectares) will be added by 2017". (Stanek, 2008)

The population grows by about 1.5 million people per year, and population density, according to Rageh (2007), is on average of 36,000 person/km², and reaches 100,000 person/km² in some neighbourhoods. 600,000 people live in and around Cairo's tombs in the City of the Dead. To make matters worse, prime agricultural land in the valley and delta is disappearing at a yearly rate of about 74,000 acres (30,000 hectares)—close to one percent of total arable land—due to urbanization (Stanek, 2008). On the face of it there is something wrong with this, since greening the sand is more costly (per square meter) than greying the green, as the per hectare costs for reclamation can reach around £20,000.

The reason for the apparent irrationality of reclaiming abundant sandy land while building on scarce green land is that the opportunity cost of not greying the green –not building on green areas is huge. This means that a straight comparison of costs of development cannot explain behaviour. The cities of the Nile spread uncontrollably, eating into the 4% of non-desert land because that land is valued for urban uses, mainly for residential purposes, beside working and recreating, where these uses are valued more highly than fields,

orchards, trees or open spaces. However, consider for now the result of this calculus: the diminishing stock of naturally or historically irrigated green land.

Part of the definition of a desert (or the Sahara) is a place that possesses no flora cover. So in this sense we can consider most of Cairo districts as urban deserts. It is very hard to find any green colour on a satellite image of Cairo. The average per person amount of green spaces in the city is not much more than 1.7 m² and reaches inhuman figures in many of the capital's districts. More than 12% of the city's residents have access to less than 0.1 m² per person of local green spaces, while more than 50% possess less than 0.5 m² (this is discussed in more detail in Chapter Five).

It is of significance for the argument of this thesis that the relatively high figures in some districts are due to the presence of many of the private recreational clubs and presidential castles. For example, Masr Al-Gideda (New-Egypt) district, which scores the highest amount of green spaces per person, contains Heliopolis, Ghaba and Lido private clubs and a presidential castle. The recorded amount of green per person is not therefore a true reflection of the average resident's access to green space. Notwithstanding access issues, however, these areas are important 'lungs' for the city, with club and private green spaces providing a variety of external benefits to the rest of the city (an argument elaborated in chapter 4).

Even in the better provided parts of the city, however, green space per person is far from the typically agreed standard of 12-18 m² per person in developing countries. It is even farther from the standards applied in developed countries – varying between 20 and 40 square m² per person (El-Zafarany, 2004). El-Zafarany notes that the Egyptian local standard for green spaces and parks in new developments and cities is now 11 m² per person.

Urban encroachment of fields, gardens and river margins implies a lack of intrinsic value placed upon green space. On the other hand, governments, private individuals, formal clubs and informal collectives within the city are actively finding ways to increase the amount of greenery in the city (Chapter Six). In Chapters Seven and Eight, I investigate demand for green space among Cairo's residents and find that they place a high value on it. The study is principally focused on green spaces within the urban fabric, rather than the

green spaces that are lost through urban expansion. However, I raise the issue of urban expansion here in the introduction as a context to the study of the city's green interstices. If nothing else, the context emphasises the tragedy, and possibly irony of the situation. Gardens of historic and ecological value are being lost to buildings while, great efforts are being made to build new gardens.

An example of the brutal expansion over and undervaluation of green spaces is the Orman Botanical Gardens, which was set up in 1875 by Khedive Ismail and landscape designed by the French designer Gustave Delchevalerie, who used a collection of rare trees and plants imported from South America, India, Madagascar and Australia. Part of its 95 feddans⁸ (40 hectare) was allotted to grow fruit and vegetables for the benefit of the royal palaces. The park presently is 28 feddans (11.8 hectare), and more than 70% of the gardens' area has been lost for the sake of urban expansion. The remaining 30% is under threat (Zeitoun, 2007). An even more painful example comes from Zohreya Botanical Gardens, which was also set up by order of Khedive Ismail, in the southern part of his palace on Gezira Island in 1868. It was named after the extensive flower gardens that provided palace vases with flowers throughout all the seasons. By 1876, the park had a collection of one million plants brought in from all over the world. In its heyday, it spanned over 49 feddans. Over the years it has been reduced to only 8 feddans, a 83.6% loss of the gardens' area (Zeitoun, 2007).

Historically, urban green spaces in Cairo have tended to be near the River Nile to ease irrigation - either directly through canals and pipes or through ground water. However, as a result of rapid urban expansion, most of the naturally occurring green spaces that emerged close to the River Nile have been built over. The construction of new green spaces, by private developers and the government mostly takes place in the desert areas far from the Nile and at great expenses.

Another historical characteristic of urban green spaces in Cairo is their trees. Most of these spaces possessed planted trees due to climatic, cultural and religious reasons. In the hot summer, tree shade creates a refuge from the burning sun, while in autumn and spring trees provide a filter from the sand-saturated wind that encroaches the city from surrounding desert areas. In winter trees provide some shelter from cold winds. The new green spaces

⁸ A feddan is a land area agricultural measurement, which is used in Egypt, it is equivalent to 4200m².

being planted far from the Nile are being planted with trees for the same reason but this makes their sustainable irrigation even more costly and problematic.

It is worth mentioning that the Arabic term for 'green space' in the Egyptian context is more simpler and uncomplicated compared with more complicated western contexts, since the commodity itself is not as differentiated as in westernized cities.

One objective of this thesis is to investigate the institutions that have kept Cairo from expanding completely at the expense of Egypt's precious green land – those that have preserved and created islands of greenery in a sea of concrete. It looks at the way these different institutions have managed to overcome the collective action dilemmas that are at the heart of all public goods supply problems.

1-7- Statement of the research purpose and questions

The Project for Public Spaces, which has worked for more than 30 years in the field of landscape architecture and has a long term interest in the quality of spaces delivered to people and peoples' behaviour in respect of space, states on their website:

“One of the joys is learning from people all around the world about how they'd like to make their communities better. No two answers are the same, but listen long enough and the degree to which people share similar desires are remarkable”. (PPS, 2005)

This thesis investigates the reasons for the apparent under-supply of urban green spaces in Cairo in the face of national scarcity of green land. It seeks to understand the dynamics of urban green space supply and demand. In particular it investigates how people use green space and the institutions that supply it.

“It is vital not to treat problems in isolation but to search creatively for integrated solutions that bring benefits across the board. To do this successfully relies on understanding the whole system interactions, in terms of human, urban and ecology” (Barton et al, 2003)

In pursuing better and more sustainable built environments, we must possess a comprehensive vision of all the factors shaping these environments within particular context, remembering that urban planning and development processes are ultimately driven

by people's wants and demands. The research therefore focuses on four layers, each of which forms a part of a complex system of urban habitat production and use:

- Supply of green spaces (explanatory analysis).....Addressed in Chapter 5
- Patterns of green space provision (descriptive analysis).....Addressed in Chapter 6
- Demand for green space (explanatory analysis).....Addressed in Chapter 7&8
- New approaches to greening the city (speculative analysis).....Addressed in Chapter 9

Objectives and purpose of the study

The research describes and attempts to explain the pattern of green space supply and demand in Cairo. In its explanation, it tries to understand the dynamics governing the way green space is supplied and used and has been supplied historically. The main goal of the research is to build a clear holistic understanding of factors, variables and influences playing a role in shaping the green spaces in Cairo. It sets out to conduct the most detailed study yet undertaken of (a) the actual quantity and distribution of green space in the city (as opposed to the quantity reported in official statistics) (b) the institutions responsible for the production of green space and (c) demand for green spaces among Cairo's residents.

Research questions

To implement this research agenda, the starting point was a set of unstructured questions arising from personal observation, reading the literature and professional and personal discussion. In no particular order, and to give a flavour of the rich research agenda being addressed, these include:

1. How does green space provision vary across the city of Cairo?
2. Are there correlations with income and other socio-economic attributes of residents?
3. Are there temporal regularities? For example, is green space better provided in neighbourhoods of particular ages?
4. Are there morphological regularities? Are some morphologies more successful at creating and preserving green spaces?

5. What institutional arrangements in the production of green space account for these regularities?
6. How successful were these arrangements in providing adequate quantity and quality of green space?
7. How do people from different neighbourhoods and with different income levels value and use green space?
8. What are their beliefs about, expectations of, attitude towards and willingness to use and pay for green spaces?
9. How much of Cairo's green space is privately supplied and how much is publicly supplied? How does the balance of private and public supply vary across the city?
10. What explains this variation in the institutions of green space provision?
11. What is the relative demand for private and public green space?
12. Is the 'enclosure of green space a sustainable method of increasing the quantity of green space in an arid city? Is it a method of sustainably increasing the quality of green space in an arid city?
13. What other methods may there be for increasing quantity and quality?
14. What can be learnt from the different institutions governing green space supply that operated in different periods of Cairo's recent history?
15. How do Cairo residents use green space? What can be learned from this pattern of use and valuation to inform a more effective targeted policy for greening Cairo?

Such questions have been refined and ordered to support structured empirical analysis and the following list of questions are specifically addressed in the empirical chapters 7-8:

1. Demand & perception

- 1-1 Are Green spaces evenly distributed across Cairo's districts?
- 1-2 Are Green spaces perceived to be safe places for Females?
- 1-3 How accessible is green space and do people use their nearest facility?
- 1-4 How do people value green spaces subjectively? What do they feel about them?
- 1-5 How essential to people's daily lives are the feelings evoked by green spaces?
- 1-6 Do Peoples' motives vary for going to green spaces with different neighbourhood typologies along the city?

1-7 Are People aware of the environmental, mental and physical health importance of urban green spaces?

2. GS Problems

2-1 How do Cairo residents as a whole perceive the problems of existing green spaces?

2-2 Do problems of distance, scarcity and accessibility vary between neighbourhood types?

3. Satisfaction

3-1 Are people satisfied with the quantity of GS in their neighbourhoods?

3-2 Are people satisfied with the quality of GS in their neighbourhoods?

3-3 Does local GS fulfil the residences' needs?

3-4 Is scarcity the major reason for not fulfilling people's needs?

3-5 Do users have to pay, reach, utilize or access GSs? Does this influence their satisfaction and mode of consumption?

3-6 Does green space satisfaction vary systematically with income level?

4. Preference of GS type

4-1 What is the preferred size and style of parks?

4-2 Do people's stated preference for style of green space vary with their local 'green space market' experience (neighbourhood typology and type of green space they usually visit)?

4-3 Are Public city parks the mostly visited and demanded GS in the city?

4-4 Does monthly income affect the type of GS usually visited, and the mode of consumption?

5. Private Space

5-1 Does scarcity and fear of over-consumption result in people's preferring fenced, gated and controlled green spaces?

5-2 Are entrepreneurially supplied private club green spaces, an effective institution for providing more & better GS?

5-3 Are private spaces more equipped for elderly, children and special needs users than public spaces?

5-4 Do private spaces have more activities occurring within the space than public spaces?

6. Willingness to participate

6-1 Are People willing to pay for good quality shared green space inspite of their poorness? Are they willing to contribute and participate in any development to enhance their built environment quality?

Specific research hypotheses tested include:

- Green space is unevenly spread across Cairo
- It varies systematically with income level and age of a neighbourhood
- People have higher demand for small well maintained spaces than larger poorly managed spaces
- People are willing to pay for good quality shared green space inspite of their poverty.
- Entrepreneurially and voluntarily supplied 'club' spaces are an effective institution for supplying more and better green space

Green spaces are the lungs of a city. Cairo's are small and apparently shrinking relative to its population – the organism that the lungs support. The evidence for the benefits of green spaces summarised earlier implies that Cairo is suffering bad and worsening health. Addressing that problem requires a sophisticated analysis of the dynamics of open space provision and consumption. This is what the thesis attempts to do.

1-8- Thesis structure

This thesis is organised into nine chapters. **Chapter One**, *Introduction and background*, has outlined the research context, ideas, questions and structure. **Chapter Two**, *Research framework and methodology*, outlines the research framework, methodology, data and analytical approaches.

Chapters three and four are literature reviews. **Chapter Three**, *Definitions, norms and concepts*, reviews the literature on urban green space definition, ideas and theories,

including the use of green space norms and a comparison of the traditional urban design view of public space and the economic theory of public space. **Chapter Four**, *Benefits, values and vital role of urban green spaces*, reviews the different benefits of urban green spaces, classifying them into environmental, economical, social and cultural, human health (mental and physical) and recreational, safety and aesthetical benefits.

Chapters five to eight are empirical chapters. **Chapter Five**, *First empirical study: Measuring the supply of urban green space in Cairo*, assesses the supply of urban green spaces in Cairo city. The chapter is divided into 2 sections, the first presenting an account of the historical evolution of green spaces in the city, and the second measuring the quantity of urban green space in Cairo. The latter first measures and assesses the spatial distribution of municipal public green spaces in Cairo; then goes on to analyse green space supply on a city scale, districts scale, and by size of green space. **Chapter Six**, *Second empirical study: Cairo's neighbourhood typology*, this chapter presents a green space based neighbourhood typology that divides the city into seven types of neighbourhood distinguished by their green space morphology and supply institutions. The chapter attempts to explain the distribution of public and private green space in the seven types of neighbourhoods, describes the historical and contemporary institutions governing green space provision; and draws conclusions about the degree to which the government and the market have respectively succeeded or failed in supplying green space in the different parts of the city. **Chapter Seven**, *Third Empirical study: Measuring the demand, usage & valuation of GS among Cairo's residents*, is a descriptive analysis of multi-stage cluster survey of residents sampled probabilistically from the city of Cairo and administered a questionnaire about their use of and valuation of green space. The green space demand information is presented as descriptive statistics under six main research headings: 1) demand and perception, 2) Problems of green space, 3) Satisfaction, 4) Preference of green space type, 5) Private green space and 6) Willingness to participate in enhancing local green space. **Chapter Eight**, *Third Empirical study: Measuring the demand, usage & valuation of green space (Regression models reporting)* reports on a selection of regressions models which attempt to explain various measures of space demand on the basis of individual, household and environmental design variables. The analysis is divided up into continuous, binary and ordinal regression models. **Chapter Nine**, *Conclusions, recommendations and farther research*, sums up the research findings, drawing

conclusions, and making a number of recommendations for green space planners in Cairo and other arid cities.

El-Kashef (2010) in her article "gold is green", declares that the future is not all dark; there is hope, but we need to start somewhere in pursuing that hope. She asks: "*A win-win tomorrow?*" And answers rhetorically: "*Only if it starts today*". This thesis aims to contribute to that start. Cairo needs a new green space and green infrastructure policy. However, this policy needs to be informed by an in-depth understanding of the dynamics of green spaces in the city. This has to be based on measurement and analysis of peoples' demand for green space (their needs, valuation and perceptions) on one hand; and measurement analysis of the green supply in the city on the other. It also requires careful analysis and reflection on the alternative mechanisms for green space supply – an analysis that goes beyond the traditional labels of public and private. This is what the thesis attempts to do.

Zeitoun (2007), states inspiringly:

"Though the desert mega-city of Cairo has little in the way of green spaces, what it has, if discovered, is a source of wonder"

‘What it has’ should be understood in terms not just of quantity and quality of spaces but of the institutions that have evolved over time, and are still evolving, that allow collective demand for ‘better lungs in the city’ to be heard and transformed into green spaces in this arid city.

Chapter Two

Research Framework and Methodology

2-1- Introduction

This research began with the idea of the sustainable arid city. Reviewing the literature on sustainable urban form and the benefits of green space (Chapter Four) confirms the importance of green space as a priority issue that is under-researched at the level of necessary details that guides policy in detailed matters. At the end of the previous chapter, a general research agenda is set out preceded by a set of detailed questions that have guided the empirical work undertaken for this thesis. This chapter describes and justifies the approach in these empirical investigations.

2-2- Research design and methodology

Figure (2-1), shows the research structure underlying the thesis. The study comprises a literature followed by three empirical studies. Literature has been reviewed along five themes: definitions and concepts; sustainability and green space (GS); institutions for green space provision; benefits of GS; and normative practices in GS supply (GS norms). The first empirical study measures the supply of GS in Cairo using satellite and administrative data. The second classifies Cairo's neighbourhoods into seven patterns and analyses the institutions that created and continue to govern green space supply in each. The third empirical study uses a questionnaire survey to analyse GS revealed and stated preferences in a systematic sample of Cairo households stratified by the seven neighbourhood types.

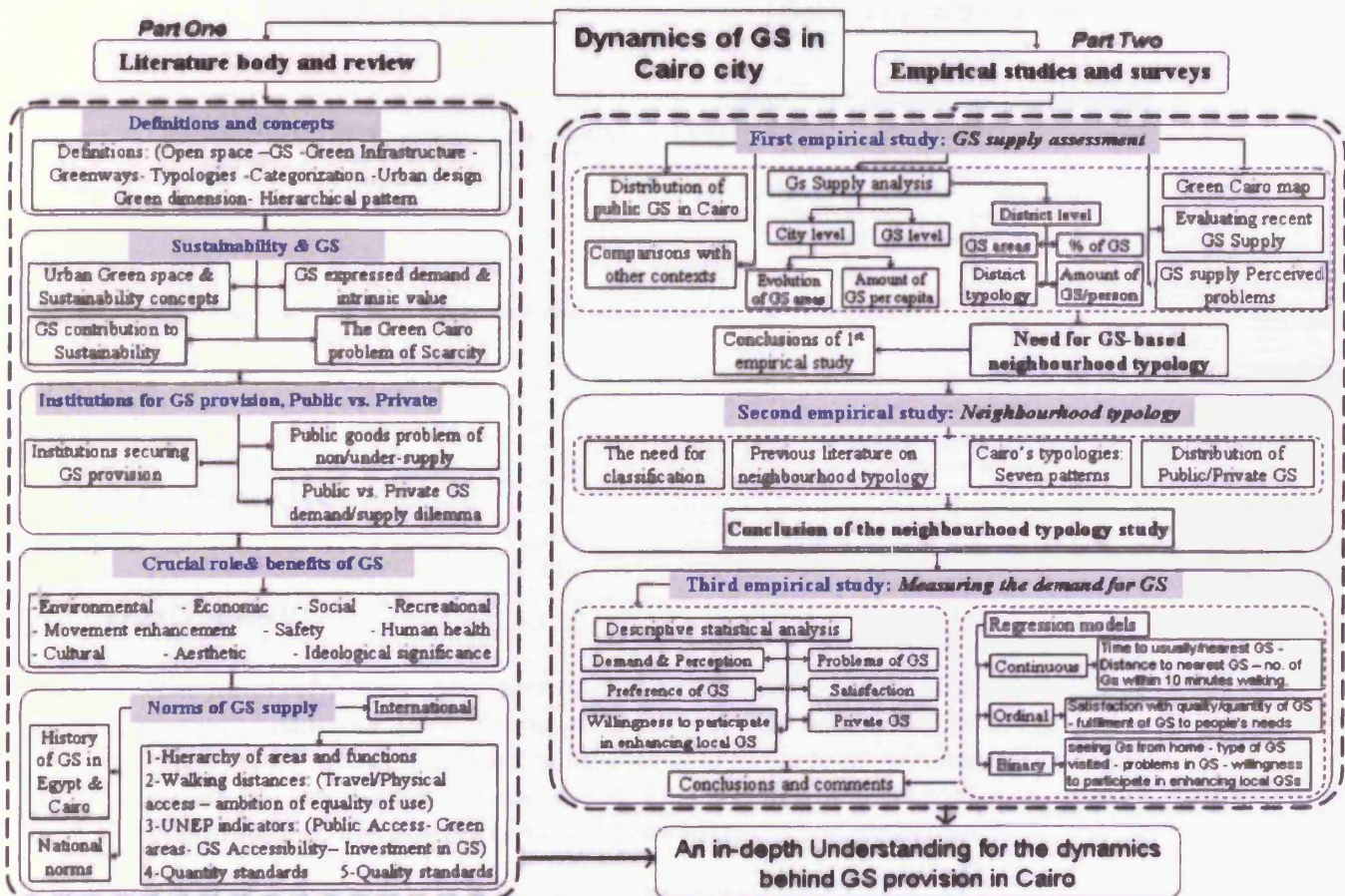


Figure (2-1), Flow chart of the research structure and framework

2-3- Methods of data collection

Various methods of data collection have been used in order to collect the jigsaw pieces of observations and analysis needed to understanding the dynamics of GS in Cairo.

Different levels of data collection at different stages have been adopted in conducting this research. For example, observation and secondary data analyses were useful in drawing a general understanding of the domain, while primary data analysis of questionnaire responses led to a more in-depth analysis. Thus the research has tried to blend a mixture of quantitative and qualitative research methods depending on both primary and secondary data. Figure (2-2), illustrates the data collection methods used. The following section is a brief description of the data collection methods used.

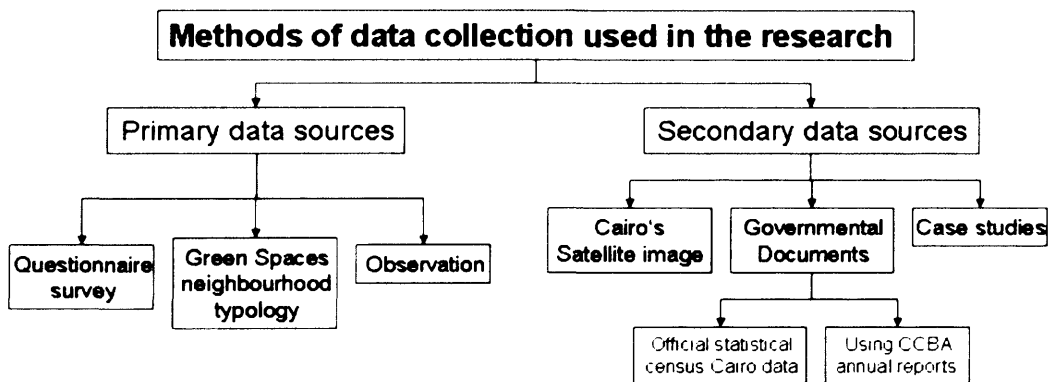


Figure (2-2), Flow chart of data collection methods used in the research

(a) Qualitative:

Observation:

"The main advantage of observation is its directness; it enables researchers to study behaviour in real time, as it occurs. The researcher does not have to ask people about their own behaviour and the actions of others; he or she can simply watch them act and speak. This enables the researcher to collect data firsthand, thereby preventing "contamination" or distortion."

(Frankfort-Nachmias and Nachmias, 2008:190)

Observations in this research were mainly natural uncontrolled observations. The more systematic quantitative analysis was supplemented by participant and non-participant observation (Kumar, 1996), in which the author participated in the activities of the observed group. Different types of GSs, such as public municipal parks and private GSs have been visited by the author for many years and this history of experience as well as purposeful observations during the period of the study, proved invaluable in interpreting the data.

A mixture of direct and indirect observation was used (Rugg G. & Petre, M 2007). When something is observed directly, this involves seeing the actions and watching peoples' behaviour. Indirect observations note the consequences of actions. The scarcity of GS can easily be observed in Cairo by examining an interpreted satellite image, as is done in chapter 5. This is an indirect observation of the processes of green space supply. More specifically, it is an indirect observation of the institutions that supplied green space at various periods in the city's history. This is the basis for the analysis of institutions in Chapter Six. Overcrowded and poor quality GS speaks for itself and many of the problems resulting can be directly observed – as a participant or non-participant.

When recording observations it was important to distinguish between the author's and his assistants' observations, on the one hand and the questionnaire respondents' observations on the other. As for the former, observations are influenced by the researchers' backgrounds and experiences in urban planning and design, which leads them to observe issues in a more orderly and sophisticated way than survey respondents. Respondents often wanted to elaborate on their observations, comments and details⁹ about GS in their experience. These are of a different quality to the expert researcher's observations and have to be evaluated and interpreted accordingly. Generally, the more nuanced, personal and disorderly comments provided a rich background to the systematic analysis undertaken.

⁹ In the questionnaire form there was an A6 area for participants comments, which was extensively used by many interviewees.

Questionnaire survey interviews, comments and quotations

The questionnaire survey in empirical study 3, blended the advantages of interviews and the questionnaire form through the way it was structured and designed on one hand, and the way it was implemented on the other. The questionnaire was designed in a way that enables the participants to emphasise their own comments and attitudes and to add their observations. Besides the interviewers tried to record nonverbal behaviour (body language) and linguistic behaviour (Frankfort-Nachmias and Nachmias, 2008, p:191-193)¹⁰. Thus the survey was an enhanced tool resulting in a more blended quantitative/qualitative study. Comments from the questionnaire interviews were used as quotations in the study to clarify, illustrate or evidence an argument. These quotations enrich the questionnaire reporting, especially when comments are repeated by several interviewees. Chapter Seven makes use of the 'compound quote' device, where a typical quote is constructed from several similar quotes as well as the representative quotations, in which a quote is made from a single respondent but it is noted that this is representative of other respondents.

(b) Quantitative

Use of secondary data

Using secondary data in this research included the following.

Official statistical census data for Cairo 2006, first published in April 2008

This was mainly used in the first empirical study, when correlating Cairo's districts' GS supply with the district population data in order to assess the GS supply in the city. Figures and conclusions are reported in Chapter Five.

¹⁰ Types of observed behaviour can be classified to:

- *Nonverbal: behaviour*: Body movements such as facial expressions.
- *Spatial behaviour*: The attempts people make to structure the space around them, such as controlling the amount of interpersonal space.
- *Linguistic behaviour*: The content of speech and the structural characteristics of talking.
- *Extralinguistic behaviour*: The formal aspects of speech, such as the rate, pitch and tendency to interrupt.

Using CCBA annual paper-based reports for the years 2004, 2005, 2006 and website for 2010

The Cairo Cleanness and Beautification Agency's (CCBA) reports were used as a guide to the municipal figures of GS, and for the future municipality policies for enhancing GS in the city. The comparison of the figures contained in these reports with observed GS figures measured from satellite imagery is an important finding of the thesis. The analysis and discussion is in Chapter Five. The gap between official and observed GS supply and distribution was measured from green space classified in an interpreted satellite image together with an analysis of other GS not appearing in official municipality figures such as street medians and private and 'club' GS (see Chapters Three and Six for a discussion of ownership issues). The spatial nature of the data source also meant that it was possible to visualise the distribution of GS in Cairo in a high degree of detail and to classify it into private and public GS. The classified public/private GS map is another important output of the thesis. It is discussed at length in Chapter Six.

Satellite image of Cairo, May 2005

Access to a high resolution IKONOS satellite image of Cairo taken in May 2005, was purchased to establish a datum for GS supply (quantity and distribution) that was independent of municipal records. This was vital for the research since all the municipal public green spaces were recorded in paper format only, making it difficult to use them analytically. In addition, there was no statistical record of Cairo's private and club green spaces. A remotely sensed source was therefore considered the only suitable data to establish a comprehensive map of green space in the city, which for theoretical reasons (see Chapter Five) needed to include GS whatever ownership it was under. For the purpose of giving an honest account, this data source is considered secondary in the thesis since the initial land cover classification (identifying land with a spectral signal corresponding to vegetation) was conducted by the company from whom use of the image was purchased (the author is not an expert in remote sensing). The image was for the month of May, the month when the vegetation and green spaces are the greenest. For nearly half the year during autumn and winter a satellite image would not detect green in many green spaces because of the many deciduous trees. On the other hand, in the summer months, sun glare resulting from the reflection of surfaces and dried out vegetation will also under-record green spaces. Thus, the month of May was the ideal month for a satellite image to be used

in enumerating the city's green spaces. The company supplying access to the satellite image also provided geo-database information for the spatial localities and names of some of Cairo's public and private spaces. However, an updating and verification process was carried out by the author, which also included adding new GS created since 2005. The satellite image was a 4 band, 1 meter precision image, which is considered a reliable high resolution image. By compiling a GIS file (using ARCGIS 9.2), in which all the available data including the most updated CAD files for Cairo city, CCBA official reports and the Geo-database which included the areas and locations of the different GSs in the city were overlaid, it was obvious that there were green spaces in the satellite image that were not captured in the CAD and the official databases. It was therefore necessary to trace, check, verify and harmonise the various data sources. The newly detected spaces from the satellite image were classified as private or public and added to the geo-database, the classification depended mainly on the CCBA official reports, site visits and the author's knowledge of the spaces in the city. This was a huge task which took more than three months to accomplish.

The familiarity of the author with Cairo, as it is his home city, helped in producing the final green space Cairo map. The greened street medians are an example. In most cases green medians on fast roads are not used by residents. However, in Cairo's case these medians in some particular places - such as Cairo's airport road - are used frequently. The purchased classified image was therefore further manipulated by the author to verify the classification by cross referencing it with maps of municipal green space, road medians and private and club green spaces. The resulting map was then used in assessing the areas in the city deprived of GS; for classifying GS into public and private; for analysing the distribution of private and public GS; and for constructing a neighbourhood typology for Cairo that tried to distinguish neighbourhoods with distinct GS morphology (direct observation) and institutions governing GS supply (indirect observation). Further details regarding the methodology and use of the GS Cairo map are given in Chapter Five.

Primary data

The main primary data used in this research is from a questionnaire survey administered by the author and his team of 24 assistants to a sample of household residents. This was a systematic sample of all Cairo, stratified by neighbourhood type. The detailed sampling

methodology is described later in this chapter. The sampling plan sought to identify 100 households from three different neighbourhoods in each of the seven neighbourhood types, totalling around 700 interviews. Because a sample replacement approach was used (the next house was picked on the list if an interview was unsuccessful at the initially selected house), 1500 houses were visited in order to complete the targeted number of responses, 615 households refused to conduct the questionnaire, however a 100 % initial response rate was achieved. However, because 170 of the completed questionnaires had key items missing and were not therefore useable, the sample dropped to 715 (The analysis of this data set can be found in Chapters Seven and Eight).

Cairo's GS neighbourhood typology and Cairo's Public/Private GS distribution Map should also be considered as primary data created in the course of this research and considered to be among the research's contribution to science.

2-4- Empirical studies

Three empirical studies were conducted. Figure (2-3), shows the main aims, tasks and analytical approaches taken in each of the studies. These studies are explained in detail in the following sections.

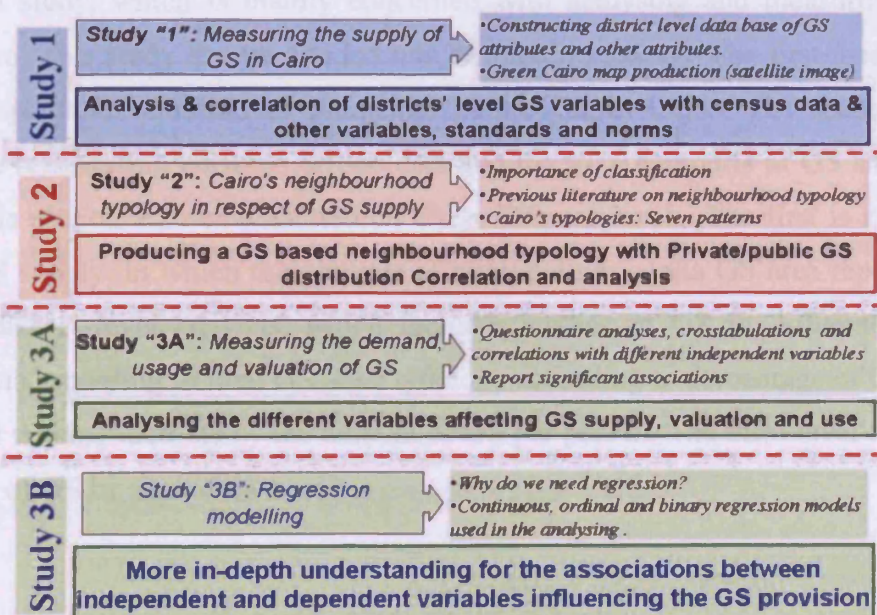


Figure (2-3), Flow chart outlining the three empirical studies

Study 1: Analysing the pattern of supply of green spaces in Cairo

Why do we need to analyse green space supply.

It is crucial to study the recent GS supply in Cairo, for many reasons, such as:

- The inaccuracy of municipal green space data from the CCBA (see Chapter Five).
- GS data needs to be correlated with other characteristics of localities in order to study its distribution more accurately than has been done before.
- In order to have a holistic understanding of the different variables influencing GS use and problems (demand) in different parts of the city, it is needed a detailed breakdown of GS (supply) in those different areas.
- Building a spatial Geo-data base was therefore an important foundation on which the other empirical studies and fieldwork can rely.

Aim, objectives, methods and conclusions

Table (2-1), shows the aim, specific objective, methods, data preparation & analysis of the first empirical study, which is mainly concerned with analysing and measuring the GS supply in Cairo. This study can be divided into two main sections. The first measures and analyses the spatial distribution of municipal public GS in Cairo. The second section focuses on the relationship between census data and the CCBA reports of GS supply. The analyses in this section are demonstrated on three different levels. The first is a city level analysis of GS supply, in which the patterns of total and per capita GS area reported. The second is a district level analysis, which includes studies of GS in different districts, ranking districts according to total GS area; typology according to percentage of GS area to built area; and ranking districts by the amount of GS per person. The third level of analysis is the analysis of GS by size of the space.

Table (2-1); Aim, objectives, method, data preparation & analysis of the first empirical study

Aim:	<ul style="list-style-type: none"> To analyse the pattern of green space supply in Cairo and relate this to underlying processes of provision.
Specific objectives:	<ul style="list-style-type: none"> To measure the green space attributes of all districts. To discover patterns in the distribution of those attributes. To correlate patterns in GS with underlying organisational and institutional attributes of districts.
Method:	<ul style="list-style-type: none"> Preparation and analysis of digital maps. Observations of the researcher and evaluation. Taking photos of green spaces. Collecting and analysing the secondary data from CCBA, on the quantity and distribution of municipal public green spaces. Determine locations and distribution of green spaces from the Satellite image.
Data preparation:	<ul style="list-style-type: none"> Identify green space, create green space maps. Build a database for the GS supply in Cairo on three different levels, city level, district level and size of GS level. Correlate the CCBA data with the census data and interpreted satellite data
Data analysis:	<ul style="list-style-type: none"> Measure statistics from maps and administrative sources and report using bivariate statistics up to district level. Qualitative analysis of quantity and distribution of GS and institutions of supply at city level.
Research Sample:	<ul style="list-style-type: none"> Cairo city districts (governorate division). Green spaces (with different sizes and functions).
Expected Conclusions/outputs	<ul style="list-style-type: none"> Correlating the CCBA paper based data of GS with satellite image, creating the spatial Cairo GS map. Reach a classification for districts and the degree of deprivation of greenery - on which point do each district locate on the (green gray spectrum)? Study the spatial distribution of GS among the capital and extract the different patterns of distribution. Identify the real figures for green spaces distribution without organisational bias (prior to this thesis, not available as far as the author knows). Green maps to demonstrate the distribution of green spaces and green

corridors and highlight the deprived areas and the well served ones.

- Relating the supply/production of GS to organizations or providers, to give a better understanding of the urban market for GS's (an unachieved conclusion, as far as the author knows, on which farther research can be built on).

Study 2: Neighbourhood-based analysis of GS supply (including a GS-based neighbourhood typology)

Aim, objectives, methods and conclusions

Table (2-2), shows the aim, specific objective, methods, data preparation & analysis of the second empirical study, which is mainly concerned with developing a GS-based neighbourhood typology.

Table (2-2); Aim, objectives, method, data preparation & analysis of Second empirical study

<i>Aim:</i>	<ul style="list-style-type: none"> ▪ To develop a neighbourhood typology, that divides up the city into areas with similar GS supply characteristics.
<i>Specific objectives:</i>	<ul style="list-style-type: none"> ▪ To relate/combine the different GS distribution patterns and modes of supply to/with underlying urban residential neighbourhoods characteristics. ▪ To relate the GS supply patterns (reflected in the neighbourhood typology) with patterns of deprivation of GS, in order to better understand the variation in GS supply throughout the city. ▪ To look at the public/private GS distribution across different neighbourhood types. ▪ To create a GS-supply neighbourhood typology that will be useful for other researchers conducting research on the GS in Cairo city.
<i>Method:</i>	<ul style="list-style-type: none"> ▪ Satellite image interpretation (as with empirical study 1). ▪ Categorizing Cairo's neighbourhoods in respect to green space supply. ▪ Observations of the researcher.
<i>Data preparation:</i>	<ul style="list-style-type: none"> ▪ High resolution interpreted recent Satellite image for the city. ▪ Updating the information on the satellite and making sure that all GSs are included ▪ Constructing an indicator matrix as a basis for neighbourhood

	<p>categorization.</p> <ul style="list-style-type: none"> ▪ Identifying the type of GS interpreted on the satellite image, (as either private or public).
Data analysis:	<ul style="list-style-type: none"> ▪ Comparing neighbourhoods in respect of the indicators to create a GS based neighbourhood typology. ▪ Comparing the geo-database information with the satellite image to study: <ul style="list-style-type: none"> - The distribution of GS in the city - Identify the pattern of distribution of public/private GSs.
Expected Conclusions/outputs	<ul style="list-style-type: none"> ▪ Distribution of GS in neighbourhoods that have developed at different period of time and under different institutional conditions. ▪ Qualitative analysis of the impact of different GS supply mechanisms with GS morphological patterns and levels of provision (from indirect observation of the processes of historical and contemporary supply) ▪ Conclusions about the degree to which governments and markets have respectively succeeded or failed to provide sufficient GS in different parts of the city (at different historical periods) ▪ Creating GS based neighbourhood typology on which further research on GSs in Cairo can confidently be undertaken. ▪ Creating a public/private green space map for Cairo (something that has not been done before). ▪ Conclusions about the relative strength and significance of private/public GS in the city. ▪ A basis for the multivariate models of demand in empirical study 3.

The available aerial typology for Cairo is an administrative municipal typology, which does not reflect the differences of GS supply within the city's neighbourhood. This is the justification for creating a more GS supply oriented typology. The neighbourhood typology is based on two sets of indicators: socio-economic and urban characteristics on one hand and the urban green space characteristics on the other hand. These are explained in more detail as follows:

First set is the district-level socio-economic and urban character factors, which include: District population, urban fabric, history of district location before development (whether it was green fields, hills, riverside, etc), Legal basis of development (squatter/informal or not).

Second set is the district-level urban green space characteristics from the satellite analysis, which include: The area of accessible district urban green space, urban green space percentage of total area, amount of accessible urban green space per person (per capita), suppliers of urban green space.

The classification process resulted in seven different typologies for Cairo's neighbourhoods (see Chapter Six):

Pattern (1): Historical ancient Cairo

Pattern (2): Colonial and renaissance urban developments

Pattern (3): Early Governmental block housing

Pattern (4): Early private sector developments

Pattern (5): late planned Governmental and private sector developments

Pattern (6): New developments (new cities and settlements)

Pattern (7): Spontaneous & squatter growths

The second empirical study ends with a study of Public/Private green spaces distribution among the different neighbourhood types. This analysis is unprecedented as far as the author knows.

Study 3: Measuring the demand, usage and valuation of green spaces among Cairo's residents

Why do we need to measure the demand for, usage and valuation of GS in Cairo?

The first 2 empirical studies focused on the supply side of the 'green space market'. The third study looks in depth at the demand side. It is possibly the most extensive study of GS demand ever undertaken in Cairo. Using the 715 valid questionnaires, the analysis extends from reporting frequencies and cross tabulation of different responses (Chapter Seven) to regression models that isolate the determinants of various demand-side behaviour (Chapter Eight).

Aim, specific objectives, method, data preparation, data analysis.

Table (2-3), shows the aim, specific objectives, methods, data preparation & analysis of third empirical study.

Table (2-3); Aim, objectives, method, data preparation & analysis of Third empirical study

<i>Aim:</i>	<ul style="list-style-type: none"> ▪ To understand more about the demand/valuation of Cairo residents for green space.
<i>Specific objectives:</i>	<ul style="list-style-type: none"> ▪ To measure the relationships between: benefit, size, quality, neighbourhood typology, use of, demand for, valuation of and attitude towards green spaces in Cairo. ▪ To identify the variables influencing the demand for, use and valuation of green spaces
<i>Method:</i>	<ul style="list-style-type: none"> ▪ Questionnaire survey for a random sample of individuals (householders) in the seven neighbourhood typologies; asking about both revealed and stated demand and preference. ▪ Observation of the researcher and the assisting team. ▪ Recording interviewees' observations and remarks.
<i>Data preparation:</i>	<ul style="list-style-type: none"> ▪ Patterns of neighbourhood typology. ▪ Stratified systematic sampling of areas and quasirandom spatial sampling of households to administer questionnaires among the different patterns. ▪ Preparing GSs photos to show interviewees, in order to measure stated preferences for different kinds of GS. ▪ Classifying the neighbourhood patterns into cells, and randomly choosing 3 cells from each pattern. ▪ Underlying the street network in the chosen cells in order to identify targeted houses. ▪ Designing the questionnaire form, translating and piloting it. ▪ Recruiting 24 interviewers and training them, in order to assist in the questionnaire implementation. Its worth mentioning that 3 interviewers were fired and replaced by others. ▪ Identifying a 'replacement' strategy in case the chosen household refused to participate or was not at home. ▪ Coding questionnaire forms. ▪ Drafting all the valid questionnaire forms using a licensed version of both Microsoft Excel and SPSS.
<i>Data analysis:</i>	<ul style="list-style-type: none"> ▪ Statistical analysis of survey data including descriptive cross-

tabulations, means, medians and frequencies, regression models. correlating various aspects of GS demand with other personal and environmental attributes.

- Conclusions/outcomes**
- Correlation of demand survey data from h/h survey with supply data from previous chapters.
 - Correlation of neighbourhood types with demand and supply data.
 - Identification of systematic variations in demand and supply by neighbourhood type and by personal attributes of respondents.
 - Patterns of preferences of Cairo's residents for different hierarchal green spaces sizes and functions.
 - Patterns of preferences for private and public GS
 - Understanding of the reasons behind both the scarcity of and deterioration of GS in Cairo.
 - Understanding of the obstacles and problems that hinder urban green spaces enhancements in the Egyptian context.
 - Patterns of residents' willingness to contribute in enhancing their local GS.
 - In-depth perceptions of the variables shaping GS in Cairo and similar contexts.
 - The most detailed profiling of different kinds of demand for GS ever produced for an Egyptian city.
-

The questionnaire analysis is divided into two chapters. Chapter Seven mainly reports cross tabulations and descriptive analysis. In this chapter the analysis and reporting follows the sequence of the main research questions and their sub questions. Figure (2-4), shows the main categorization of the research questions and their sub-questions. The six main categories are; demand & perception, GS problems, Satisfaction, Preference for GS type, Private GS and willingness to participate. Some very significant and interesting results emerged from this analysis (see Chapter Seven).

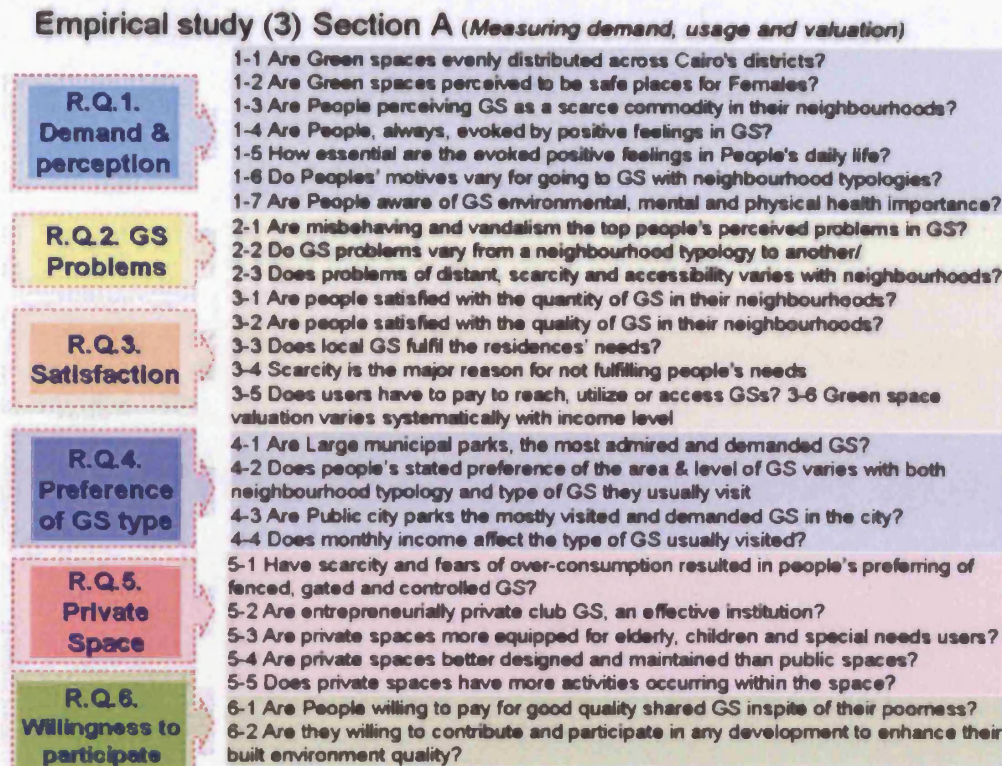


Figure (2-4), Flow chart of third empirical study (measuring the demand and valuation of GS)

Chapter Eight presents a selection of regression models. Figure (2-5), shows the kinds of regression models used. More than 42 models were run, but for reasons of clarity and ability to report, only the more significant models have been included in the thesis. The analysis of the regression models is limited to a discussion of the variables included as significant in the model and the direction of the regression coefficients. Given the broad scope of the thesis, the regression analysis had to be limited one way or another. Two possibilities were considered: (a) reporting only a very few models with comprehensive discussion of the models including analysis of the size of the standardised coefficients (relative importance of the variables); (b) reporting a selected subset of models (selected to illustrate the information contained in the survey database) but limiting discussion to certain aspects of the model. The latter was chosen since the principal purpose was not to test theoretical hypotheses (which would require thorough examination of all aspects of models relevant to those hypotheses) but to explore the varied nature of demand for green spaces across the city and across various socio-economic groups. Discussion of the significant independent variables and the direction of the relationship with the dependent

(demand) variable seemed adequate for this purpose. Selected models will be more fully reported in subsequent journal papers that focus on specific hypotheses.

Three categories of regression models were used: linear regression models with continuous level dependent variables. These included ‘time to usually visited GS’, ‘distance to nearest GS’ and ‘number of GSs within 10 minutes walking distance from the interviewees’ residence’. The second category was ordinal regression models that sought explanation for variations in the following variables: ‘satisfaction with quality of usually used GS’, ‘satisfaction with quantity of GS’, and fulfilment of various needs relating to GS. The third category was binary regression models sought explanations for variations in: ‘seeing GS from home’, ‘type of GS usually visited’, ‘perceived problems in GS’ and ‘willingness to participate in enhancing local GSs’. Chapter Eight reports the results of these regression models.

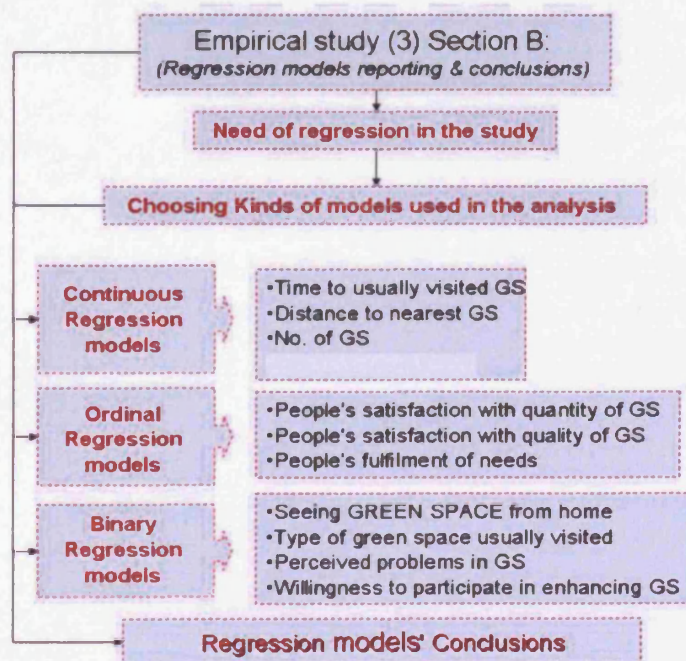


Figure (2-5), Flow chart of third empirical study (Regression models for measuring the demand and valuation of GS)

Sampling of the third empirical study questionnaire survey

Target and study populations

Measuring the valuation of urban green spaces for the whole city of Cairo, with a population of more than 7.7 million persons (targeted population)¹¹, is clearly impossible without sampling. The target population in this study is the total finite population about which information is required. Precisely, it equals 7 786 640 persons, according to the 2006 general census (CAPMAS). The study population, on the other hand, is the basic finite set of individuals that the study intends to create data for and on the basis of which generalisation about the target population will be made.

The survey therefore targets all the population living in Cairo (dismissing the population which only work in Cairo while living in other governorates), that utilize urban green spaces and represents a 1:10,000 sample survey. It is stratified by GS-neighbourhood type.

Sampling unit

The sampling unit is household. Households were selected from the sampling frame (below) and any available adult individual was selected to complete the questionnaire for the household.

Population and sampling frame

The neighbourhood typology map created in the second empirical study is the basic reference for the sampling process in the third empirical study. Three neighbourhoods were randomly chosen from each of the seven patterns.

Sample selection

Equal probability of selection guarantees all study population members an equal likelihood of being selected in the sample.

¹¹ Figures are according to the census official reports for 2006, which was officially published late April 2008

Sample selection approaches

The chosen technique in this research is cluster sampling. Cluster samples avoid the need for lists of the entire population and reduces transportation and training costs (because sampled units are near each other in the clusters rather than spread out). The first stage sampling unit in the cluster design is the neighbourhoods in the GS typology map, (see figure 2-6), where seven categorical patterns fully represent Cairo's urban space.

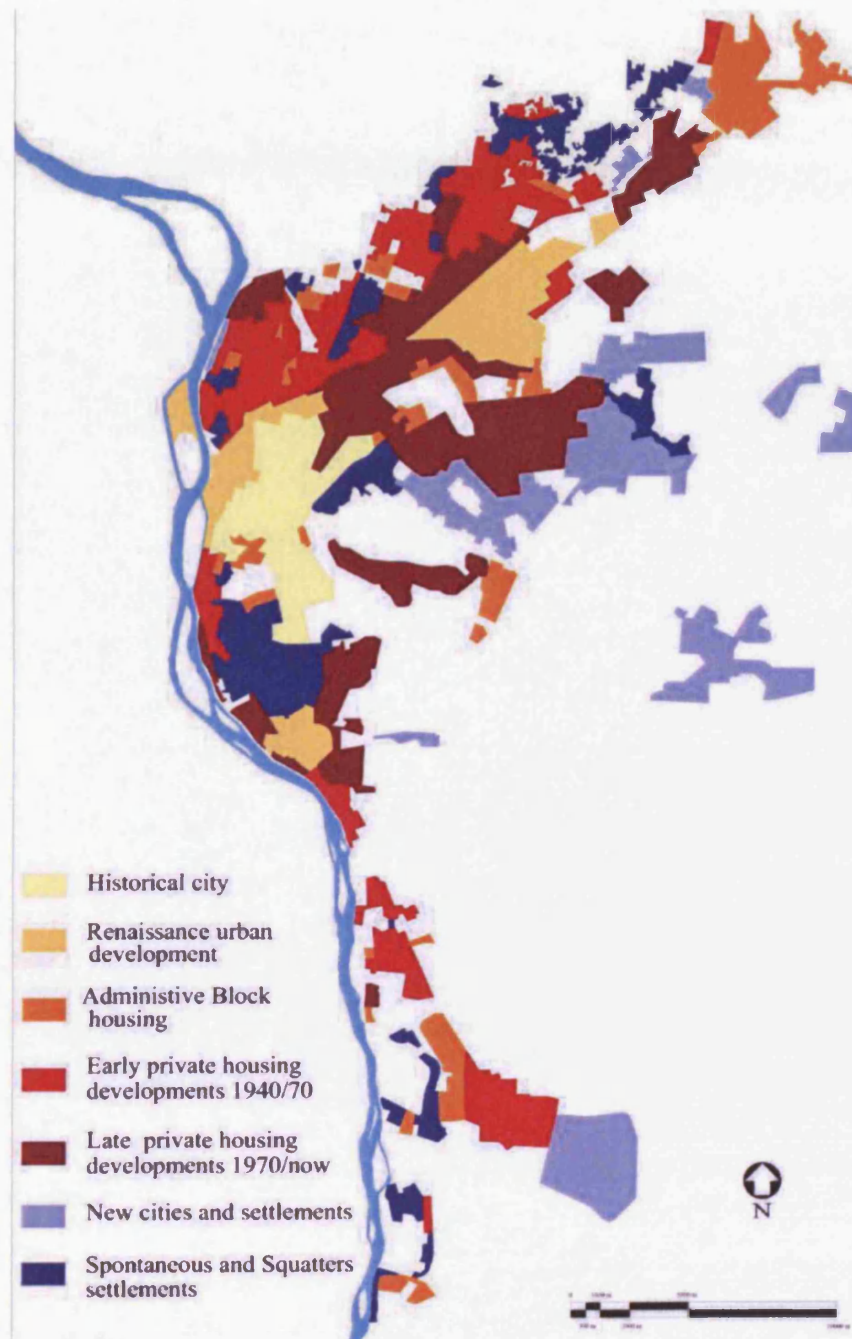


Figure (2-6), Distribution of Cairo's different typologies
Source: Author's second empirical study

The second phase was to divide each of the seven patterns into numbered neighbourhoods, in order to choose randomly only three of them to represent the neighbourhood pattern in the implementation process of the questionnaires. Figure (2-7), shows the example of pattern five, which contains 22 clustered neighbourhoods, from which three were randomly chosen, the clusters numbers were; 6, 14 and 15. In these randomly selected clusters of household survey respondents, the questionnaire was conducted using a geographical randomisation process.

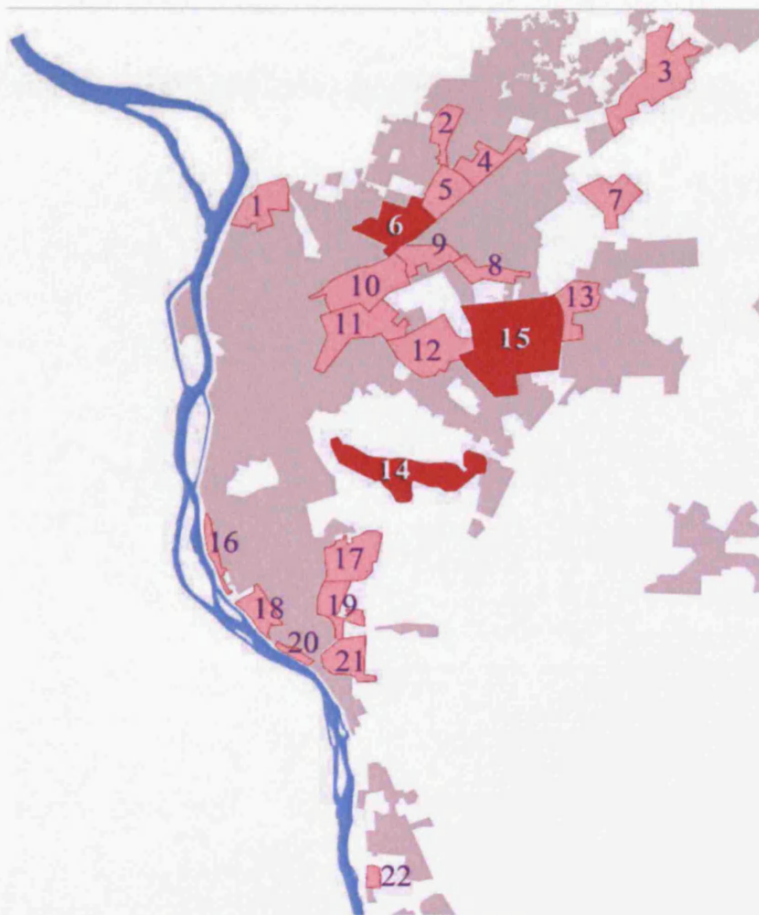


Figure (2-7), Pattern five's 22 cells, from which three only are randomly chosen to conduct the questionnaire. The chosen cells were 6, 14 and 15.

Source: The researcher

All the neighbourhoods are numbered, then three neighbourhoods are selected by using the random numbers table, resulting in 21 neighbourhoods (clusters of household survey respondents) in all seven patterns. 100 households were randomly selected from the three neighbourhoods in each pattern. Figure (2-8), shows the locations of each of the 715

questionnaires administered within the seven patterns. The household locations were chosen using a girding technique and a random numbers generator.

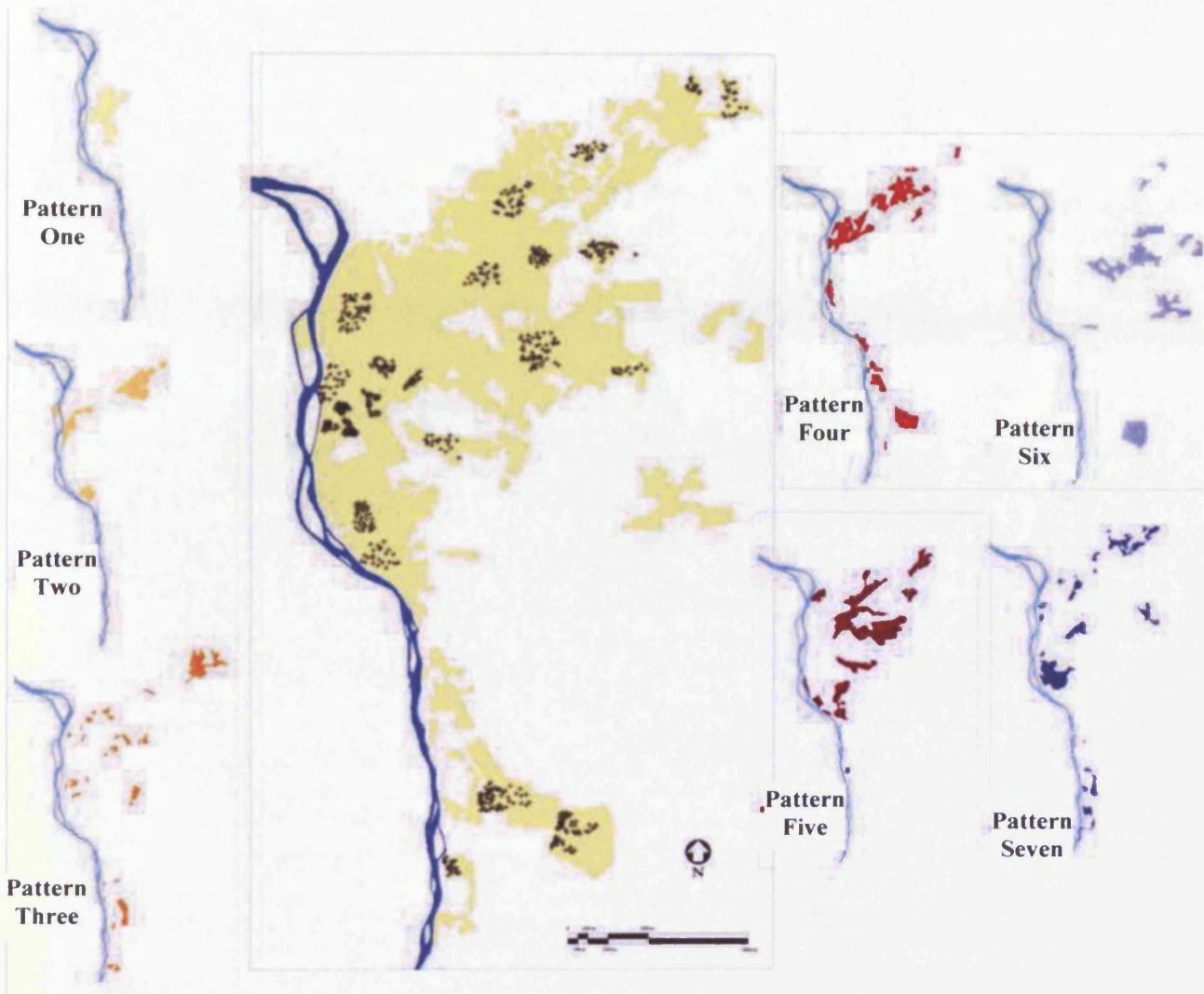


Figure (2-8), Distribution of Questionnaire localities over Cairo's 7 neighbourhood typologies. (larger map is available in appendix 4)

Source: The researcher

Figure (2-9), shows the strategy followed in selecting the questionnaire locations in detail for cluster 15 in pattern five. The process was repeated in each of the 20 clusters of household survey respondents in the seven different neighbourhood types. A grid of 100m was overlaid on a satellite image of selected clusters, and all cells numbered in order. Then the street network was overlaid on the satellite image and the 100m numbered grid. Using random numbers, 50 random numbers were chosen, which were projected on the equivalent

cells and locations were checked to be valid - only accessible residential localities were approved.

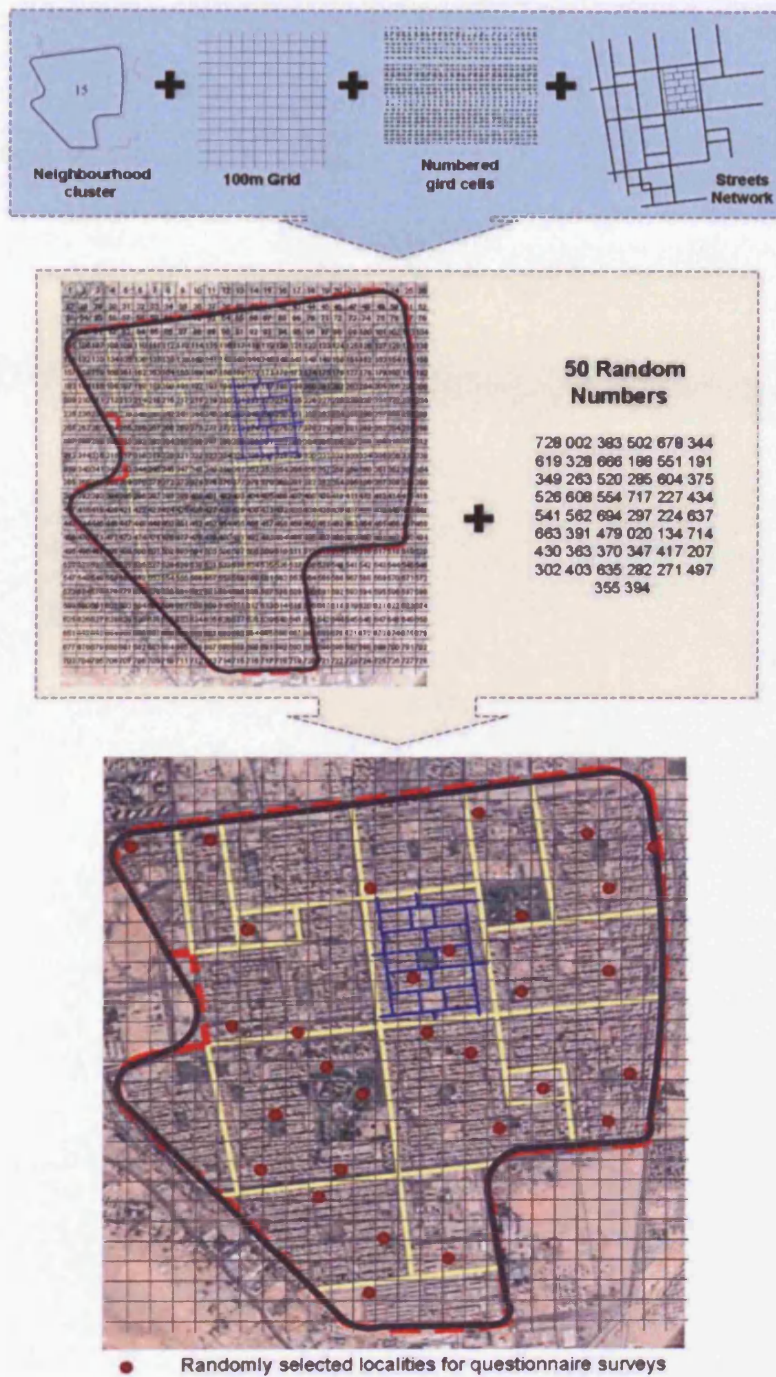


Figure (2-9), Flow chart of the applied strategy for choosing locations of households for inclusion in the questionnaire survey

Source: Author

Table (2-4) shows an example of the selection of 50 random cell numbers from 728, in cluster 15 of pattern five. Only 35 cases are needed, but the rest are kept on reserve in case

the selected cell number was not valid for any reason such as falling in a space, a road or non residential area on the one hand, or the selected household refused to participate in the survey on the other. In the previous case (empty cell), the first thing to be done was to take the next cell number in the row. This guarantees a degree of random selection of households within the cluster.

Table (2-4): An example of using the random numbers generator in choosing 50 random numbers (cells) out of 728 (cells) in the whole cluster. Duplicated numbers were not allowed

50 Random Numbers

728 002 383 502 678 344 619 328 666 188 551 191 349 263 520 285 604 375 526 608 554
 717 227 434 541 562 694 297 224 637 663 391 479 020 134 714 430 363 370 347 417 207
 302 403 635 282 271 497 355 394

Piloting the questionnaire form

Piloting the questionnaire survey was conducted in two different stages. *The first phase* examined the questionnaire form to acquire feedback for enhancements. This was conducted by sending the questionnaire form by email to five colleagues who have used questionnaires for their own research. Positive feedback was received regarding the questionnaire structure and content, however issues of the length of the questionnaire form and the ambiguity of two questions were raised. Modifications and enhancements were undertaken leading to the final questionnaire form.

The second piloting phase assessed the application of the questionnaire survey. The choice was between two methods: posting (either mail or e-mail) or face-to-face survey. From the researcher's personal experience with the post service in Cairo, it was decided that mail posting would not be reliable. That left the choice between emailing and face-to-face. A comparison between both was conducted through reading a number of references¹² and compiling the pros and cons table (2-5). Then an email list of 300 contacts was prepared to pilot the questionnaire, and to measure the response rate. Questionnaires were sent before Christmas (early December) 2007, with a clear statement asking respondent to fill the questionnaire and send it back within 2 weeks. By the end of January 2008 (after nearly 7 weeks) only 11 replies were received, with a response rate of less than 4%. Barnett (1991)

¹² Source: Compiled by the researcher from (Henry, 1990:26-32; Alkoudary, 2005:162-169; Barnett, 1991; Kumar, 1996:110; Frankfort-Nachmias and Nachmias, 2008; Rugg an Petre, 2007)

states that a first mailing usually lead to a response rate as low as 50%. It was concluded that with a questionnaire as necessarily complex as the one developed for this study email is not a reliable method despite its advantages of cheapness and fastness.

Table (2-5): Pros and cons of email, posted and face-to-face questionnaire survey

Postal / Email questionnaire survey	
<p>Advantages:</p> <ul style="list-style-type: none"> - Relatively cheap. - Fast. - Convenience of respondent during filling questionnaire forms. - Assurance of anonymity of respondents. - Responses are more accurate as respondents have both the freedom and enough time to return to questions. - No time boundaries for completing the questionnaire form. Freedom to divide the completion process on different time stages regardless of any timing boundaries. 	<p>Disadvantages:</p> <ul style="list-style-type: none"> - Low response rate. - Non verbal behaviour can not be recorded. - No control over the environment in which the questionnaire is completed in. - Probability of not understanding questions, leads to either increasing the number of unanswered questions or biased answered questions. - Respondents may not answer or skip some questions. - Inability of interviewing computer-illiterate citizens, not only does it exclude people who cannot read or write, but it excludes people who cannot use computers. - No control over time in which the questionnaire is completed and returned.
Face-to-face questionnaire survey and interview	
<p>Advantages:</p> <ul style="list-style-type: none"> - Higher response rate compared to post/email questionnaires. - Ability to observe nonverbal behaviour. - High flexibility. Where trained interviewer can extract the needed information from respondents following several techniques, such as repeating or rephrasing the question(s). - Control over the order of questions and interview environment. - Ability to record spontaneous verbal answers. - The ability to interview illiterate people who cannot read or/and write. - Control of time. - The ability of setting a time schedule for accomplishing the data collection task. - Respondents could be observed during their answer, where in email postal questionnaires there are no control on the respondents and their answers. - Higher reliability of collected data 	<p>Disadvantages:</p> <ul style="list-style-type: none"> - Expensive. - Time consuming method. - The need of recruiting and training a number of interviewers, which needs both time and finance to accomplish. - The time of interview might be inconvenient for the interviewee. - A less degree of anonymity. - Difficulty in access to respondents. - No opportunity for interviewee to consult his/her records.
Source: Author	

A decision was taken to use the face-to-face method for more reliable data. In the first week of questionnaire implementation during the training of the interviewing team, an average of 4 questionnaire forms were completed per day, ending with 20 questionnaire forms by the end of the week. This provided very useful feedback about how best to administer the questionnaire. Among the useful points discovered was that the questionnaire was long (5x A4 pages including the cover letter), - some of the interviewees

in the week-long pilot survey complained about this. In addition, un-necessary repetition was found in one of the questions, and ambiguity in another (which asked about situating the neighbourhood of residence on a rural-urban continuum!).

A new version of the questionnaire was duly developed during the weekend after the first week of pilot implementation, ready for the main phase of implementation to commence in the survey team's second week. The piloting phase was the main method of training the 24 research assistants, (20 of whom were the author's previous students and 4 were social workers).

Translating the questionnaire form process¹³

The author originally drafted the questionnaire form in English and this was translated by the author into Arabic and then given to 4 native Arabic speaker friends and colleagues (together with the English version). They were asked to evaluate the Arabic translation, by highlighting any ambiguity or mistakes in translation or understanding. Only minor recommendations were made and were taken in consideration in the final Arabic version of the questionnaire.

As an additional check, a different Arabic speaking friend was asked to reverse the translation from the final Arabic version back to English, and then compare between the two English versions. The process reached a very satisfactory result, as the two versions nearly coincided, with only a very few marginal differences that did not substantially affect the meaning of the questions.

Questionnaire Design and structure

The questionnaire's main goal was to measure the demand for and valuation of green space among a representative sample for Cairo's residences. This guided the detailed shape and structure of the questionnaire and the phrasing of questions.

"Because the findings of surveys often influence policy decisions that have an impact on people's lives and may be the only source of information on an issue available to the public, survey questions must be carefully constructed"

¹³ Please see appendix [1], for the English version of the questionnaire and appendix [2] for the Arabic version

and ordered to elicit accurate data." (Frankfort-Nachmias and Nachmias, 2008:230)

Prior to designing the questionnaire form a number of references were read in order to identify the main points to consider in order to produce a successful in-depth questionnaire. Among these were (Converse, 1986; Oppenheim, 1992; Hague, 1993; Kumar, 1996; Peterson, 2000; Woodward, 2000; Rea, 2005; L.Scheaffer, 2006; Braunstein, 2007; Rugg and Petre, 2007; Frankfort-Nachmias and Nachmias, 2008;). Learning from these sources, the following criteria were used in the questionnaire design.

- The survey questions were careful to address the research questions and research problem, and all questions referred to the study goal and directly addressed the study goals. Only relevant and crucial questions were asked, and the temptation of "interesting to know" questions was avoided.
- I was keen to have the questionnaire as short as possible to guarantee that the length of it does not bore participants, and to maximize the response rate. Only pivotal questions were addressed and other less important questions were cut out during the drafting and piloting processes.
- Experts' opinions and guidance was included in the questionnaire design process. Their suggestions improved the questionnaire.
- A statistical analysis framework (bivariate and multivariate analyses) was set up prior to launching the questionnaire survey, and a clear plan for how to analyze all questions was known in advance.
- A coloured, neatly written and signed cover letter with the university logo, a clear title, a statement of anonymity and a thanking for contribution statement, were used to give the best first impression to the respondents. This showed esteem and respect for the respondents on the one hand and professionalism. This was important in persuading the respondents to be interested in the questionnaire completion.
- Simple, direct language, short sentences and basic vocabulary were used in writing the questionnaire generally and the instructions specifically. The researcher's email address was clearly written on the cover letter for any inquiries or for follow up.

- Most of the questions were multiple choice questions, however in case of open ended questions an adequate space for response was left and respondents were encouraged to use the A6 space in the end of the questionnaire to add other comments.
- In case of multiple choice questions, choices were mutually exclusive and covered the total range of answers, (except when asking respondents to choose as many answers as they wish). The mutually exclusive responses were vital for converting the resulting data set into dummy variables for regression analysis.
- Wording of the questions was careful not to include any questions that might dissuade respondents from answering.
- The questionnaire started with fact-based questions and then went on to opinion-based questions; beginning by asking for demographic information then going on to questions about opinions and perspectives. This got respondents engaged in the questionnaire and warmed up before facing more challenging and reflective questions about their opinions
- Completing the questionnaire until the last question was the target for every interviewer, thus holding the respondent's interest was important. Thus the questioning format varied, and coloured pictures of different green spaces were used to attract the respondent's attraction. In addition, questions were grouped into coherent categories flowing smoothly from one to the next.
- Each questionnaire form had a coding number, name of the interviewer and the neighbourhood typology pattern clearly written in the header area of each page of the form.

Questionnaire's structure

The questionnaire form consists of 6 main sections, each section addressing a different topic and all of them together designed to obtain an interviewee's comprehensive perceptions about the demand for and valuation and use of GS. Figure (2-10), shows the six sections and their subsidiary questions. The sections are; A-Demographic information, B-Urban district characteristics, C-Usage and activities, D- Motives, sensations and feelings, E- Stated preference, F- Most frequently visited GS questions.

All the questions were coded in order to ease the drafting and analysis phases; coding consisting mainly of the section letter and the question order, such as: the second question of age in the first section code will be (QA-2). This has eased handling the questions, and eased their drafting process in both Microsoft Excel and SPSS software which was used in the analysis. It also eased the reporting of the findings.

The multiple choice questions, which measured many aspects of demand, needs and valuation, were compiled with reference firstly to the research questions and a consideration of the best form of questions: open ended, multiple choice, whether the choices are mutually exclusive or not and so on. Second, questions were informed by a number of case studies that have measured different aspects of demand, needs and valuation in respect of green space. Third, the questionnaire design and structure was guided by the need for a clear set of dependent and independent variables to facilitate regression analysis. Likert scales were applied in the multiple choices questions giving the possibility of treating these as semi-interval data or ordinal data. Mutually exclusive choices (such as the questions about gender or type of GS usually visited) were asked in binary form and coded for dummy-variable regression. Some questions gave interviewees the opportunity to choose more than one answer (such as in cases of perceived problems in GS and feelings evoked in GS).

It took nearly four months of testing and design iterations and a pilot survey have been conducted before reaching the final version, of the questionnaire (appendix One). The following sections show the different stages have followed in piloting then implementing the questionnaire survey.

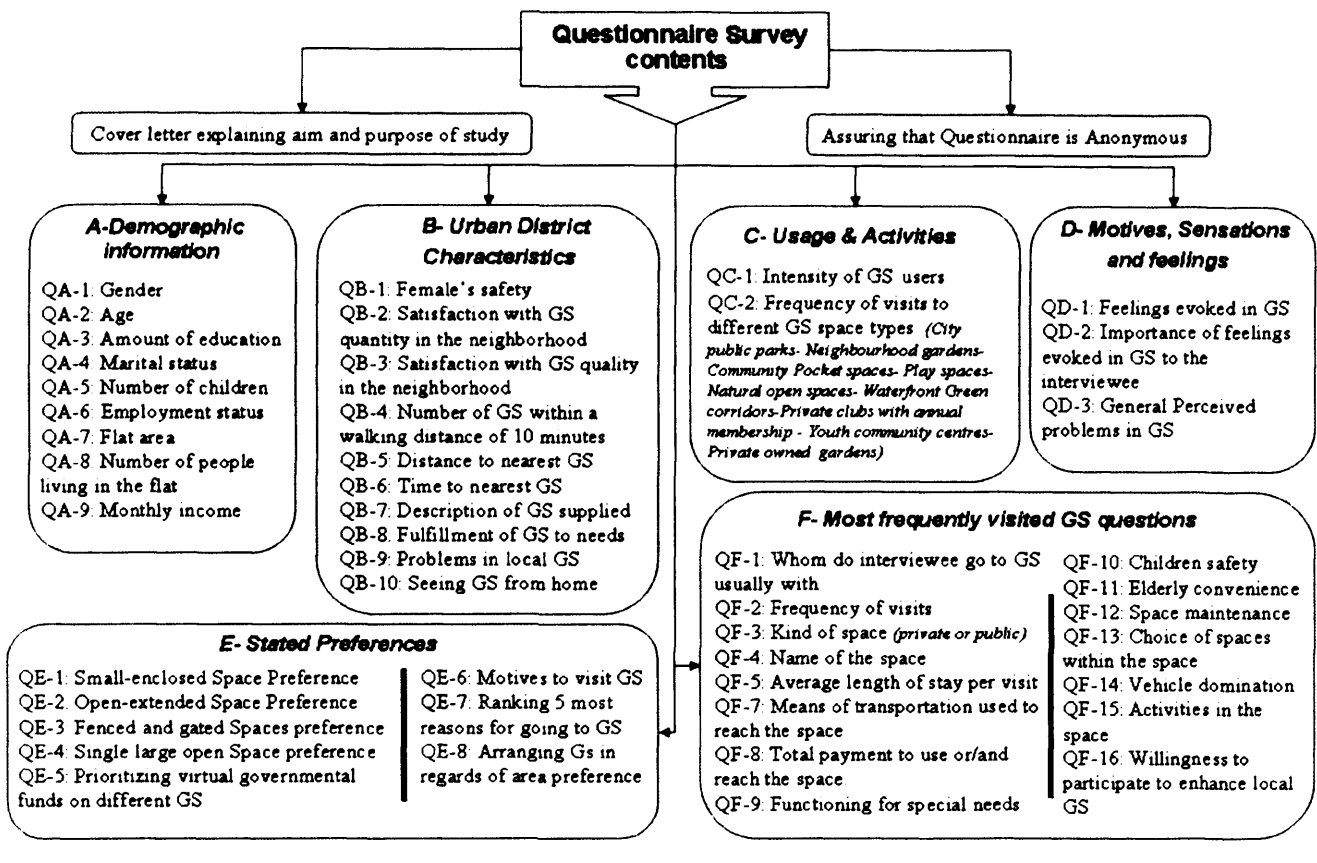


Figure (2-10), Questionnaire structure and contents

Questionnaire cover letter

Figure (2-11), shows the questionnaire's cover letter which was used in conducting the survey. As the first impression is important, and will have great influence on the respondent's attitude towards the completion of the questionnaire form; the following issues were taken in consideration in the design of the cover letter:

A **Questionnaire form**
Measuring use, attitudes and views of households to Urban Green Space in Cairo

B This questionnaire is the empirical study for a PhD thesis about *urban green spaces dynamics in arid contexts*, in which the application is chosen to be on Cairo city, the main researcher is *Nezar A. Kafafi*, The lecturer assistant in the department of Urban Design – Faculty of Urban & Regional Planning – Cairo university, who is studying for PhD degree in the School of City and Regional Planning – Cardiff University – Cardiff - UK.

C To define what is meant by green space in this questionnaire it is any space you and your family go to recreation that has vegetation.

D **It is assured that the questionnaire is anonymous, and all the answers and outcomes are used for research purposes only.**

E *Please do not hesitate to ask the interviewers about any unclear question, and feel free to add your worthy comments*

F **Thanks you for your contribution**

G Main Supervisor: *Professor Chris Webster*
Ch Webster

H For correspondence:
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Figure (2-11), Questionnaire's cover letter

A- Questionnaire title; It was stated in bold that this is a questionnaire form, followed by the title of the research study: "Measuring use, attitudes and views of households to urban green space in Cairo" stated clearly to describe the research interest and field of study.

B- Defining purpose of study title; A comprehensible description of the purpose of the study was stated, mentioning the researcher's name and occupation, and the reasons for conducting the survey.

C- Define what 'green space' means in this research; it was important for reasons of clarity to define what is meant by green space in this research.

D- Reassuring anonymity by emboldening and underlining the statement; The first aim for the research interviewing team was always to set the respondents' mind at rest that the questionnaire is anonymous. This reassurance gave peace of mind among the respondents and led them to feel free to express any negativities they have experienced in GS, and to write down their comments and suggestions.

E- Encouraging respondent to react, ask and give comments; The survey team was instructed to run as much an interactive questionnaire interview as possible, and a statement in the cover letter invites the respondent clearly to raise queries and not to hesitate to ask the interviewer for any thing, especially where he/she does not understand a question or the reason for it.

F- Thanking for contribution; To show gratitude for the respondent's contribution a thanking statement was clearly written in bold.

G- Titled and signed Colour print paper; The coloured titled paper show attention and respect for the respondent and the signature and university address adds formality and professionalism and assures the respondent of the researcher's authority and integrity.

H- Stating clearly the corresponding address of the researcher; for corresponding issues the full email address of the researcher was stated clearly. After the survey had been conducted it was surprising to receive a number of messages regarding the questionnaire, with some respondents asking to send them feedback of the analysis, while others asked how can they contribute further. Many wishes of success and wishes of a better green spaces in Cairo's built environment were also received.

Questionnaire implementation

Implementing the questionnaire was a tough process. Data gathering was conducted using the traditional and tiring method of knocking the doors, chatting and extracting information from interviewees. The method proved its efficiency, however, as responses and body language could be observed and translated into interviewer comments. Feelings like anger, happiness and suspiciousness were also recorded.

In order to reach the 715 reported cases used in the analysis, more than 1500 household were visited in their randomly selected locations (47% response rate). 615 selected interviewees refusing to fill the questionnaire, which required another household (cell) to be selected from the surplus in the 50 random selections in each neighbourhood. The numbers of largest rejections were 195 in pattern seven (squatter areas) and 103 in pattern three (government block housing). Together these two patterns accounted for nearly half of

the total rejections. 170 questionnaires were excluded because of incompleteness. Among the reasons for not filling the questionnaire forms were:

- Being busy.
- Do not have any interest in the research.
- Feel that the research won't benefit me directly.
- Household not at home.
- Ask for more money to conduct the questionnaire.
- Do not go to green spaces
- Feel that contributing to such research is a waste of time, as only the government has the authority to develop and construct new parks.

It was observed that the poorer the neighbourhoods, the more difficult it was to conduct the survey. Thus, a simple payment was given to respondents to show a gesture of gratitude for participating. Each respondent was offered 5 EGP (approximately 1 US\$) upon the completion of the questionnaire form, for his/her time. It is worth mentioning that this small gesture encouraged many to participate - especially apparent in the poorer neighbourhoods. On the other hand some participants refused to receive any payment for their contribution, saying that they do not need the money. This was the case in the more wealthy neighbourhoods.

Arrangements for the survey, including recruiting assistants, began six months or more prior to the six week implementation time in July and August 2008. All the recruited personnel were experienced in conducting questionnaires and interviews. 20 were planning school graduates or undergraduates who conducted surveys and questionnaires in their school modules. The other 4 were social workers who were experienced in large household surveys, two of them working in the 2006 census data gathering project. The first week was dedicated to preparing the questionnaire forms and the survey locations of the 21 clusters (3 neighbourhoods in each of the 7 neighbourhood patterns), preparing maps and training the interviewing team.

It was taken in consideration that interviewers must be mixed gender, as in some cases especially during the morning there was not a male present in the household, and with due

respect to cultural norms, it would have to be the female interviewer who introduced herself and asked the questions. There were eight female and sixteen male interviewers, with a female interviewer in each neighbourhood pattern. My main task was accompanying one team in the morning and another in the afternoon to inspect, guide and monitor the data gathering process. As a result of this monitoring, three of the recruited interviewers were fired due to carelessness and inefficiency. The completion rate was 40 questionnaires per day on average. The data gathering process took nearly five weeks. The interviewers were directed to commence their job in two shifts, the first from 10:00 until 14:00, and the second from 16:00 to 20:00. The reasons for choosing these particular times were:

- Avoiding being too early and disturbing the interviewees, especially since the survey was being conducted in the summer vacation when people tend to stay awake until late evening and to wake up late.
- Temperatures are remarkably high in the afternoon and many people tend to have a siesta after returning from work
- Sunset in summer is around 20:30-21:00, this gives the second shift a better chance of success, as usually the households are relaxing at home, and the interviewer is less likely to interrupt any important activity.

Difficulties faced

The poverty in some neighbourhoods, led to a violent response from people in some neighbourhoods, with a tendency to accuse the interviewers of being inconsiderate of their real problems. For this reason I was keen not to send an individual female interviewer without being accompanied by a male interviewer.

The completion rate was hindered by factors such as:

- The extremely hot summer
- Far distances the teams had to cover to reach some remote neighbourhoods.
- The inadequacy of transportation to some of the randomly selected neighbourhoods

- The high rejection rate in poor neighbourhoods.
- Out of control interruptions during the interview itself such as phone calls or children crying.
- The vacations that interviewing team members took (travelling with their families – a family custom to go to the coast to escape hot summer days).
- The negative impression that people have of social surveyors and interviewers, as they perceive them as either a municipal representative of the government, whom they do not trust, or a legislative officer, (worse since these officers are usually responsible for demolishing illegal squatter buildings).
- The misunderstanding of the purpose of the questionnaire, as many respondents were confused between the purpose of research study and governmental use.
- The prevailing frustration among most of Cairo's residents who feel that they are living with the city's unsolved problems. They tend to be very pessimistic about the city's and generally the country's future. These respondents tended to discourage the surveying team and despise the research.
- The non-appreciation of some people of greenery, and their preference for other sorts of leisure or space such as the cafés and shopping malls.

The survey was meant to be spatially hyperlinked to the satellite image of Cairo by using GIS. Each form had a specific coordinate from the satellite image and had its own attributes, but on the ground, and due to the very high rate of rejection from initially selected households, it was very difficult to relocate the points of the actual interviews, and to track the changes from the initially allocated location point for the questionnaire interview. There were seven different groups working at the same time, and in some cases, they faced many rejections and had to use the rest of the random numbers generated for each neighbourhood. Another reason for dropping the idea of geo-coding the questionnaire's data and linking with the satellite image was the unavailability of GIS experts among the already very busy survey team. Besides, it would have added an unaffordable expense to the research budget to hire experts to help the author correlate the

questionnaire data with the satellite image localities. It was a good idea, however, and with some logistical modification, could be adopted in future research on green space.

Unexpected Positive responses

This section highlights some of the most interesting and unexpected responses, I faced through the study:

- 3 interviewees wrote down their phone numbers and 2 wrote their email addresses in order to keep them in touch with the results of this research.
- Although it was argued that the questionnaire was a bit long, nearly 1/3 of the respondents added additional comments at the end of the questionnaire forms in the A6 comments area
- Some comments were very constructive and applicable, reflecting a high degree of awareness among some of the interviewed householders.
- Some interviewees offered to take some forms to give to their friends and neighbours. A case that the surveying team had been trained to respond to. The response was first to thank the interviewee for his/her attention and care which is mostly appreciated. Secondly, they apologized for not having enough copies, and explained that they have specific locations at which to administer the questionnaires.
- I received 39 completed questionnaires via the internet, as my email was printed on the cover letter of the questionnaire.
- It happened many times that a member of the interviewing team was invited for something to drink or even to join the household and family for food, which shows both the generosity of respondents and the gentleness and friendship of the interviewer.
- I received several messages by email, asking to keep the respondent updated with the questionnaire analysis results specifically and my thesis generally.

2-5- Ethics in the research¹⁴

Ethical issues addressed in this research are briefly as following:

Issue 1: Voluntary participation

The voluntary participation (and lack of coercion of any form) was fully guaranteed for the chosen households; and the 615 rejections is a proof. More than 40% (615 of 1500) of householder approached refused to participate in the study.

In this respect, the first phrase of the interviewer emphasised that participation in the questionnaire is voluntary and that the interviewee's decision would be respected with thanks. Moreover, interviewers stated that the interviewee is free to end the questionnaire whenever needed, and he/she is free not to complete the whole questions. That resulted in 170 excluded questionnaires, more than 11% (170 of 1500).

Issue 2: Informed consent

This issue is closely related to the notion of voluntary participation. All participants were fully informed about the procedures of the questionnaire, the aim and objectives of the study; why it is needed; what the data will be used for and any possible risks involved. No questionnaire was conducted unless a clear consent to participate statement was given to the interviewer.

The participant verbal willingness to complete the questionnaire was considered to be a 'signed consent' for his/her approval to go ahead, and participants were always encouraged to raise any queries related to the research and/or his/her safety or anonymity- and share it with the interviewer.

Issue 3: Risk of harm

Ethical standards require that researchers do not put participants in a situation where they might be at risk of harm as a result of their participation. By harm it is meant both physical

¹⁴ This section was compiled using the following references (Kumar, 1996; Denscombe, 2003; Trochim, 2006; Supsford and Jupp, 2006; Rugg and Petre, 2007; Frankfort-Nachmias and Nachmias, 2008)

and psychological. Participants were reminded that the questionnaire could be paused if they had any urgent thing to do – something that lengthened the duration of the interview on some occasions. Among the frequently asked questions prior to filling the questionnaire form was;

- Whether the participant have anything in the microwave, oven or on cooker.
- Whether the children are safe at the moment, and it is safe and proper to participate for nearly 15 minutes in conducting the questionnaire, otherwise he/she was asked gently by the interviewer to make sure that everything is fine prior to starting.
- Where is the best place to conduct the interview? Some participants chose to complete it in front of the home door; others preferred to be with their children in the living room to watch them while filling the form; and others preferred to go to the flat balcony to complete it in the fresh air. The interviewer accompanied the respondent at all times in order to record any observations and answer questions.

As the questionnaire did not encroach upon any political or religious issues, it posed no obvious risks to the participants or researcher in this respect. There was some inevitable risk to the interviewing teams, however, especially for female interviewers. Some of the neighbourhoods were poor, violent informal neighbourhoods. Such risks were reduced by having the researchers work in teams of 2 with mixed gender.

Issue 4: Confidentiality & Anonymity

There are two standards that are applied in order to help protect the privacy of research participants: confidentiality and anonymity. In this research, anonymity of participants was chosen to fully guarantee complete privacy. Participants were assured that their identity will remain anonymous throughout the study - even to the chief researcher himself. This was also clearly stated in the cover letter, and no space was provided in the questionnaire for any contact details of the participant in order to guarantee anonymity to the greatest extent.

Issue 5: Providing incentives

Each respondent was told prior to their contribution that he/she is eligible to 5 EGP, if they wish to complete the questionnaire form with the interviewer. This was considered to be an incentive, motivation and appreciation for the respondents' time and interest. Providing money as an incentive was a decision based on the researchers' knowledge of the Egyptian context and the poverty that many people live in. Offering nominal compensation for the interviewee's time guaranteed higher levels of contribution, and also showed respect to the households who contributed their valuable knowledge to the research. The author consulted a number of professors in the faculty of urban planning at Cairo university, who had wide experience in conducting questionnaire surveys as consultants for the ministry of housing and settlements' development in Egypt. All of them agreed that, using incentives is among the most effective tools in conducting questionnaires. The total bill for the incentives was 3020 EGP (289 GBP, equivalent to nearly 520 US\$ at the time)

Issue 6: Seeking sensitive information

The questionnaire did not include any sensitive information; even with the monthly income question, ordinal categories were provided to enable the participant to choose the equivalent category without the need to state an exact figure. Again, the freedom to not answer any question was emphasised, and no pressure was applied.

Issue 7: Using secondary data and copyright

Due ethical consideration was given to obtaining, analysing and reporting secondary data and copyright issues were followed as fully as possible. The main secondary data used in the research were:

- IKONOS satellite image for Cairo, purchased from a GIS consultancy company (E.H & A.S, Cairo). A contract was written for purchasing the rights for the author to use the interpreted satellite image for his PhD research purposes and a clear declaration given that the former owned the rights to use the image including to pass on the interpreted image for subsequent analysis by the author.

- Cairo Census data for 2006, which is available free online for the members of the CAPMAS (Central Agency for Public Mobilization And Statistics)¹⁵ of the Arab republic of Egypt. The site is available in both Arabic and English languages.
- CCBA (Cairo Cleanness and Beautification Agency) annual reports, which are in the public domain and available for free from their headquarters in Abbasia, Cairo.

Any farther data or quotes used in the research are fully referenced and all copyrights are preserved.

Issue 8: Approval of Institutional Review Board

The research empirical study, involving the use of the satellite image interpretation and the questionnaire survey, were submitted to the ethics committee in the school of city and regional planning of Cardiff University – the Institutional Review Board (IRB) - and was approved by the ethics committee in the university prior to fieldwork commencing. The process included completing an ethical approval form, to which a brief summery of the empirical studies to be done and a final copy of the questionnaire form were attached. The submitted form included detailed clarification of the following ethical issues: recruitment procedures, consent procedures, possible harm to participants, data protection and dates of the survey. The form also included the supervisor's declaration and signature that all ethical issues have been dealt with in accordance with University policy.

Issue 9: Restrictions imposed by the sponsoring organisation

The sponsoring organisation, the Egyptian high education ministry, was informed and sent a copy of the questionnaire form in both Arabic and English languages. And a statement of approval was sent to the researcher to conduct the questionnaire as it is reported in this research.

¹⁵ Available at: <http://www.msrintranet.capmas.gov.eg/pls/fdl/tst12e?action=&lname=#top>

Chapter Three

Definitions, norms and concepts

3-1- Introduction

This chapter begins with introducing what is meant by urban green spaces. Then it reviews the idea of norms and standards of urban green space, on which assessments of green space are typically based. Next, the chapter reviews the issue of public and private goods in urban green spaces supply, developing a theoretical position on the nature and definition of green space. It does this through discussing the institutions for securing urban green supply, and addressing the issues of the public goods problem of non-supply and under-supply and property rights, public goods and open space. This selective literature review is designed to provide the theoretical background for the empirical analysis on green space supply and demand in subsequent chapters.

On the CABI (the UK's commission for architecture and built environment) website¹⁶, cited in 05/07/2010, there were 44 different publications under the topic parks and green

¹⁶ <http://www.cabi.org.uk/publications/categories>

spaces, - the seventh highest category among the 49 caetogries and subcategories of publications researched by the comission. Table (3-1), shows the distribution of CAFE's parks and green spaces' publication in the last eight years, which shows that parks and green spaces are still being actively researched.

Table (3-1); Number of CAFE publications on parks and green spaces

Year	2003	2004	2005	2006	2007	2008	2009	2010	Total
Number of publications	2	9	6	8	3	6	6	4	44

The figures above reflects the importance of green spaces in our daily life and the necessity of studying and understanding the different dynamics behind these places that contribute to them working and faling. According to a study of the public attitudes to built environment which was carried out for CAFE, 85% of people surveyed felt that the quality of public space and the built environment has a direct impact on their lives and on the way they feel (CAFE 2002, quoted in CAFE, 2003).

This thesis seeks to make a searching enquiry into the issue of valuation of GS in an arid city, where the value of green space might be expected to be that much higher (due to greater scarcity) than in the temperate (and rather wet) United Kingdom. It focuses on the dynamics of both supply and demand, and investigates both sides of this dynamic equation by conducting in-depth empirical research. The most important ideas to review from the literature, therefore, are basic ideas that gives us a theoretical vocabulary to discuss these matters. The remainder of this chapter, therefore, produces concise review of definitions and theoretical categories concerning GS. This is considered to be more relevant in providing a foundation in the thesis than reviewing in detail the many diverse case studies, found in the literature, reporting specific examples of GS problems in particular cities.

3-2- Definition, typologies and concepts

What is urban green space?

In their urban research report for the UK's Department for Transport, Local Government and the Regions, Dunnett, Swanwick and Woolley (2002), used the following general definition for urban green space:

"Land that consists predominantly of unsealed, permeable, 'soft' surfaces such as soil, grass, shrubs and trees (the emphasis is on 'predominant' character because of course green spaces may include buildings and hard surfaced areas); it is the umbrella term for all such areas whether or not they are publicly accessible or publicly managed. It includes all areas of parks, play areas and other green spaces specifically intended for recreational use, as well as other green spaces with other origins." (Dunnet et al, 2002:8)

Coles and Grayson (2004), choose to add accessibility and function to their definition:

"Urban green spaces are understood as public green spaces located in urban areas, mainly covered by vegetation (as opposed to other open spaces) which are directly used for active or passive recreation, or indirectly used by virtue of their positive influence on the urban environment, accessible to citizens, serving the diverse needs of citizens and thus enhancing the quality of life in cities or urban regions."

Baycan-Levent et al (2002) add ownership and property rights in their definition of urban green space as they say:

"By urban green spaces we understand public and private open spaces in urban areas, primarily covered by vegetation, which are directly (e.g. active or passive recreation) or indirectly (e.g. positive influence on the urban environment) available for the users."

Greenspace Scotland (2010), adopt a definition that elaborates on the accessibility issue:

"Greenspaces are the 'green lungs' of our towns and cities contributing to improving people's physical and mental health by providing places for informal recreation - walking, cycling, sitting, socialising and children's play - and 'breathing spaces' to take time out from the stresses of modern life. They bring the countryside into our towns and cities, and make it accessible from our 'backdoors'."

Greenspace Scotland (2010) have developed the following functional taxonomy on green spaces: *Breathing spaces* - oases of calm within the city bustle to take time out and recharge human batteries; *healthy spaces* - encouraging us to get active and develop healthy lifestyles; *living spaces* - accessible attractive spaces which meet the needs of local people; *meeting spaces* - communal places encouraging communities to come together; *play spaces* - safe places where children can adventure, explore and imagine; *working spaces* - attractive places to live and work, helping inward investment; *learning spaces* - stimulating places for lifelong learning, allowing young and old to learn together; *wild spaces* - where nature is welcomed back into the hearts of our cities and plants and wildlife are seen first hand; *creative spaces* - inspirational places encouraging creativity in an outdoor setting; *celebration spaces* - gathering places for festivities and celebration.

Finally, at the very fundamental level, green space means any vegetated land or water within or adjoining an urban area (APSE, 2008), and includes:

- Natural green space including natural and semi-natural habitats
- Green corridors paths, disused railway lines, rivers and canals
- Amenity grassland, parks and gardens
- Outdoor sports facilities, cemeteries and allotments
- Derelict, vacant and contaminated land
- Private gardens

To conclude, urban green spaces definition differ according to the background and purpose of the definer and the context in which it's defined. The following section elaborates the key attributes of urban green spaces.

Key attributes of urban green space provision

According to Dunnett and others (2002:34), people's reasons for using urban green spaces fall into seven broad categories: enjoying the environment; social activities; getting away from it all, walking activities, including dog walking; passive or informal enjoyment; active enjoyment, including sport and specific activities; and attending events. These categories are considered to be the outcome of the urban green space provision, however, these categories are influenced by a number of attributes, which are accessibility, quality,

multi-functionality, primary purpose and quantity. These attributes are considered to be the guiding principles in urban green space provision (PPG17, 2002). Each is briefly elaborated below.

Accessibility normally is considered the most important for the simple reason that public sector green space planners are typically concerned with maximising access across the city. However, it should be noted that using the fundamental definition, most green spaces in many cities, are supplied by the private sector in the form of private gardens. It should also be noted that inaccessibility can contribute to environmental quality, biodiversity and enhance the built environment through the conservation of green spaces. In the theoretical lexicon, it is therefore necessary to be specific about access. This can be achieved in four ways – with reference to physical barriers (gates and walls), institutional barriers (property rights and fees), the barrier of distance (demand falls off with distance); and social/ cultural barriers (even if it is otherwise accessible, a green space might be inaccessible to one group because it is used by another) (Webster, 2001).

Quality is thought to depend on two main sets of factors; the first of which is the needs and expectations of users, while the second is the design, management and maintenance of a space. While users are typically assumed by green space planners to be homogenous – green spaces being designed for all sort of people without exclusion, it should be noted that green space users are not at all homogenous (as is demonstrated in detail in the empirical study in Chapters Seven and Eight). Green spaces are more likely to work well if they factor in the specific demands of target users. This is easier for private green space suppliers but is very difficult for public space designers.

Multi-functionality is therefore essential in the provision of urban green spaces, as these spaces in practice have to meet a variety of user needs, for example, grass pitches used by children for play; by teenagers for sports games, meeting and kite flying; by youth for exercising, jogging and training; and by the elderly for walking, sitting, relaxing, socialising and meditating.

A primary purpose is typically created to avoid the conflicts created by multi-functionality. This both reflects the multi-functionality nature of green space and brings clarity and consistency to planning, design and management policies of the space.

Quantity is usually measured in terms of the amount of provision (for example, area, the number of spaces and the amount of green space per person). It is an essential attribute in urban green space supply, and quantity is assumed to play a vital role in enhancing quality of life and built environment. However it should be noted that there is a trade-off between quantity and quality, and similarly, between quantity and accessibility. In the subsequent discussions about private and public green space, this trade off is considered empirically.

3-3- International Norms and standards for urban green spaces supply

Natural landscapes and urban green spaces are affected directly by the climate zone they are located in and the surrounding morphological features. They are also affected by the institutional, social, economic and political context of a city. The consequences and effects of these contexts on the urban environments must be understood in comparing differences between countries in respect of green space standards. However, greenery possesses its own magic and secret in fulfilling peoples' needs and it might be supposed that this magic works in much the same way for people in many very different climatic contexts. What climate and other contextual parameters does effect, is the feasibility of different types of green space supply in response to people's demand. Chapters Six to Eight investigate the interaction between demand and supply, looking at the quantities and quality of green space supplied under different conditions and investigating the behaviour and values of Cairo residents in respect to green space consumption.

Before doing this, in the remainder of this section, I consider the use of standards of urban green spaces supply and the use of norms that relate to factors such as function, hierarchy, travelling distances, physical accessibility. Egyptian national norms of green spaces supply provision are described and compared with international norms. The purpose of doing this is first, to document a factual basis for claims of deficiency; and second, to raise the question of usefulness. How useful are norms? How are they constructed and what meaning do they have? When we view the total supply of green space as comprising land

owned by government and private organisations and even individual and having various degrees of excludability, what do these norms mean?

Hierarchy of areas, typologies and functions

In order to assess the supply and demand of public goods and services, and in order to meet administrative requirements of public providers, norms and standards are widely employed by urban governments. An example from an arid city is Dubai in United Arab Emirates. Baxter (2010), reports that Dubai Municipality has confirmed plans to increase the emirate's green areas by 4% this year and next year by creating more public parks and increasing green spaces in the city. She adds that officials are aiming to increase the amount of green space per capita, by doubling the currently estimated figure of 13.18 m², to 25 m² by 2020 (by contrast, the most optimistic reporting of the amount of GS per capita in Cairo did not exceed 2 m² – discussed in Chapter Five).

In the planning of open space there have been many approaches that go beyond merely specifying green space per capita, typically classifying hierarchical and functional typologies. A recent approach in the UK, for example, is found in the Planning Policy Guidance note PPG17, where 8 different functional types of green spaces, are identified:

- Parks and gardens
- Natural and semi-natural green spaces, including urban woodland
- Green corridors
- Outdoor sports facilities
- Amenity green space
- Provision for children and young people
- Allotments, community gardens and urban farms
- Cemeteries, clustered churchyards and other burial grounds

Added to this are hard-surfaced open spaces: civic and market squares and other hard surfaced areas designed for pedestrians.

In the UK, typologies for green space are only a guiding one. In the application, each local government interprets the guidance and develops its own typology depending on local

characteristics of places and needs. An example from a UK local authority (Southampton) contains five categories of green space (figure 3-1):

- *City parks* (destination parks) – that attract people from outside the city and may have national importance, have a range of facilities and features.
- *District Parks* - attract people from across the city, have a number of facilities and features and hold neighbourhood events.
- *Local Parks* - used by the local community, with limited facilities.
- *Amenity Green Space* – Used by the immediate local community this green space usually connects to or is adjacent to the homes of the residents using it.
- *Other Green Space* – These include sports areas, woodlands and natural spaces, cemeteries, allotments, civic spaces, school grounds and privately owned publicly accessible spaces including golf courses and greenways.

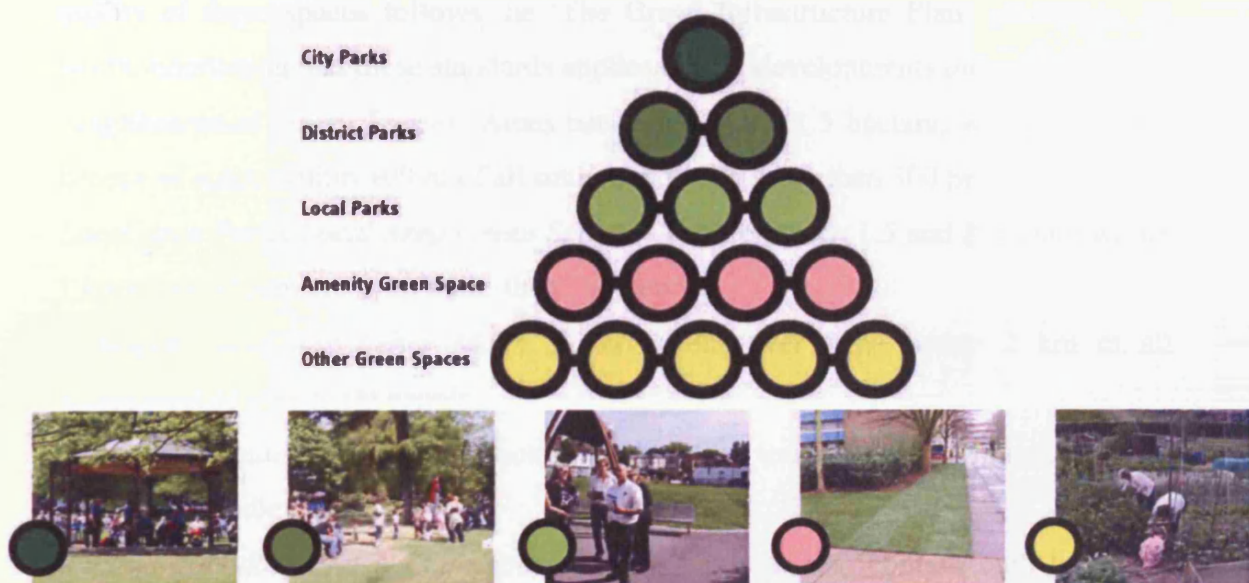


Figure (3-1) Southampton's five categories of green spaces,

Source: Southampton's Green Space Strategy Summary and Action Plan, could be found online at:

<http://www.southampton.gov.uk/Images/GSS%20Pages%20%20%20%2001%20-%2024%20tcm46-218151.pdf>

This is a strongly functional classification based principally on the dimension of distance. The underlying behavioural assumption is presumably that different sizes of green space meet different types of demand and that at the largest scale; these can be shared by more people.

Cities all over the globe adopt variants of these UK examples and are presumably based on a similar set of assumptions about behaviour and demand.

A slightly wider typology is exemplified from another UK local government: Solihull in the Midland region of the country (Armstrong, 2005). They are prefaced by a set of goals that drive all of the local government's interventions and this shows how green spaces are viewed in a context very different to Cairo. The goals include: Creating a brighter future for our children; Improving the quality of life; Closing the gap of inequality; Treating people as individuals within a diverse community; Giving good value services. The hierarchy of parks and green spaces adopted is more explicit and more diverse than Southampton's:

- *Internal/Informal Green Space*: A minimum of 0.4 hectare per 1000 people, with a minimum area of 0.2 hectare, for all settlements of over 300 people, where the design quality of these spaces follows the 'The Green Infrastructure Plan' guidelines, its worth mentioning that these standards applies to new developments only.
- *Neighbourhood Green Spaces*: Areas between 0.2 and 1.5 hectare, with at least 0.2 hectare of space within 400 m of all settlements with more than 300 people.
- *Local Area Parks/Local Area Green Spaces*: Areas between 1.5 and 8 hectare within 1 km of all settlements with more than 300 people.
- *Principal Parks and Other Major Parks*: Areas over 8 ha within 2 km of all settlements of over 5000 people.
- *Sustainable routes*: Traffic-free routes such as canal towpaths, cycle routes, walking routes, and bridleways.
- *Wildlife corridors and wildlife sites*: These areas will also contain both local and strategic areas of accessible natural green space, and Local Nature Reserves.

All such devices reflect, as this case makes explicit, the goals of the supplying organisation and perceptions and assumptions about demand and need. The appearance of sustainable routes in the lexicon of green spaces reflects the mainstreaming of the sustainability agenda in local level government in the UK. In Cairo, the approach taken to hierarchy and function is considered later in this chapter. For now, we can note that all such norms tend to take their principal structure from assumptions about walking distances (and related assumptions about catchment and size).

Walking distance

Urban green space will always be an important public good contributing to the fulfilment of residents' needs. Assessing what an optimal amount of green space, however, is not an easy task. Typically, planners borrow standards from other countries. Sometimes, but not always, they are informed by scientific studies. The walking distances residents are willing to cover to use green space will differ between one country and another, according to physical factors and preferences. Physical factors include climate zone (arid, tropical), topography (mountainous, green fields, deserts), morphology (street grid pattern), land features and natural obstacles (water bodies etc) and man-made barriers (fences, railways, housing blocks, highways, privatized properties and premises). Preferences include demand for green space (willingness to pay).

At another level, walking speed varies by individual, depending on stride length, terrain or walking surface, and physical condition, age and gender. It must be presumed that standards for the provision of green space ultimately derive from averaging across such factors. For example, on average, women can walk at 3 miles per hour¹⁷, while for the average man; the speed is a little quicker at 3.5 miles per hour¹⁸ (Crawford, 2009). Standardised distances are an important guide which permits us to identify sections of a city facing levels of access below what is considered to be an acceptable standard and which permits the evaluation of the efficiency of an urban green space hierarchy. Elaborating this, there are 3 components to the access standards issue.

Firstly, travel accessibility: The ease of travelling to an urban green space. Under the assumption that local green spaces are used frequently (for example, daily or weekly), it is typically assumed that they are, or should be, accessed by walking (using the term in a broad sense and includes using wheelchairs and other walking aids). This clearly depends on the quality of pedestrian and road network and the density of local green spaces. Provision standards are therefore created on the basis of reasonable walking distances from home to nearest green space types (whatever that type - not necessarily the least in hierarchy). Typically, the distance is an average one making allowance for all abilities and

¹⁷ 3 miles is nearly 4.8 km, that is 20 minutes per mile. Where 1mile= 1.6 km

¹⁸ 3.5 miles is nearly 5.6 km that is nearly 15 minutes per mile

set at around 300m distance for a 5 minutes walk (City Environmental Indicators Encyclopaedia).

(Figure 3-2), for illustration, shows target walking distances for different types of green spaces (according to the UK local authority referenced earlier). The weakness of this kind of guidance is that it does not allow for different housing densities, population levels or major barriers (eg. railways and rivers), which should be taken in consideration when looking at provision for a particular area.

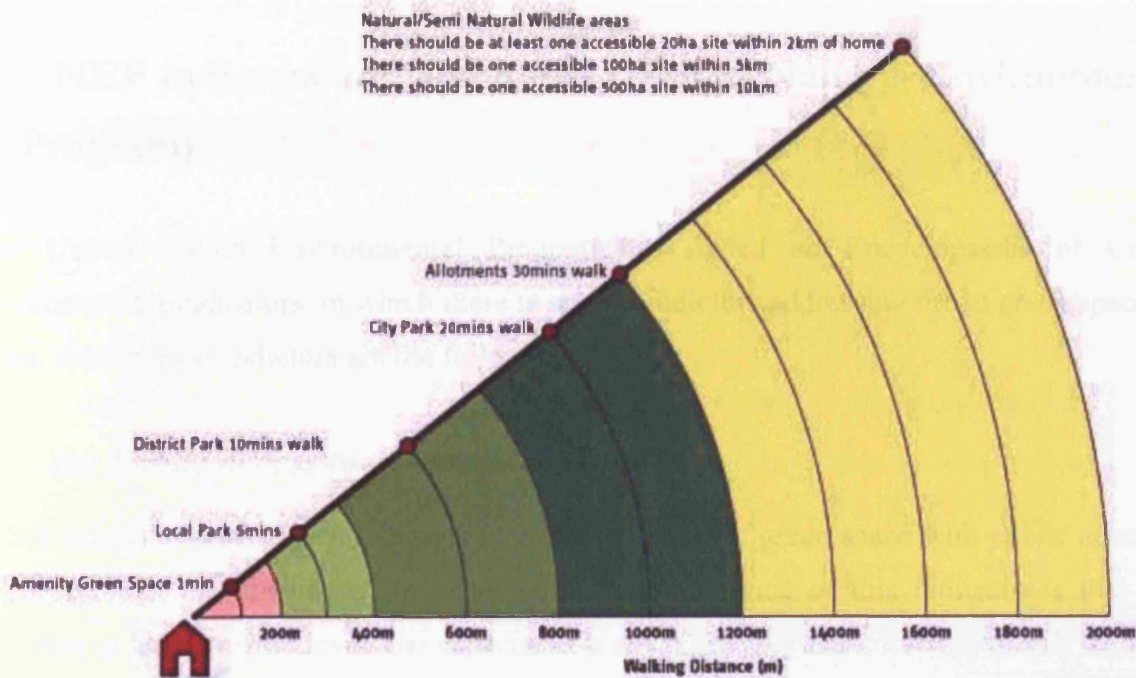


Figure (3-2) Southampton's city green spaces' walking distances

Source: Southampton's Green Space Strategy Summary and Action Plan, could be found online at:

<http://www.southampton.gov.uk/Images/GSS%20Pages%20%20%20%2001%20-%2024%20tcm46-218151.pdf>

The second component to access is physical access. This is the physical access to a green space, which can be hindered by fences, guards, vegetation and water buffers, gates and so on. Normative standards are sometimes developed, such as those by the Sensory Trust in the UK, which adopts the principle of "Least Restrictive Access" to outdoor spaces. The ideal is full accessibility to urban green spaces, but if full accessibility is not available (i.e. because of steep slopes in river valleys or because of sensitive nature conservation areas)

The third dimension of accessibility is institutional access. This is influenced by the legal ownership of a green space, the mechanism used to finance it and the owner's and local government's view of open access. Spaces that are otherwise accessible by virtue of

distance and design may be rendered inaccessible by the institution of access fee or membership. Equality of use for all members of society is usually a strong ethic in municipal plans for green spaces and as I show in subsequent chapters, this sets up an inevitable tension between ideal provision and practical provision. With increasing frequency, institutional open access is being compromised by the need to secure better incentives to supply more green space and to maintain the quality of green spaces in the face of limited funds and rising demand.

UNEP indictors and standards (United Nations Environment Program)

The United Nation Environmental Program has issued an Encyclopaedia of City Environmental Indicators, in which there is several indictors addressing urban green spaces issue, among these indictors are the following.

(a) Public access to green space

Public access to green space indicator is measured in m² of green space with public access to the number of inhabitants (m²/inhabitan), the importance of this indicator is that it indicates at an aggregate level, the capacity of a city's green space infrastructure. A higher number indicates greater capacity and lower congestion. However, this is only a crude measure and in some senses it is surprising that this is such a commonly used measure. The reason is that, by definition, public goods are not consumed individually but jointly. Other than private gardens, green spaces are public or club goods (see discussion late in this chapter) that are consumed by many people at the same time in a non-exclusive manner. A 3KM square urban park in a city of 300,000 is not consumed at 10m sq per person. Each person consumed the full 3KM square – or some part of it. Many large green spaces in cities provide relatively uncongested semi-wilderness recreational area. Many small green spaces are congested with over use and conflicting use. So the more important attribute of green spaces is arguably not so much quantity per capita but size distribution.

(b) Percentage greenery

Green areas indicator is the percentage of parks, green spaces, open areas and playgrounds of the total built-up area (%). This is a very simple indicator, but it can also be misleading, as population and building densities vary dramatically among a city's different districts. Studies typically state that a minimum green space area should be 10-20% of a total city's urban area according to the United Nations Environment Program. This appears to be based on studies carried by United Nations projects in many different cities. It may not be a reliable standard but it is still a rough indicator of the average supply of urban green spaces supply. The standard is also obviously culturally and environmentally specific. Most European cities have a percentage of 30-40%, and some cities even reach 50%. However, arid cities like Cairo can target a more modest 10% as a standard. In a later chapter I report my calculation of Cairo's green space percentage as estimated from satellite imagery. It comes out as the inhuman figure of 3.85%.

(c) Accessibility of green areas

Accessibility to green areas indicates the average proximity to urban green areas. It is typically measured by calculating the percentage of people within 15 minutes walking distance of urban green spaces or some similar metric. This is useful so long as it is feasible to walk and so long as the green space from which distance is measured is of adequate quantity and quality. If straight line distances are used (rather than network distances) then the indicator can overestimate supply. If people do not walk because of high summer time temperatures then the measure may be meaningless. If the nearest green space is overused, underinvested and degraded, the indicator may also overestimate.

(d) Investment in green areas

This indicator measures the investments in green area maintenance per year as a percentage of city product or some other denominator. It is an important indicator to show the amount of willingness and capacity of the municipality to maintain existing green areas, besides its efforts to supply new ones.

What is interesting in all the above indicators is that all of them are concerned only about open access 'public spaces' – spaces that people have a right to access and use. This

reveals a preoccupation with the access issue but only insofar as open space is viewed as a pure public good and the government as the sole or principal provider. As the next chapters show, there are a variety of ways of providing open space and the government as well as the market can fail in playing its role. Standards such as the UN's are useful for helping governments play their part but this should be understood in the context of the reality that government stands alongside private individuals, firms and various forms of collective consumption organisations in greening the city.

Quantity standards

The absence of a nationally recognised and widely applied set of standards for open space has been debated for many years and many organisations around the world have been trying to standardise quantitative norms for open spaces. The difficulty in reaching international norms are well understood, but the necessity of having national norms is growing.

Increasing the quantity of green space is among the first priorities of city councils and governments and there is therefore a need for guiding standards. The following standards are typical of different kinds of green spaces provided in the city, taken from a number of references that covered the green space provision in UK, such as (CABE, 2004; Armstrong, 2005; CABE, 2005; Bjerke et al. 2006; PPG17: Planning for open space, sport and recreation, 2006; Salfords city's Local Greenspace Standards, 2006; Czerniak and Hargreaves, 2007; PGSS Action Plan with revisions, 2008; CABE, 2009).

- Natural and semi natural wildlife areas = 1.75 hectare per 1000 population
- All outdoor sports provision, excluding Golf = 1.0 hectare per 1000 population
- Formal parks and Gardens (City park, district park, local park) = 0.42 hectare per 1000 population
- Amenity Green space = 0.22 hectare per 1000 population
- Allotments or cemeteries = 0.20 hectare per 1000 population

The following section summarises open space standards that are available for use by local authorities and other stakeholder groups across the United Kingdom.

National Playing Fields Association - The Six Acre Standard

The NPFA recommends a minimum standard for outdoor play space of 2.4 hectares (6 acres) for 1,000 people. Outdoor playing space is not the same as public open space. It is space that is safely accessible and available to the general public, and of a suitable size and nature, for sport, active recreation or children's play. It is a significant component, but not the only form of open space. The recommendation is that the total should be broken down into 1.6 hectares (4 acres) of outdoor sport space and 0.8 hectares (2 acres) of Children's playing space.

English Nature - Accessible Natural Green Space Standards in Towns and Cities

The ANGS model requires:

- That no person should live more than 300m from their nearest area of natural green space of at least 2 hectares in size
- Provision of at least 1ha of Local Nature Reserve per 1,000 population
- That there should be at least one accessible 20 hectares site within 2km from home
- That there should be one accessible 100 hectares site within 5km
- That there should be one accessible 500 hectares site within 5km

The Woodland Trust - Woodland Access Standard

The Woodland Trust Woodland Access Standard requires:

- That no person should live more than 500m from at least one area of accessible woodland of no less than 2 hectares in size
- That there should also be at least one area of accessible woodland of no less than 20 hectares within 4km (8km roundtrip) of people's homes

Example of English & Scottish Local Authority Open Space Standards*Table (3-2), Example of English & Scottish Local Authority Open Space Standards*

Organisation	Open Space Standard
Greater London Authority <i>Guide to Preparing Open Space Strategies</i> March 2004	London's Open Space Hierarchy, based on indicative catchment for different sizes of parks.
	Over 400 ha 8km Regional
	60-400 ha 3.2km Metropolitan
	20-60ha 1.2km District
	2-20 ha 400m Local parks
	0.4-2ha 400m Small local parks
	<0.4ha 400m Pocket parks
	variable where feasible Linear Open Spaces
Stockport Metropolitan Borough Council	Overall provision of 2.4 ha per 1000 population for active recreation. 1.7 hectares should be for formal sports provision, including: Pitches, courts and greens for public and private use for all age groups Athletics facilities Pitch and putt courses and similar facilities 0.7 hectares should be available within easy access of homes for casual play
Aberdeen City Council <i>March 2001</i>	<ul style="list-style-type: none"> - 2.8ha of open space per 1,000 people. - Sports pitches/ playing fields 1.6ha/ 1,000 people. - Equipped children's play space 0.3ha/ 1,000 people. - Natural wild space 0.4ha/ 1,000 people.
City of Edinburgh Council <i>Open Space and Ancillary Facilities for New Housing Development (Aug 2004)</i>	<p>4 acres (1.6ha) per 1,000 persons or 1 acre (0.4ha) per 100 houses in large developments. 10% of the site area in major infill housing developments.</p> <ul style="list-style-type: none"> - 20% of the overall site area of a new housing development - Private gardens should be a minimum of 9m in depth - Amenity landscaping must be greater than 1.5m wide - Small play areas located 60m from home and larger, well equipped play areas 240m from home
<i>Green space Standards (2001)</i>	Target of 5ha per 1,000 population. 0.7ha children's play per 1,000 population to be accessible within 90m (Open Space without equipment), 300m (Local Play Area), 1000m (District Play Area). 1.7ha for outdoor sport per 1,000 population to be accessible within 500m for kick-about and 1000m for playing pitches. 0.5ha amenity green space per 1,000 population to be accessible within 400m. Provides alternatives for off-site and on-site provision.

Source: Compiled by the researcher from: Haringey Open Space & Recreation Standards SPD, 2008; London Borough of Hammersmith & Fulham Council, 2008; Scottish Government (Chapters 6&7), 2010

We can conclude, from this sample of local and national standards, that quantitative open space standards are the most commonly used type of standard and that standards vary considerably even within a single country.

If we apply UK norms to Cairo city; taking Formal parks and gardens, the city's population of nearly 7,765,000 in 2006, means that it ought to have from 12,424 – 21,742 hectares of formal parks and gardens. The amount of green space according to municipal records for

2006 was 1,312 hectares - which is from 6 to 10.5 % of what the city ought to possess according to UK norms. This comparison serves to show that normative standards are highly context specific. It also reveals the lack of scientific basis for them.

Quality standards

Criteria and standards that focus on the quality of urban green space have a somewhat different function. These are means by which urban green spaces can be graded, measured and compared.

The Green Flag Award scheme, is an example, having the purpose of driving up standards and raising people's expectations. Quality criteria for the award include the following:

- A Welcoming Place
- Healthy, Safe and Secure
- Clean and Well Maintained
- Sustainability
- Conservation and Heritage
- Community Involvement
- Marketing
- Management

Such measures may also be used to systematically audit the quality of a city's green spaces. Figure (3-3), shows the proposal of Southampton city council in the UK for standardising quality among the city's green spaces, where each green space would be allocated a minimum score that it should obtain for its type. The audited parks and green spaces are reviewed against the standard for that type of site and form the basis for targeting future resource allocation for improvements.

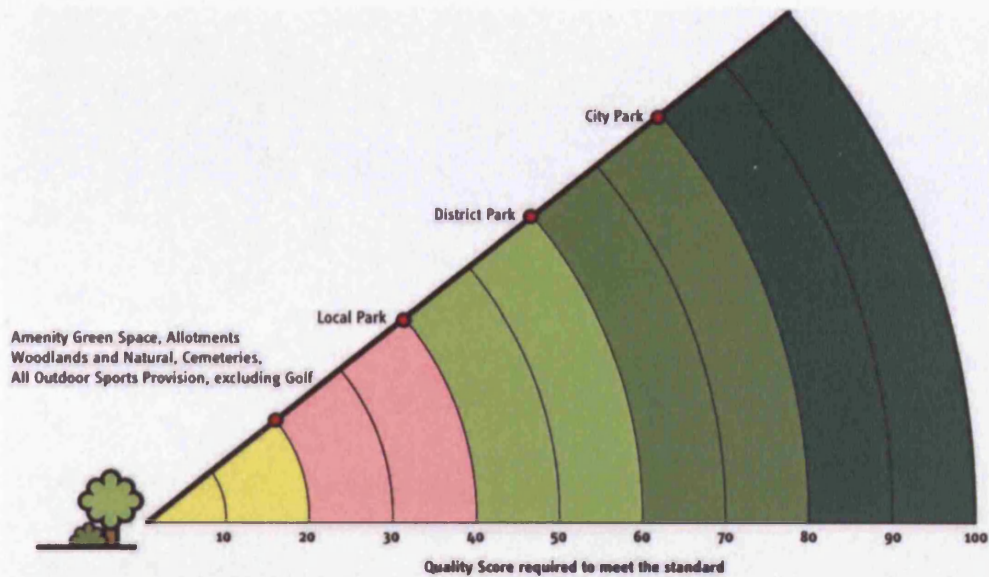


Figure (3-3) Southampton's city green spaces' quality standards

Source: Southampton's Green Space Strategy Summary and Action Plan, could be found online at:

<http://www.southampton.gov.uk/Images/GSS%20Pages%20%20%20%2001%20-%202024%20tcm46-218151.pdf>

The highest score obtainable is 100. For example it would be expected that a local park when audited would get a score of at least 40, however, it could get a score of up to 100 and be an outstanding quality local park. If it scores less than 40 then it would be prioritised for improvement to ensure that it does reach that score.

There are other possible indicators built on the environmental performance of a city and the role of green spaces, mainly trees. Environment specialists admire large trees for their high environmental performance since a small number of large trees can equalize the pollution emitted of one car. More simply is the number of trees per inhabitant. More scientific, would be a quality indicator that took account of the environmental performance of various tree species.

All of these efforts prove that green spaces are very important to urban governments and that they find a need to set standards in order to demonstrate that they are supplying their cities at certain levels of performance in pursuit of a better quality of life for the inhabitants. I now turn to Egypt's attempt to do the same.

3-4- Egyptian national norms for urban green spaces supply

Cairo's cleanness and beautification agency green space typology

The CCBA, which is the responsible organizational body for green spaces in the capital have developed a classification for the green spaces -or green areas as the agency describes them- into 4 categories: (i) Public parks and gardens¹⁹ –the prevailing majority of the green areas in the classification 72% (of the spaces identified); (ii) specialized green areas such as International, Aga Khan and Ibn Sandr gardens (12%); (iii) distinctive green areas such as Azbakia, Ain Helwan and Sindebad gardens (5%); and (iv) ‘self effort’ green spaces with 10% of the total of the four types of green spaces (areas) in Cairo city.

These figures should be taken cautiously, however, since in its report in 2006, CCBA claims that the total amount of green areas in the city is 3038 feddan (1276 hectares), table (3-3), while adding up the reported categories only comes to 1806 feddan (759 hectares). There seems to be a significant 41% of the city's green spaces without classification. Moreover the pay-to-enter schemes are not recorded accurately as there are several parks and gardens that exceed the stated ticket prices by the agency in the table.

Table (3-3); CCBA typology of urban green spaces in Cairo city (2006)

	Area in feddan	Quantity	Percentage	Pay-to-enter scheme ²⁰
Public	1000	258	72%	Free
	308	42		1 EGP in working days.
Specialized	222	25	12%	2 EGP in weekends and holidays
Distinctive	91	17	5%	0.5 EGP in working days. 1 EGP in weekends and holidays
Self efforts	185		10%	---
total	1806		100%	---

Source: CCBA 2006 paper-based report

¹⁹ The differentiation between parks and gardens are not distinctive in the Egyptian context, as most of the green spaces are described as gardens, its very uncommon to call them parks, even if the spaces are larger and functionally different.

²⁰ The information provided in this column is the reporting of the CCBA 2006 report, however, and based on the researcher's own experience, it is not accurate at all, as for example Al-Azhar park entrance ticket is 5 EGP, this park was visited by both the researcher and the main supervisor mid August 2008.

Table (3-4), shows another example of the unreliability of municipal data provided by CCBA. The table shows an interesting comparison between CCBA data published in 2006 (paper-based) and 2010 (the organisation website). The comparison shows many conflicts, such as; an acute decrease in quantity of public green spaces from 300 to 236, which can not be true, as the city did not loss 21% of its public green spaces in the last 4 years. On the contrary and according to the CCBA (2010), the quantity of green space per person has increased from 1.6 m²/person to 1.8 m²/person, (even with the city's population growing more than 600,000 person in these 4 years). Another example is the fixed area of specialized green spaces of 217 feddan in both 2006 and 2010 while their quantity changes from 25 to 24, and the distinctive green spaces changing from 91 to 50, a reduction of 45%. Much of this is unexplainable as is the absence of the 'self effort' green space in the 2010 reporting.

Moreover the city's Arboretum, which is not for public use, is added to the total amount of public green spaces in the city. This shows an ambiguity in the city's green space accounting framework - issues addressed in more detail in Chapter Five.

Table (3-4), comparison between the CCBA's figures for the years 2006 and 2010

	2006		2010	
	Area in feddan	Quantity	Area in feddan	Quantity
Public	1308	300	875	236
Specialized	217	25	217	24
Distinctive	91	17	50	16
Self efforts	185	-----	Not mentioned	
Arboretum²¹	125	31	118	31

Source: The researcher compilation based on; CCBA 2006 paper-based report, and the CCBA online website,2010, cited on 05-07-2010, at, <http://www.ccba.gov.eg/Content/Gardens/default.aspx>

The municipality agency have also neglected to mention any information about an important venue of urban green space supply in the city, which is the private clubs, which is responsible for nearly 60% of the green spaces in Cairo (as reported from my own empirical analysis in Chapter Five).

It clearly makes sense that urban open space typologies and standards are defined and set locally, as national and international standards cannot cater for variant local circumstances, such as differing demographic profiles, morphological features, climatic factors, urban population densities and the extent of existing built development.

²¹ Arboretums in Cairo do not function as usable green space for public; they are mainly nesting areas that provide the municipality with plants and for commercial use, as it sells plants for citizens.

The Egyptian government requires local authorities to develop precise, detailed and current qualitative and quantitative information, by which to establish any locally derived standards and norms for the provision of urban green space within its boundaries. However, there is not a definitive national Egyptian standard or set of norms for urban green spaces. In addition, there are several different ways used to calculate urban green spaces areas or the amount of green spaces per capita when monitoring performance against a norm. Figures for Cairo differ from the lowest of 0.3 m², where only public spaces of reasonable quality are measured, to the highest of 2.5 m², where the area of river Nile, increasing the figure dramatically and giving a false indicator. The most reasonable figure for Cairo, reported in several studies, is the average of 1.5 m²/person (Elzafarany, 2004; Elzamely, 2006).

These figure change from one district to another within Cairo. Elzafarany reports that the Egyptian norms for new settlements and cities is 11-13 m²/person, and urges that this norm cannot be applied to all Cairo due to the high building density of the city, and scarceness of vacant spaces to be used as Green areas. He concludes that the realistic figure which could be achieved is 5-7 m²/person, and that can only be achieved through a restricted municipal policy that converts all the military possessions in the city to green, beside adopting new technical policies to use the mountainous areas to the east of the city as mountain gardens and stepped greenery, and develop the river Nile banks into public water gardens.

Chapter Five presents empirical evidence on the scarcity of Cairo's green spaces, regardless of norms, comparing actual green space supply, measured from remotely sensed sources, with government claims. The findings of that chapter show that norms and government-reported achievement against those norms are one thing; the independently measured results on the ground are another thing. Government agencies have an incentive to use optimistic methods of calculation and producing inflated figures. Norms might be useful in driving public officials to find ways of producing more green space, but in doing that, they may well set up a system that encourages the true's state of provision to be hidden.

I turn now to the theoretical definition of green space. This contrasts with the practical definitions used by green space practitioners and discussed above. Theory is only as good as it is useful. The reason for the following discussion is the need to have thinking tools

that help us make consistent and defensible distinctions between various categories with the domain that we are studying. In particular, in this thesis I need to be able to make a justified critique of the Cairo Municipality's use of the term green space (as I have started to do informally above) and I need a sound basis for classifying various types of green space that is consistent with the manner in which those spaces are used and valued. As the discussion so far in this chapter and in the next shows, the overwhelming preoccupation in defining green spaces and open spaces more generally is in their ownership (loosely defined as public or private). This turns out not to be too useful when it comes to analysing the supply and demand of green space in the city. Citizens have various kinds of demand for green space and a variety of agents are active in supplying to these demands. Government is only one supplier. We need therefore to go beyond traditional urban planning and design taxonomies of green space and adopt a better founded behavioural taxonomy and theoretical underpinning. I do this with reference to the economic theory of public goods.

3-5- Property rights and urban green space as a "public good" dilemma

The theory of public goods (see for example, Cornes & Sandler 1996 and Webster & Lai 2003) gives us some categories to discuss issues of urban green space more efficiently.

Public goods are goods that are infinitely capacious and jointly consumed by an infinite number of co-consumers (Samuelson 1954, 1955, Webster and Lai; 2003). Green space and other public open space is typically treated as a public good by planners and urban designers, who like to talk in terms of 'public realms'. Only in the largest urban parks does one find wilderness that could possibly be described as being in infinite supply such that the consumption of one person does not detract from the consumption of another. Typically, competitive consumption of open spaces occurs as one group of users dominates a space at the expense of others. In Cairo, some parks are the favoured destination of modernist couples who behave in a way perhaps normal in western parks but considered a bad influence on the children of the city's more devout Muslim and Christian families,

who avoid these spaces. Even without group domination, popular open spaces lose their public goods characteristics simply because of numbers. In a crowded open space, one person's consumption, through walking, sitting or some other activity reduces the consumption possibilities of others. In the extreme, on festivals and holidays parks and gardens become so crowded to the extent that there may be no space left to spread out a mat to sit on. The park land in this case has been completely transformed into many private spaces. There are no wilderness-scale parks in Cairo and it may be assumed *a priori* that most of the city's green spaces do not function as public goods. They are congestible and therefore something less than pure public goods.

Private goods, in the economic literature, are those that are not jointly consumed. They are consumed by one individual (or perhaps one household, if the household is the unit of analysis). Cairo's ancient private courtyard gardens are examples of pure private good green spaces. Over-use is prevented by the allocation of private property rights, which give those who hold those rights the power to restrict access.

The economics literature makes a distinction between private, public and club goods. Club goods are goods that are jointly consumed by more than one person (or household), who hold well-defined property rights over that joint consumption, allocated by an organization or individual who has the right to exclude those who do not contribute to the cost of supply. Club goods, thus defined, are similar to so-called local public goods (or spatially impure public good (Webster, 2001)). These are jointly consumed goods consumed by a finite set of co-consumers and where access is controlled in some way by the costs of travel or the effect of distance. An oasis in the Western Egyptian desert provides shared green space for those who dwell near enough to enjoy its benefits. Distance and the rules that evolve among the local communities render this a spatially impure public good. If the rules over who has a right to access the benefits (for example customary water rights) become sufficiently well defined to prevent outsiders freely using the resource, then the local public goods is conceptually and practically the same as a club good. Some writers restrict the term club good to shared goods that are allocated formally by contract. But as the oasis example shows, there is a fuzzy line between formal and informal agreements. The important definitional and theoretical idea is that the collective good is congestible after a certain number of consumers and that the collective users have some control over the number of co-consumers. Clubs may therefore be seen as joint consumption sharing

arrangements that protect over-use. Cairo's tolled municipal parks are a kind of club. The municipality has taken upon itself the role not only of supplying the park but also allocating rights to specific individuals who contribute to the cost of supply. Membership is allocated on the basis a per-entry fee. Apart from the time period, this is no different in principle to the city's private leisure clubs, where access to green space is allocated on the basis of a per unit of time fee (typically monthly or annually in that case). Clubs are a way of supplying shared goods efficiently – in a way that matches demand and supply (from the perspective of club members) and prevents over-consumption.

Green space clubs, whether organised formally by contract or less formally by mutual agreement, may therefore be seen an institution that helps prevent the overuse of the 'urban commons'. It might also be noted that green space clubs (including sports clubs; residential clubs such as condominiums and gated communities; commercial clubs such as malls and office parks; and public park clubs such as tolled entry parks) are an institution that incentivises entrepreneurs to supply more green space. Bundling-in private gardens into a private house is a well understood mechanism that incentivises private house developers to supply green space. Territorial clubs extend this principle to the neighbourhood.

Institutions for securing green space provision

Applying these categories to urban green space: 'public good' green space is open to all and is of sufficient capacity (naturally or by virtue of unlimited investment and management) to accommodate all who have a demand to use it. N , the number of consumers = infinity. For private green space, $N=1$. For club goods or local public goods, $1 < N < \text{infinity}$. The distinction between club green space and spatially impure (local) public good green space is the existence of formal rules. The significance of rules, and of club goods, is that the quantity and quality of a shared good can, in principle, be adjusted to demand by design.

The basic premise of this conceptual model is quite different from that dominating most urban design commentary on public open/ green space. In the latter, the focus is on the type of spaces (parks, medians, squares etc) and on public versus private (by which is meant unrestricted versus restricted access). This leaves no room and an ambiguous language for discussing the shades of grey in the debate, such as privately provided shared

community green space, or indeed publicly provided private green space (such as individual gardens attached to social housing).

Having defined a more useful set of categories and theoretical ideas, therefore, we can extend the logical possibilities for the institutions of green space supply in Cairo as follows:

A. *Public planned, developed and governed unenclosed green space*

(eg. Street medians, squares and the municipal-run gardens free at point of access).

These spaces are typically thought of as public goods but few or none actually are: they are congestible.

B. *Public planned and managed, privately funded (self effort) unenclosed green space*

(eg. Self effort gardens and community parks, which were established using peoples' own funds, but which are still governed by the municipality). These spaces should be thought of as local public goods, however they are very few in the city.

C. *Public planned, developed and governed enclosed green space*

(eg. municipal-run parks and gardens with toll access). These are more like club goods and enclosure means that a higher degree of public goods characteristic can be maintained. These are pay on entry 'clubs'. They can also be captured by certain groups at the expense of other groups.

D. *Public planned and built green spaces with spontaneous club management*

(eg. failed municipal-run parks taken over by resident groups). These are formerly open access gardens that have been captured by surrounding residents who have designed and implemented a more effective institution for maintaining the supply of neighbourhood green space. This sort of spontaneous club management is a successful example of collective action established by residents to face the scarcity of an important commodity. It deprives the 'general public' from using the space by turning a congested or poorly maintained open access green space into a club good that members of the collective action can benefit from, (see Ostrom, 1990). Although the collective action is not common in Cairo, but several cases could be tracked in Madinet Nasr district of pattern Five. This point is elaborated in more detail further in the discussion.

E. *Public planned and private built green space*

(eg. resident-run parks and gardens). These would include gardens attached to private organisation (such as a religious or corporate building) that appear in public plans. They may be open access and subject to congestion of governed as clubs with access restricted to members of the organisation.

F. *Private planned and built unenclosed public green space*

(eg. courtyards and margins of mosques and churches). Although these are typically open access, possibly with opening times, the governing organisation maintains a right to control access and could take action to ration the space if it became unacceptably congested.

G. *Private planned and built club space*

(eg. recreational clubs and gated residential estates). These are the private recreational clubs that provide a leisure environment for so many of Cairo's middle and upper class families.

H. *Private planned and built green private space*

(eg. palaces, private gardens). Private gardens are relatively rare in modern Cairo because of the dominance of apartment buildings. Some still exist in the ancient and renaissance parts of the city. In the modern suburbs, town house style housing has appeared, producing private green space via the housing market. Another example is the enclosure and capture of the surrounding garden for any multi-store residential building by the ground floor residents, which is considered to be a privatization of the local public good.

This typology of green spaces is based on the consumption characteristics of the space concerned and provides a more nuanced, sophisticated and theoretically well-founded typology than the kind of professionally-used typologies that have been discussed so far in this chapter. Figure (3-4) schematises the typology in terms of a continuum between pure public and pure private green space public goods.

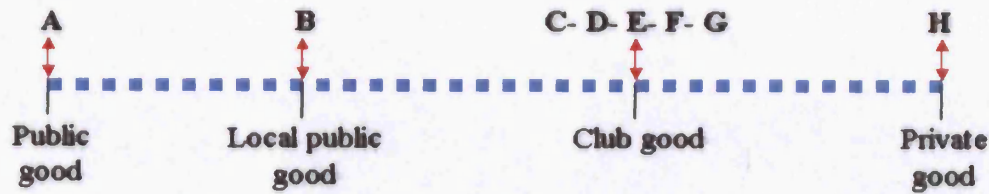


Figure (3-4) Public/ Private good continuum

Source: The researcher, based on (Webster and Lai, 2003; Webster, 2007; Kafafy and Webster, forthcoming)

Demand for open access green space is not the same as demand for private access green space. In the former, the object of demand, a park for example, is used by many people. They all have a demand for the same piece of land. If you asked people how much they valued – were willing to pay for – the park you would get the collective demand by adding up the valuations (willingness to pay) across all individuals (for a technical discussion see for example Samuelson 1955, Johansson; 1993). To get aggregate (social) demand for a collectively used good you therefore have to sum the willingness to pay (or other measure of demand or value). This is not the same with private gardens. To get the aggregate demand for private gardens, you sum over the number of gardens (or houses with a garden or particular type of garden). This is because gardens are divisible green spaces –divisible legally such that an individual household can express its demand for a single garden through the price mechanism. Where individual property rights are not clearly allocated over green space (as is nearly always the case with open space) it is not divisible; a price cannot be easily specified and collective action problems are likely to prevent the supply of green space in a way that satisfies users demands. Ostrom (1990) identifies a number of basic design principles that characterise the groups that are able to organize and govern their collective action behaviour successfully. These principles include: a) Group boundaries are clearly defined. b) Rules governing the use of collective goods are well matched to local needs and conditions. c) Most individuals affected by these rules can participate in modifying the rules. d) A system for monitoring members' behavior exists; the community members themselves undertake this monitoring.

It is clear that this sort of highly organized agreement among residents is really difficult to achieve in an urban setting; and this is why collective actions typically fail in

practice. However, it have been achieved in the case of public planned and built green spaces with spontaneous club management (*Type D*) where the homogeneity of residents and collective willingness to participate in preserving a high quality green space have secured the success for these collective actions groups. However, it should be noted that this sort of collective action has emerged at the expenses of others by depriving and excluding them from using and accessing the green space. There is a trade off in cities between open access with a high risk of degradation on the one hand, and club access with better resource protection but unequal access. These themes are developed further in the empirical chapters of this thesis.

Specified simply, the collective action dilemma is as follows: since there is no price system and system of clear property rights over use of the green space, individuals have an incentive not to reveal their true preference for such spaces. They are likely to express a lower willingness to pay if asked, or to not be forthcoming with voluntary contributions if asked, preferring to wait for others to contribute. If others contribute, but they do not, the green space that they all demand is provided anyway at no cost to the non-contributing individual. If all pursue this logic, the good either doesn't get provided at all or is underprovided (see Webster and Lai 2003). The traditional response to this in the twentieth century was for governments to supply green space. Hence the idea of open space standards. Government provision on the basis of taxation revenue is only one type of supply institution however and later on in the thesis I explore others, including traditional institutions and modern market institutions.

As already discussed in various ways, there are two fundamental problems when considering public institutions for supplying green space in cities: (a) the quantity of space provided and (b) the quality. The quantity of public access green space is a function of public funds available and public demand. The quality is also a function of funds and demand. There is a trade off – which is an important issue when it comes to green space standards. For a given budget, less quantity means more quality: more quantity means less quality. With publicly provided green space it is difficult to get both quantity and quality right. The most pressing problem is quality – securing adequate investment to get good quality design and materials and putting in place the governance institutions to sustain those spaces as well managed and attractive locations. Privately supplied green space doesn't face the same degree of problems since, where green space is bundled into

property sold on the market, price helps determine how much green space is wanted. Price takes care of the quantity problem and the institution of private property generally takes care of the quality problem.

To address this challenge, we need to understand the dynamics behind the supply and demand of green space. In all but the wildest wildernesses of the world, green space is a commodity: it is supplied, by private and public individuals and agencies in response to a set of private and public demands and preferences. So we need to understand both the patterns of preferences and the actions that deliver and destroy green space. In particular, we need to understand the institutional mechanisms that create, maintain and govern green spaces.

There are four extreme possibilities in respect to the economics of Cairo's unusually scarce green spaces. First, its residents do not have a strong preference for greenery and so there emerges little effective resistance to the shrinkage and the limited extent of new green spaces. Second, they have a preference but there is a collective action problem: there is a demand but either the government or the market fails to deliver an adequate supply. Third, there is a demand, which the market is incapable of meeting because of the public good nature of green space, but which the government partially meets through taxation and investment. Fourth, the government is unable or unwilling to meet a demand for green space but profit-seeking and social entrepreneurs discover ways of doing so. So we have the possibility of no demand; simultaneous government and market failure; government success and market failure; and government failure and market success. These are extremes and we might expect different neighbourhoods in the city to perform differently depending on the government and market institutions prevalent at the time of development and on the current social, economic and governance dynamics. In Chapters Five and Six, I examine the evidence of government and market failure in supplying collectively consumed green space in Cairo in different parts of the city at different historical periods and under different institutions.

Framed in this way, the economic dynamics of open space in Cairo are no different to those in any other city (Webster, 2002, 2007), save that nature provided a limited initial endowment (beyond the narrow reach of the Nile Delta) and a continuing threat through desertification. The endowment problem might suggest that the city's green space

'economy' is special in another way, however. Scarce stock and high population density might lead to high demand. Following the normal laws of demand and supply, greenery is made doubly scarce by natural conditions and the recreational, aesthetic and related needs of 18 million people living in metropolitan Cairo at an average density of up to 806 people per hectare (GOPP, 2006).

But if it is valued highly, why is it so under threat? At a fundamental level, the answer lies in basic land economics: very high population density means very high land values, which means a very high opportunity cost of open space. But if the people living at a high density have a positive demand for green space then I would expect that demand to surface through experimentation with various mechanisms of collective action. Different mechanisms might be expected to have operated at different periods of the city's historical development – which might be viewed as a process of institutional evolution (North, 1990, 1994, 2006). We might also expect to find evidence of contemporary institutional experimentation at various spatial scales as the people of Cairo search for more effective ways of cooperating in pursuit of better standards of living. I return to this idea in the empirical chapters of this thesis, where I report various types of green space supply solutions and various kinds of response in terms of valuation, demand and consumption behaviour.

3-6- Conclusion

Urban green space typology used in this thesis

Urban green space as defined in this thesis is simply any urban open space that possesses any kind of greenery (trees, shrubs, grass or flowers), no matter what the type of ownership or property rights (public or private), or what type of consumption operates in the space (public, local public, club or private). Property rights and consumption types are approaches that help further refine and classify green spaces beyond this basic definition. Adding these attributes to the simple definition, gives the working typology of green spaces in Cairo used in this thesis. This includes:

- *Public parks and gardens* – including neighbourhood, town, country parks and gardens
- *Play spaces* – pitches, adventure playgrounds and outdoor play facilities.
- *Natural and semi-natural green spaces* – urban wildlife parks, wetlands, green belts and post-industrial land green lands.
- *Amenity green spaces* – residential squares and public spaces around buildings and informal recreational areas.
- *Provision for children and young people* – children playgrounds and yards, children's play facilities for special activities.
- *Functional green spaces* – publicly accessible cemeteries, mosque yards, churchyard and burial grounds.
- *Community gardens and fields* – Allotments, urban farms and urban agriculture.
- *Green corridors* – including linear green space, canals and riverbanks, disused railways.
- *Public spaces*: including streets, civic squares, market place, and residential roads.
- *Greening of urban vacant and derelict* and uncared lands.
- *Road verges* and green medians
- *Self effort gardens*,
- *Domestic and housing green spaces*,
- *Privately owned green spaces* - such as sports and family clubs with membership to enter
- *Arboretums*.

The last four categories would typically be categorised as private space in urban design and policy commentaries. Since most green spaces in cities are in private hands, it makes little sense to define the concept of green space in a way that excludes private spaces (see Chapter Four for a discussion of green space as a general urban asset with city-wide systemic benefits). Most private gardens confer benefits on more than one person or household – via spill over benefits (Chapter Four) and visitors. Private landowners should therefore be seen as an important supplier of urban green space. The spaces they provide may individually cater for lower numbers of consumers but in the collective they may well provide for many more numbers than open access urban green spaces, which perform a different kind of function.

The institutions governing supply have changed over time, with market conditions and government policy or lack of it. To varying degrees, both government and market have failed to provide adequate in most of the city's neighbourhoods, to be elaborated in detail in Chapter Six. Throughout the city, municipally supplied parks are supplied as club goods through entrance tolling. The majority of the green spaces in Cairo are supplied through institutions that assign access via private or formally shared property rights, meaning that they are provided as either private goods or entrepreneurially or government-organised club goods. In a coarse classification that measured green space from remotely sensed and map data, it was estimated that 67% of the urban green space in Cairo is privately supplied, while 33% are publicly supplied. However only 1/3 of the publicly supplied can be considered pure public good, which are provided publicly and are free to enter, (CCBA, 2006), which means that only 11% of Cairo's urban green spaces are pure public, while nearly 90% are either club or private goods.

The enclosure of Cairo's 'urban commons', is interpreted to be a necessary institutional adaptation. It preserves the quality of municipally supply green space and it induces a greater quantity of supply of private and club green space. The following section of this thesis quantifies the benefits of urban green spaces and drops the shed on their importance in enhancing the built environment and the quality of life.

Chapter Four

Benefits, values and functions of urban green spaces

Introduction

Public urban open green spaces can accommodate all people, regardless of gender, ethnic origin, age or beliefs and can act ‘as a democratic forum for citizens’²² and their societies. However, to function in the ideal way in which they are typically imagined to function, they must be well designed, accessible, subject to re-investment when needed and well maintained. If they are meant to be open to all in a city (infinite demand – see the discussion in Chapter Three) then they must be designed, financed and governed in a way that is appropriate to such a vision. With many open spaces provided by governments, this condition does not hold, however: physical and institutional design do not match. For this

²² See (UE Associates 2009. sustainability appraisal and strategic environmental assessment for the lee valley regional park development framework).

reason, various institutions have emerged over time to preserve the benefits of green public spaces. Inevitably, the result is something less than public: spaces are enclosed and charged for in order to limit their use to a level appropriate to the design of the space and associated facilities. In this chapter, I review the benefits of green spaces including that which is provided as open access space and that which is provided as limited access space.

If these public open spaces are well designed and cared for, they bestow the communities they serve with several merits. These spaces 'shape the cultural identity of an area', contribute to forming its 'unique character' and 'provide a sense of place for local communities'. It should be noted that this is true whether the community served is a local community or a dispersed community.

Large scale green open spaces help in air circulation, and thus help to enhance the movement of hot and polluted air. They do this by the exchange of gases and also benefit the urban environment by reducing the number of roads and therefore the pollutants caused by vehicles.

Burden (2006) argues that '*Although care and maintenance of trees and urban open spaces is a costly provision, the value in returned benefits is so great that a sustainable community cannot be imagined without such important features*'. For this reason, the view is taken in this thesis that any institution that has the effect of increasing the supply of green spaces and their related benefits should be considered in a city's green space planning. This is particularly important in an arid city where the level of supply, for historical and contemporary reasons is so low. Hence in Chapters Six, Seven and Eight I look at private green space alongside public green space as part of Cairo's vital green space supply mechanism.

This chapter, however, is about benefits regardless of access, although some of the benefits may be better or less well supplied by a private or public supply mechanism. A categorization of the various dimensions of benefits will ease the discussion later in the thesis. The categories of benefits chosen, emerging from the literature, are: environmental, economical, social, health and human well-being, safety and aesthetical. The purpose of the chapter is to give an overview of the range of benefits and, where appropriate, of the evidence for those benefits. It is a descriptive account in the main, choosing not to

critically evaluate the claims in any depth (that would be a PhD thesis in its own right) but merely presenting the claims and evidence in an orderly fashion as a background to my own analysis of demand and valuation of Cairo's green spaces reported in Chapters Seven and Eight.

4-1- Environmental Benefits

Figure (4-1), summarises the different environmental roles of GS, which the rest of this section elaborates.

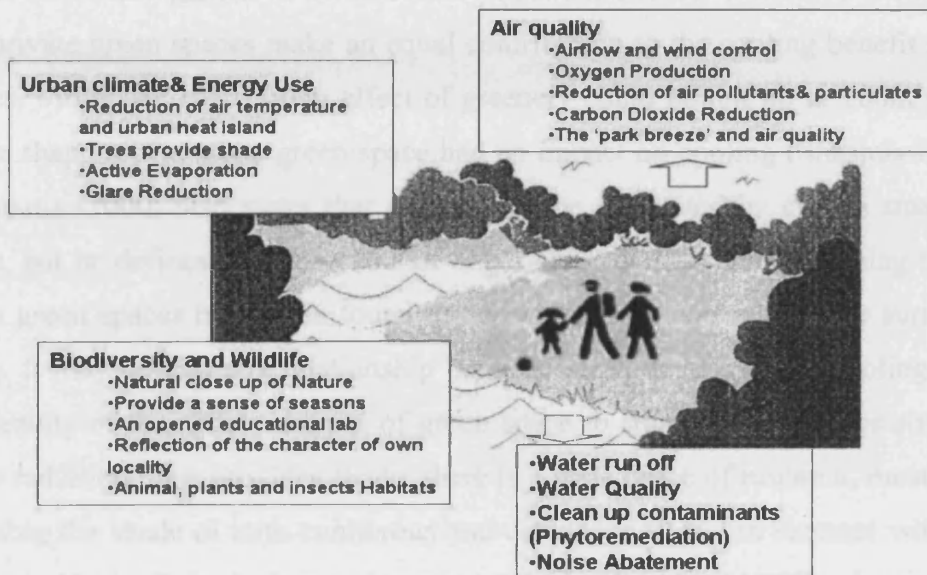


Figure (4-1) Environmental benefits of urban green space

Source: Author's own summary of the main environmental benefits recorded in the literature

Urban climate and Energy Use

Urban greenery plays an important role in enhancing built environments as greenery has a lot of influences on many climatic aspects, including the control of air movement both in direction and speed and reduction of temperatures (Communities and local government, 2007). The following section demonstrates the various climatic benefits of urban green spaces, drawing from selected published research.

Reduction of air temperature and urban heat island

The proportion of GS was revealed to be the greatest influence on the ecology of four urban areas on Merseyside, UK (Whitford et al, 2001). When comparing the different urban areas Davies and others (2008) noticed that places with the greatest number of trees had better 'carbon-storage capacity'²³ and temperatures were 7°C lower on average, in the areas where vegetation cover was 50%, compared to urban areas where the vegetation cover was only 15%. (Whitford et al, 2001; CABE, 2004a).

Recent research in Tel Aviv²⁴ showed that the presence of trees and greenery resulted in a significant cooling affect of air temperature ranging between 1°C in a heavily trafficked street to 4°C in a small garden of 0.15 hectare²⁵ (CABE, 2004a). This establishes the fact that small private green spaces make an equal contribution to the cooling benefit as larger green spaces. Moreover, the cooling effect of greenery could be felt up to 100m from the site, and the shape of the urban green space had an impact on cooling (Shashua-Bar et al, 2000). Upmanis (2000) also states that cooling can be facilitated by even a small urban green space, but he defines these as parks of only one or two hectares, claiming that such small urban green spaces have been found to be two degrees cooler than the surrounding urban areas. It may be that any relationship between size/ownership and cooling may be due to the ability of the different types of green space to support trees. Trees absorb and reflect solar radiation, thus provides shade; there is a wide range of research, mostly in the US, addressing the shade of both coniferous and deciduous trees - in summer with leaves and in winter without. Tree shade on a hot summer's day is valued by all cultures (Gill, et al, 2006) but especially in hot arid regions where natural shade has immense value. Coder (1996), draws attention to the benefits of trees in providing shade especially on hot days and in arid contexts, reporting temperature differentials of 5 to 15° F when walking under tree canopied linear spaces and streets. As context and in contrast, he also reports that urban spaces are 3 to 10° F warmer than surrounding countryside because of urban related factors, such as decreased wind flow, high density surfaces and heat generated from human associated activities.

²³ pp.15

²⁴ A capital city in the hot arid dry zone of the middle east

²⁵ Equivalent to approximately 1500 m²

This is part of a growing body of evidence showing that urban green spaces make a positive contribution to reducing the urban heat island (UHI) effect ‘*metropolitan area which is significantly warmer than its surroundings*’²⁶. The main cause of the urban heat island is modification of the land surface by urban development; the second most important cause is waste heat generated by energy usage. The United States Environmental Protection Agency (EPA), states that:

*"... important cause of changing in energy balance is the lack of vegetation in urban areas, as vegetation is replaced by asphalt and concrete for roads, buildings, and other developing structures which are necessary to accommodate growing populations, These surfaces absorb - rather than reflect - the sun's heat, causing surface temperatures and overall ambient temperatures to rise."*²⁷.

Different heat capacity and thermal conductivity therefore causes a change in the energy balance of urban areas, leading to higher temperatures than surrounding rural areas. Roloff (2006) states that cities are "heat islands" that are usually 5-9 degrees hotter than the surrounding rural areas, and that ‘trees can reduce utility bills for air conditioning in residential and commercial buildings by 15-50 %’; they are a natural ‘low-tech’ cooling device.

Quite obviously, heat island moderation effects occur at a city scale and green spaces make a contribution whether private or public. This thesis’s main focus is on understanding the processes of supply of green space and the revealed and stated preferences of individual users. It is clear from the demand analysis in Chapter Seven and Eight that some individuals appreciate the wider city-system benefits of greenery. An interesting question for further research is the degree to which private and public green spaces contribute to systemic benefits such as heat island moderation. As already suggested, there may well be a systematic relationship between ownership, size and funding mechanism on the one hand and the density of vegetation on the other (including the number, type of and performance of trees).

²⁶ Wikipedia, cited in 15/11/2007

²⁷ Wikipedia, cited in 04/05/2010, <http://wiki.aia.org/wiki%20pages/green%20roof.aspx>

Active Evaporation

The performance of trees is important to the city-wide benefits of green spaces. Coder reports that as much heat is dissipated on a fifth of an acre house lot (approximately 809 m²) with '30% vegetation cover, as running two central air conditioners. Moreover, a 17% reduction in building cooling can be achieved by active evaporation of trees' (Coder, 1996).

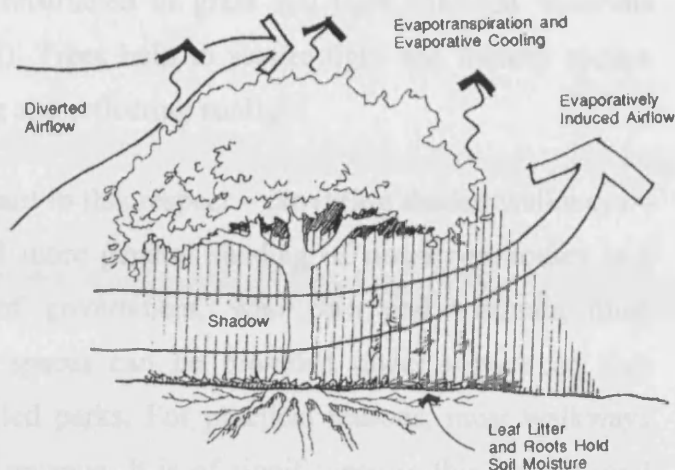


Figure (4-2) Urban green spaces' trees vital role in active evaporation

Source: Motloch, 2001:79

The importance of active evaporation is not only in reducing temperature, but also in saving energy, money and reducing the amount of harmful emissions produced from the excess usage of air conditions. Historically, of course, arid cities used trees in courtyards, open green spaces and water features together as primitive air conditioning technology.

The institutional innovations that have made club spaces so popular in recent decades and that have provided financial incentive to developers to supply greater quantities of trees and other greenery, can therefore also be seen as innovations in urban air conditioning. While many may be exclusive, they have spill over benefits to the rest of the city. The municipally supplied parks of Cairo, discussed in subsequent chapters and paid for by entry fees, are thus able to sustain well maintained lush vegetation.

Glare Reduction

The Cambridge dictionary definition for glare is “to shine too brightly”, while Wikipedia states that “*Glare is difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlamps at night*”²⁸. Greenery provides spaces in an arid city that give relief from the sun’s glare. All kinds of greenery from grass to high trees plays a role in this. Glare is not only a problem of direct solar radiation, but of reflections of the sun from buildings constructed of glass and light coloured materials (Federer 1976, quoted in Woolley 2003). Trees help to scatter light and thereby reduce light intensity as well as directly blocking and reflecting sunlight.

Street tree planting is particularly important in this respect – providing shaded walkways – and this means that glare reduction and more general shading of pedestrian routes is a particular green space responsibility of government, who own and maintain most walkways. Most other kinds of green spaces can be provided under private or club ownership or by government owned tolled parks. For practical reasons, most walkways have to be provided on the basis of tax revenue. It is of significance in this respect, as I show in Chapter Six, that the neighbourhoods in Cairo with the most extensive street planting are in the city’s renaissance quarters, constructed when the city was under the influence of westernization, as the original designers and planners of these neighbourhoods were Europeans who were stimulating their own contexts’ features and concepts of green city on one hand, and were not used to Cairo’s high temperatures and therefore encouraging a particularly strong demand for publicly funded street trees on the other hand.

Air quality

Airflow and wind control

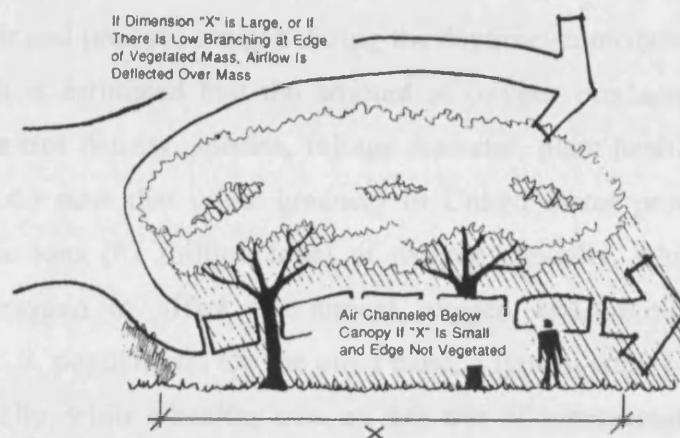
Wind flow can be characterized by three determinates which are wind speed, wind profile and turbulence. (Woolley, 2003). It has been claimed that the environmental classical aim of building with respect to wind flow has been neglected in twentieth century city development, as many cities have adopted row houses and other morphologies which suit

²⁸ [http://en.wikipedia.org/wiki/Glare_\(vision\)](http://en.wikipedia.org/wiki/Glare_(vision)), First cited 13-11-2007

car users and other utilities. This has tended to increase wind flow in some areas and deprive other urban areas of proper airflow.²⁹

Figure (4-3) Urban green spaces' are used to divert wind flow

Source: Motloch, 2001:83



Trees not only block unwanted winter winds, but also can be planted to funnel airflow to certain areas and to baffle away wind from other areas. Both vertical and horizontal concentrations of foliage are used to change airflow movement (Salim et al, 2009). In cold weather areas, trees can be used as windbreaks around homes and residential blocks shielding against wind and snow to reduce heating costs by as much as 30% (Roloff, 2006). Urban green spaces with their palms, trees and green cover have always played a purification role for cities and settlements in arid regions. and the green belts around arid cities form a first line of defence in the face of desert sprawl and sandy winds.

While foresightful urban designers and public open space designers might pay attention to wind performance of their designs, designs are likely to be more environmentally efficient, the more the developer can directly benefit. Put another way, if the benefits are internalised, a developer will have the incentive to design with environmental dynamics in mind. This might suggest that green spaces that are designed as integral parts of residential and other urban projects – in such a way that the value of the properties increases – are likely to be more environmentally sophisticated.

²⁹ In many desert arid countries, wind saturates with desert sand which damages sight and causes many health problems. This was solved in ancient time by traditional bending road systems that not only decreases the speed of wind flow, but also purifies the wind from suspended sand particles.

Oxygen Production

It is well known that green spaces are the lungs of any settlement, as plants generally absorb carbon dioxide from the air and produce oxygen during the daytime, contributing to the process of air purification. It is estimated that the amount of oxygen produced per acre³⁰ depends on factors such as tree density, species, foliage diameter, plant health and rate of growth. Nowak et al. (n.d.) state that urban greenery in United States produces 'approximately 61 million metric tons (67 million tons) of oxygen annually, which is considered to be an enough oxygen to offset the annual oxygen consumption of approximately two-thirds of the U.S. population'. On the other hand, a typical adult person consumes 386 lb of oxygen annually, while a healthy tree, an Ash tree of approximately 9 meters height, can produce nearly 250 lb of oxygen annually, which means that two trees can easily supply annually the oxygen needs for an adult person (Alexander, 2007). Another figure claims that a large tree can produce enough oxygen for the daily requirements of ten people (treesintown website³¹; CABE, 2007; treesforcities website³²). Coder (1996) cites another figure: 'one acre of trees (approximately 78 trees) generates enough oxygen each day for 18 person.'

Oxygen production from trees is a reasonably pure public good. Whomever the tree is owned by and wherever it is located, it will contribute to the health of everyone else in the city (or at least to those within the radius of oxygenated air dispersal). From the point of view of oxygen benefits, therefore, private green space is as important as public. If the market can be induced to increase green space supply through defining property rights over it (as discussed in Chapter Three) then urban oxygenation can be thought of as a positive externality of the urban design resulting from club neighbourhoods.

Reduction of air pollutants, and particulates

Air pollution is a major threat to environmental health in urban areas and has no regard for political and economical boundaries. One can be living in a superior urban area, but still suffering from pollution generated in nearby areas of the city. The larger the scale of polluting industries, the more ubiquitous the spill-over effect. The sun has rarely be seen in

³⁰ The acre is a unit of area which is equal to; 4,840 square yards or 43,560 square feet or 4,046.8 square meters

³¹ www.treesintowns.com

³² www.treesforcities.org

a blue sky in Beijing over the past decade and ‘the midday hazy glare eventually gives rise to an equally indistinct sunset’³³. The city’s rich and poor neighbourhoods are equally affected. In developed countries with a more stable distribution of industry and tighter environmental controls, it might be expected that the housing market eventually internalises the pattern of pollution so that polluted areas become cheaper than others, as happened in the east side of many UK cities, which were more susceptible to wind-driven pollution due to the prevailing winds coming from the west.

Today the main producers of air pollution are still industrial processes, but also increasingly motor vehicles consumption (European Environment Agency, 1999). These pollutants include many unhealthy metals and lethal components such as sulphur oxides, carbon monoxide, nitrogen oxides, hydrocarbons and carbon dioxide. Measuring such pollutants in the air depends on several factors that can vary through distance and time. Woolley (2003) notes that the blanket of pollution that covers most urban areas hinders radiation from escaping, which in turn, raises temperatures dramatically. Some estimates suggest that in heavily polluted areas the increase in temperature may reach 10°C.

Urban trees help improving the urban environments air quality (Nowak, n.d; 2007; 2008), by cleaning the air through different processes that include: (a) Intercepting and slowing particulate materials causing them to fall out and (b) Removing gaseous pollutants by absorbing them with normal air components through the stomata in the leaf surface. Removal of particulates according to Coder (1996) can amount to ‘9% when air passes across deciduous trees and 13% across evergreen trees’ and street level particulates can be reduced by up to 60% by trees. Pollutants partially controlled by trees include nitrogen oxides, sulphur dioxides, carbon monoxide, carbon dioxide (required for normal tree function), ozone, and small particulates less than 10 microns in size, which are all harmful if exceeding the safe amounts in the environment.

Another sort of enhancement of air quality through green space is the park breeze, which is defined as a gentle wind blowing from the park out to the adjacent buildings. This is a local climatological effect caused by differences in temperatures – much as wind often blows on and off shore on the coast at different times of the day. Poor air quality in a town may be helped by the fresh air blown out from the parks. Indeed, it has been found that air, even in

³³ Personal communication, Professor Chris Webster

small parks, can be purer than adjacent urban areas, even in case of being close to heavy traffic. However, park breeze and the park climate island effect depends on the city's layout and the wind direction. (Upmanis 2000, quoted in CABE, 2004a).

This suggests that public planning might be necessary to optimise air-filtering effects of design. Apart from very large scale units of development, private green space planning tends to focus on individual lots. While this may allow it to optimise other environmental performance dimensions of green space such as tree density and shade design, private developers cannot often optimise the design of multiple blocks or lots. Indeed, this is precisely why public planning is necessary – to coordinate the private plans of individual for greater social gains (Webster and Lai, 2003).

Hydrology

Many researchers have noted that new urban development introduces artificial surfaces that are non evaporative, smooth and non-porous and have the effect of increasing water volume, velocity of run off. The result is increasing problems of water quality deterioration, losses, erosion, and flooding. Such problems can be partially solved with urban trees and greenery, helping by intercepting, slowing, evaporating and storing water through normal tree functions. Green infrastructures are not the final solution for water run off problems, but present a line of defence. Coder (1996) reports that 'evergreen trees intercept and evaporate 22% of winter water precipitation and run off, while deciduous trees intercept and evaporate 7% and that water run off is reduced by approximately 2% for every 5% of tree cover area added to a community'. Coder also notes that urban tree canopies in a medium sized city reduced the volume of a six-hour storm flow by 7% and reduced the volume of a twelve-hour storm flow by 17% (11.3 million gallons in the city studied).

Clean up contaminants (Phytoremediation)

Phytoremediation is defined as “*The use of plants to clean up or remediate contaminated soil, sludges, sediments, and ground water through contaminant removal, degradation*” (USEPA, 1998). Westphal & Isebrands (2001) state that ‘phytoremediation has been used extensively in Europe in modern times and has become popular in North America in the last 20 years’, as it has been observed that there are several advantages to the technology when compared to other clean-up technologies. In an aesthetic, natural and passive way, ‘plants can effectively and economically remove, degrade, or contain contaminants’. Furthermore, phytoremediation can bring the benefits of a green environment to those who ‘live, work or play near the phytoremediation site’. This can lead to social benefits and a sense of ‘redressing past environmental injustices’.

Phytoremediation is a local intervention designed to optimise the use of a particular site with particular contamination problems. It is as likely to be used therefore by private green space suppliers as public. Heavily contaminated sites in a city may well require public subsidy for remediation on the basis that land restoration creates positive externalities for the wider urban community.

Noise Abatement

It was widely acknowledged that urban spaces and trees have a significant impact on noise reduction. Soft walls of greenery and trees not only shape spaces and create boundaries, but also create noise isolators (Papafotiou, 2002; Chinh, 2007; Pathak, et al, 2008). Coder (1996) reports that by reflecting and absorbing sounds, trees decrease noise by 7 db per 100 feet of forest while solid walls decrease sound by 15 db. He also adds that trees provide what he loosely calls “*white noise*“ which he defines as “*the noise of the leaves and branches in the wind and associated natural sounds that masks other man-caused sounds*”. (Coder, 1996)

Heisler in 1977 reviewed results from research on trees and noise reduction, making the following points: (Heisler, 1977, quoted in Woolley, 2003)

- The higher the level of noise, the wider the green barrier needed.

- Leaves rustling, birds singing, animal wildlife scenery all together can affect the perception of noise because the perceiver becomes engaged with the immediate natural noises, which partially mask the surrounding noises.
- Trees in urban green spaces can act as a psychological barrier between people and a noise source; the visual impact of the vegetation screen decreasing peoples' consciousness of the noise source.

The impact of trees on noise reduction is a complex issue, as it depends on the type of noise, the type of planting and trees, and the perceptions of noise. Private developers have the incentive to plant noise reducing vegetation in order to optimise the value of their real estate, especially where their land adjoins a noise-polluting land use. On the other hand, governments are typically best placed to plant noise-reducing vegetation along express roads. The green medians and vegetative buffers lining the express roads in many developing countries, ring roads and airport express routes for example, typically produce surprisingly high quality green recreation spaces as well as creating noise, sight and air pollution buffers.

Biodiversity and Wildlife

The principles underlying the design of Britain's Victorian parks included the provision of rich, stimulating places for rest and relaxation as a refuge of the growing grimy industrial city (CABE, 2006a). Such vision is repeated in public parks in cities around the world. (Goddard et al, 2010). The term biodiversity used to mean wildlife, but should more properly mean the whole range of species found in a place. An urban park includes the biodiversity of different mammals, birds, butterflies, species of insects and types of trees, grass and cultivated plants, as well as many hundreds of species of micro organisms, fungi and so on.

Provide a sense of seasons linking the natural world with the urban environment

Seasons can be easily recognised from the tree foliage – the dropping of leaves in the autumn, buds in spring and flowers in summer. For more experienced people seasons can be 'read' in many other ways from the natural world, such as the migration of certain

species to different places and the appearance of different species of birds, animals, plants and insects.

An opened educational lab for the whole community

Green space provides a communal experience for experiencing and learning: not only for the scientifically oriented members of the community but children. Playing in green space becomes engraved in their minds and memories: it helps in shaping their character, provides a better mental life and is an important source of information about the cycle of life and the importance of different animals, plants and insects and their role in life.

Urban green spaces and parks are places for exploration and adventure; and they provide a variety of natural forms in contrast to the man-made environment of the city. Even the simple knowledge that a natural area exists, is actually, for many, a source of satisfaction as an 'existence value'.

Biodiversity and the character of a locality

Biodiversity both helps create and reflects the character of a locality, and supports the individuality of a place. This applies to the particular fauna-flora mix and as well as the morphology and texture of green spaces and infrastructure. The mix of or uniqueness of tree species and their distribution – and even individual prominent trees can create a landmark for a place and a unique feature for it. For example, the palm-sided royal ways for palaces in Egypt is a feature denoting luxury and is characteristic of governmental palaces, where the huge Teen Banghaly trees are also a feature, being planted more than a hundred and fifty years ago. People recognise destination when seeing these huge landmark trees.

The relationship between biodiversity and the ownership and size of green space is an interesting one. As implied earlier when discussing Victorian parks, the biodiversity of well stocked and well maintained parks can be high. The biodiversity of private gardens, however, is even higher, (The reading Biodiversity action plan, 2006). There is evidence, therefore, that biodiversity can be best achieved by the privatisation of green land, producing private gardens. If there is an intrinsic value in biodiversity, this is a relevant

consideration in the planning of a sustainable city and biodiversity and social access to green space to some extent stand as opposing objectives.

4-2- Economic benefits

“An attractive environment is likely to influence house prices. Houses in attractive settings will have an added value over similar, less favourably located houses. This effect is intuitively felt.”(Luttik, 2000)

It is intuitively obvious and backed up by many research papers that a high-quality public environment can have a significant positive impact on the economic life of urban environments. Towns compete with each other to attract investments and neighbourhoods compete to attract residents. Good parks, squares gardens and other public spaces become a crucial in creating privileged spaces.

Estimating the economic value of open green space would seem, in principle, a difficult process because green spaces provide several functions simultaneously. However, with hedonic modelling methodology, so long as data can be captured for the many various on- and off-site determinants of property price (such as number of rooms and proximity to shops) then green space variables can be used to capture the impact of the various attributes of green spaces. The most usual is a ‘distance to green space’ variable, although more sophisticated studies may include size, quality and function variables. Hedonic studies that estimate the value of green space through the surrogate housing market include (McDougall, 1976; Kanemoto and Yoshitsugu, 1988; Parsons, 1990; Gat, D. 1996; Ready, et al. 1997; Malpezzi, 1998; Orford, S. 1999; Le Goffe, 2000; Luttik, 2000; Michael, H. J. et al. 2000; Taylor and Smith, 2000; Anthon, et al, 2005; Jim and Chen, 2007; Kong, et al, 2007)

Hedonic modelling is a well developed method of estimating the economic value of green space. It cannot easily, however, measure wider economic benefits, such as the attractiveness of a city or part of a city to investors; or the impact on the economy of the better health that comes through more greenery. Figure (4-4) summarises a wide range of economic benefits of green space that go beyond the traditional hedonic approach. The

question is, does the existence of urban green space affect people's choices of where to live or to move to/from?, the following section is a brief demonstration for the issue.

Figure (4-4), The different economic values of urban green spaces

Source: Author's own summary of the economical benefits



The positive impact on property values

In his hedonic modelling research, Luttik (2000) covered 8 different regions in the Netherlands, and found that the largest increase in house prices due to an environmental attribute (increasing value by +28% holding other things constant), was for houses with a garden facing water. A pleasant view of an open space led to an increase in house price of '6-12%'. In addition, the research analysis revealed that 'house price varies by landscape type', where attractive landscape types 'attract a premium of 5-12% over less attractive environmental locations'. Luttik adds that: 'A garden bordering water can increase the price of a house by 11%', while the view of a park increases it by 8% and having a nearby park without viewing it from the property increases the price by 6%. On the other hand, properties with a view of an apartment block are reduced in value, other things being equal, by 7% (Luttik, 2000). A similar picture emerges from research in Dallas (CABE, 2004a), where many residents cited the public green spaces running to the rear of their houses as a major factor in their decision to move to the area. Nearly two thirds of these residents believed that the presence of the green spaces have elevated the value of their homes by at least 15 %. Interestingly, half the people who did not have green spaces at the back of their homes, on the other hand, said they would prefer to have this kind of communal green area close by, even if that would be at the expense of their own private open space. This suggests that certain types of communal green space (evidence suggests larger spaces) are preferred over private green spaces (gardens). It might be conjectured

that this preference relationship might hold down to a certain minimum size of private green space. The balance of preference – public green space as a substitute for private green space – is a rich and interesting empirical question. CABE (2004a) reports that ‘in 1980, 16% of Denver residents said they would pay more to live near a greenbelt or a park. By 1990 this figure had risen to 48%’. In Berlin in 2000, ‘proximity to playgrounds in residential areas was found to increase land values by up to 16%’. In the same study, a high number of street trees resulted in ‘an increase of 17% in land values’.

Scale of public and private green space is one influence on preference; quality is another. Henry (1994) reports a study on the ‘contribution of landscaping to the price of single-family houses’ which showed that ‘a house that obtained an "excellent" rating for the landscape from a local landscape professional could expect a sale price 4-5 % higher (depending on the size of the lot) than equivalent houses with a "good" landscape rating.’ Homes with landscapes rated “fair” or “poor” could expect ‘a sales price 8-10 % below equivalent homes with good landscape appeal’, which means 12-15 % below the excellent rated landscape houses. In a Colorado State University report (n.d), it is stated that:

"A survey of American real estate agents revealed that 84 % of the agents felt that a house on a lot with trees would be as much as 20 % more saleable than a house on a lot without trees. In addition, 62 % of the respondents stated that the existence of healthy shade-trees usually strongly influences a potential buyer's impression of a property raising its saleability rating."

Create tax revenue

If parks, green spaces and other public spaces raise property values, they also help raise taxes paid to government when these properties are bought or sold, or via annual property taxation. In San Francisco, closeness to the Golden Gate Park was found to generate between \$5-10 million for the state in the shape of annual property taxes (CABE, 2003). In an interesting study of the prices of homes and businesses in different districts, real estate agents estimates were compared between street-tree districts and non street-tree districts. A \$15-25,000 premium was found in the tree-lined districts, which also increased the local tax yield (Burden, 2006).

Improved business

For retailers, a good-quality public space creates an environment which can improve trading by attracting more people into an area. That is why many shopping malls provide high quality green and other public spaces and children play-areas. It is common to find businesses that have no access to outdoor spaces providing indoor green spaces in order to attract customers; a very common phenomenon in arid cities. Well-planned improvements to public spaces within town centres have been shown to have boost commercial trading by up to 40%, beside generating significant private sector investment (CABE, 2004a). Businesses on tree-scaped streets were shown to be associated with a 12% premium in commercial income (Burden, 2006). Interestingly, Wolf found that people would be willing to pay, on average, 12% higher for products in districts with trees (Wolf, 1998). It has also been found that small businesses when choosing a new business location, rank open spaces, parks, green spaces and recreation areas as a top priority locational criterion.

Create employment opportunities

Open spaces in urban areas, whether green or grey, provide opportunities for a variety of employment types, including cleaners, landscape architects, gardeners, park rangers and security officers (Woolley, 2003). In fact, employees who maintain an open space are vital to sustaining that space as a useful benefit to the users. It can also be noted that open spaces in cities, especially cities in developing countries with a buoyant informal economy, provide employment opportunities for informal commercial entrepreneurs and workers – notably street vendors, especially of food and drink.

Enhance workers' production

There is a growing body of evidence that being within a healthy environmental working atmosphere improves worker productivity (Wood, 2003; Miller, et al, 2009; Taiwo, 2010). When adding plants to windowless work places like college computer labs, a positive influence of plants on those observed working had been detected, with a '12% improvement in reaction time on computer tasks recorded', and participants being less stressed, with 'systolic blood pressure readings lower by one to four units' (Lohr et al, 1996). Realising the importance of green spaces in working places in 2002 in USA, the

national information campaign 'Plants at Work' was launched, designed to educate the public on the benefits of interior plants (Gilhooley, 2002). Green spaces both outdoor and indoor play a vital role in enhancing the productivity of workers and creating positive economic values.

Combating sprawl

Green belts and other devices can be used to make urban expansion more efficient and thereby increase the overall net output of an urban economy. This is particularly so when they are used to avoid costly informal settlement sprawl. It should also be noted, however, that green belts can be inefficient, if they unnecessarily lock up land that is of little recreational or agricultural value and if they raise the aggregate volume and costs of commuting.

Energy saving (cooling buildings in summer, warming them in winter)

Akbari and others (1992) argues that 'summertime air temperatures in cities can be as much as 10°F³⁴ warmer than in surrounding rural areas due to the replacement of soil and vegetation with concrete, asphalt, and metal'. This has an economic impact through costs of air conditioning. As Burden (2006) states that 'asphalt, concrete streets and parking lots are known to increase urban temperatures 3-7°C', they tend to influence significantly energy costs for consumers and homeowners. Burden states that a properly shaded neighbourhood, which is shaded mostly from urban green spaces and urban street trees, can 'reduce energy bills for a household from 15-35%'. In a USA study, it was found that urban greenery reduces energy expenditure in cooling buildings by 27% in summer, which was equivalent to nearly \$242 savings per home per year (Coder, 1996).

³⁴ A temperature interval of 1 degree Fahrenheit is equal to an interval of $\frac{5}{9}$ degrees Celsius, Thus, 10°F = 5.5°C

Food production

The opportunity for growing crops for consumption in open spaces can easily be overlooked in the urban situation because of the prevailing belief that agriculture is only for the countryside. Fruit and crops have an economical value, however, and can contribute positively to the city's economy (Leeuwen, et al, 2010). The urban agriculture movement in the West is growing in importance, through the influence of lobby groups trying to recapture green space for local food as well as big business buying up low value urban land for commercial agriculture (an interesting phenomenon in some derelict US cities like Detroit and shrinking cities in Eastern Europe) (Woolley, 2003). In less formal cities in developing countries, many city dwellers of rural origins tend to use their private spaces – no matter how small - to cultivate some of their essential food needs, even if they create these spaces on balconies, pots, corridors, on the sides of building's and roofs. Poor families use construction debris and tyres as containers to grow fruit trees, medicinal plants and several vegetable species. Many of these residents tend to live in ground floors where they privatize the building's surrounding spaces by fencing them, and cultivating goods, and breeding birds, either for the dwellers' own consumption or for trading.

Community trees and forests in and surrounding cities, also create many traditional products for the cash and exchange market, including lumber, fruits, nuts, mulch, edible fungi, composting materials, and firewood.

The growing attention given to urban agriculture (UA) can be seen in the number of publications and scientific meetings on the subject, and the number of national and international cooperation agencies and networks engaged in this issue. It should be stressed that urban agriculture is more crucial to developing countries where it have been found that primary activities practised within urban municipal boundaries produce food and health, fighting hunger and malnutrition, and providing economic security. UA contributes to social sustainability while increasing ecological sustainability through the transformation of waste, saving natural resources, preventing soil erosion, greening, pollution reduction and addressing desertification in arid contexts (Madaleno, 2000).

Attracting tourism

There is a huge body of research demonstrating the direct relationship between urban green spaces and tourism. Well-designed landscape is always valued and attracts people everywhere. In London, for example, Hyde Park, Kensington park and St. James park are famous throughout the world and it is hard to find a tourist who has visited London that did not go at least to one of them. In Cairo, Al-Azhar Park is the most recently launched green space and visitors are now exceeding 1.5 million per year, finding a distinguished place on the Egyptian tourist tour map.

The economic benefits of green spaces can be achieved at all scales. Major parks bring tourist and other business to a city. Were they to be costed in a full social cost benefit analysis, they would no doubt prove to be a worthy type of municipal investment. Large private parks or private green space preserved by public regulations –as in green belts - have the same effect, giving a city a green feeling and raising its value in many ways. At a local scale, green spaces confer benefits on surrounding properties. Where the space is provided by governments, the benefits are windfall gains captured by surrounding property owners. Increasingly, however, private developers are learning how to use green space as a design feature to maximise the value of their schemes. Internalising the benefits of greenery within a scheme provide an incentive to private developers to become suppliers not just of homes but green infrastructure too.

4-3- Social and cultural

In a sedentary lifestyles common in today's society, social ties and communication have been diminishing. Green spaces can provide a venue for those ties to develop and flourish. The following section presents some of the social benefits of GS.

Promoting neighbourliness

The open spaces near our homes give us a valuable place to socialise with our neighbours. Green space bring people together from different ages and cultures, thus helping to create a

real sense of neighbourhood across group boundaries. The following are some of the benefits that underlay green spaces promotion of neighbourliness.

GS provides an inclusive venue for social events, festivals, ceremonies and people gatherings

One of the benefits of high-quality green public space is its potential as a venue for social events. They are gathering places for festivals and celebrations where neighbours party together. Well-managed community festivals and other events have a very positive effect on the urban environment, drawing the community together and enriching the sense of neighbourliness and belongingness. Coley and colleagues (1997), argue that well stocked and managed green spaces attract residents to use them intensively:

"By making outdoor residential spaces more attractive, trees and grass may draw residents to these spaces, additionally, areas with trees are likely to attract residents more than areas without trees by dint of the physical and psychological comforts associated with trees. People simply enjoy nature –looking at it, being around it, and having it available." (p:472)

Research results consistently indicated that natural landscaping encourages greater use of outdoor areas by residents. Spaces with trees attracted larger groups of people, as well as more mixed groups of children, teenagers, the elderly, tourists, and recent residents (Francis, 2006). A related social benefit of green space is that it encourages voluntarism and increases the involvement of people in environmental restoration activities, which creates a feeling of satisfaction associated with a sense of accomplishment (Miles, 1998). There is a parallel between the idea of the well stocked, well designed and maintained private garden that functions as an outdoor living room and a well stocked, designed and maintained shared space, which functions as some kind of outdoor communal living room. If individuals and groups can have a part in designing and maintaining it, then the chances of it functioning as a place of social engagement and deepening are even greater.

Generates community cohesion and improves social inclusion

People from all ethnic backgrounds spend some of their leisure time in green areas. Urban parks are more inclusive than non-urban green areas and they can promote social cohesion (Peters et al, 2010). Residential common areas with trees and other greenery help to build

strong neighbourhoods. Sullivan and others, for example, at the human-environment research laboratory in University of Illinois showed that:

"In a Chicago public housing development, residents of buildings with more trees and grass reported that they knew their neighbours better, socialized with them more often, had stronger feelings of community, and felt safer and better adjusted than did residents of more barren, but otherwise identical, buildings." (Sullivan et al, 2004)

Jackson & Kochtitzky (2010) argue that having daily contact with green spaces creates different social effects such as cohering the community, and reducing crime and vandalism.

Kazmierczak and James (2007) argue that 'urban green spaces in socially excluded areas' can enhance community cohesion and inclusion of individuals into society in four ways: 1) 'they are free and accessible to all', 2) 'they provide space for human interactions', 3) 'they relieve stress and restore mental fatigue, thus reducing aggression', and 4) 'they offer opportunities for urban residents to participate in voluntary work.'

Increase social ties and helping to organize a community

"Neighborhood social ties are the glue which makes a collection of unrelated neighbors into a neighborhood—a source of social support and sense of community, and a social unit more capable of forming local organizations, defending against crime, and mobilizing for political purposes". (Kuo et al, 1998:824)

Research suggests that the construction of neighbourhood social ties (NSTs) may significantly depend on the informal social contact which occurs in neighbourhood common spaces. Kuo and others argue that the presence of trees and grass supports common space use and informal social contact among neighbours (1998), and therefore enhances social ties among neighbours. They also encourage community organizers by focusing efforts to improve common green spaces. Coley, Kuo, & Sullivan, report in their research (1997) that they found that residents dislike and fear common spaces in their residential neighbourhoods when these spaces are devoid of vegetation. However, the simple addition of trees and grass was sufficiently to transform residents' responses and perceptions of these spaces. From 758 observations of individuals in 59 relatively barren and relatively green outdoor spaces in an inner-city neighbourhood in Chicago in 2004, it

was found that on average 90% more people were using green spaces than barren ones. Moreover, it was found that on average 83% more individuals engaged in social activity in green than barren space (Sullivan et al, 2004: 692-693). While Coley (1997) adds that the amount of time residents spent in equal-sized common spaces was strongly predicted by the presence, location, and number of trees (Coley et al, 1997).

Youth and children

The fourth principle of the UN declaration of the rights of the child³⁵, states that:

"The child shall enjoy the benefits of social security. He shall be entitled to grow and develop in health; ... The child shall have the right to adequate nutrition, housing, recreation and medical services."

Children have the right to play and recreate but unfortunately, 'increasing urbanisation has left many children with far fewer opportunities than previous generations to play freely' outdoors and experience the natural environment. Good quality public green spaces can help to fill this gap, providing children with opportunities for fun, exercise and learning.

Enhance children's play

The back yard nature website, published by California Green Solutions, states that '*Spaces with trees and grass offer better play opportunities for children than places without such landscape elements*'. In their studies in Chicago, Kuo et al. (1998), Taylor et al. (1998), Taylor and Kuo (2006), report that 'children were observed playing in areas surrounding apartment blocks'; these play areas were similarly arranged but not all of them had trees and grass. Significantly, 'a higher level of creative play was found in the green spaces than in the barren areas'. Thus, green spaces provide the best venue for outdoor play for children, from which they achieve social development, as play provides opportunities to acquire and practice social skills. Collaborative games and pretend scenarios require and develop cooperation, altruism, concern for others, the ability to comprehend and flexibly interchange social roles and self-control. Furthermore, play provides opportunities for

³⁵ DECLARATION OF THE RIGHTS OF THE CHILD Adopted by UN General Assembly Resolution 1386 (XIV) of 10 December 1959, retrieved from

<http://www.un.org/cyberschoolbus/humanrights/resources/child.asp>

Cited in 01-06-2010

children to confront and resolve emotional crises, manage interpersonal conflicts and gain moral understanding (Taylor et. al, 1998:5).

Improve children's interaction with adults

Like play, access to adults has a key role in children's social and cognitive development. It is difficult to imagine how children might become fully functioning members of society without the guidance, challenge and models provided by adults. It is through interaction with adults and adult's supervision that children learn the values and appropriate interpersonal communication skills of their community. Moreover, and with respect to cognitive gain and development from children's play in the outdoor space, linguistic interactions and problem solving interactions with adults are important mechanisms through which language and reasoning skills advance and develop (Taylor et al, 1998:5-6). Outdoor space, especially green space provides one of the best kinds of place for this constructive interaction to take place.

Improve youth social inclusion

"For socialising and making friends, public open space is still the dominant arena for personal interactions and face-to-face communication". (Seeland et, al, 2009:16)

Social inclusion means friendships, social contacts, joint activities, social networks, social support, cultural and national identification, and political participation (Friedrichs and Jagodzinski, 1999 quoted in Seeland et al, 2009). Green spaces play a vital role not only in accommodating youth with all their diversities, but also in creating a venue for social inclusion and building friendship among them. Youth tend to be unruly, seeking freedom and prefer to be unchained. In their study, Seeland and others (2009), researched the role of urban green spaces in building social inclusion among youth in Zurich, where they studied the positive role green spaces play in fusing the migrant youth with their native peers. They argue that in a city like Zurich were its 80 parks and other green spaces together with urban forests make up 43% of the municipal area; these spaces are attractive to Zurich's young people. In his study, Seeland asked the youth participants where, besides school, they could easily make new friends. The results were interesting, as 43% of the participants mentioned 'outdoor environments', such as parks, playgrounds, and lakeside locations, followed by cultural events (cinema, concerts), parties and discos (16%). Outdoor

environments was almost triple the importance of the nearest category, showing the efficiency of these places in creating friendships and strengthening inclusion between social groups. Interestingly, there was no significant difference between the pupils who had always lived in Switzerland and those who had moved to Switzerland either a short time or a long time ago. It is the magic of good green spaces that they are free, geographically accessible and have no restrictions or boundaries on their use.

Seeland et al., conclude with the profound statement:

"A society that considers the potential of public urban green space for social interaction in its green space planning has recognized the social policy value of the landscape" (Seeland et. al, 2009:17)

Cultural value

Green spaces reflect peoples' characteristics. They are mirrors for the civilizations and urban context they are in, as exemplified by the hanging gardens in Babel, the Islamic gardens in Andalusia (Spain), the Zen gardens in Japan, Victorian parks and gardens in Britain and many other examples all over the world. Each space has its characteristics, which reflects the civilization it was established in and reflects their culture and values. These spaces are priceless heritage for their nations, and a source of pride and remembrance of their historical glory.

Contribution to civic pride

Civic pride is important. Ancestors knew it and positively promoted the best of their parks and green spaces as examples of civic achievement. It is still relevant today. Each community gains its pride from the urban assets it possess, and green spaces are among these assets to be proud of. This is true of small community gardens as much of grand urban parks. Al-Azhar Park in Cairo, opened in 2005 to replace a 600 years refuse dump and debris area with the most spectacular park in Cairo, it is a great source of pride for all Cairenes (Kafafy, 2008).

Displaying and hosting public art

Green open spaces are a great venue for exhibitions, public art shows and fairs. They are open, pleasant, cheap, accessible, naturally lighted and ventilated. In many places in the

world, green open spaces are the theatre for many amateur dramatists where they perform their arts, whether it is dancing, singing, drawing or sports.

A source of 'Nature' for all people and for next generations

"Trees add beauty and grace to any community setting. They make life more enjoyable, peaceful, relaxing, and offer a rich inheritance for future generations..... Trees are valuable as commemoratives of deceased loved ones and for passing on something of value to future generations. ". (Roloff, 2006)

Wise, sustainable usage and good maintenance preserves green spaces for future generations as part of a generation's gift of cultural heritage to the next.

Provide meaningful outdoor environmental educational activities

Green open spaces are an open natural lab for learning values, gaining cognitive experience and integrating with nature. They enhance outdoor education and experiential learning. Green spaces play a vital educational role in schools, helping to develop a deeper relationship with nature, enhance children's social development and teach children how to grow plants which is mentally stimulating and adds to children's knowledge and expertise (Seeland et al, 2009). Green spaces are used for community education as well, such as waste minimization and the recycling of wastes through composting and mulching. Green spaces when acting as a venue for outdoor education bridge the three major domains of oneself, others, and the natural world.

Ideological and spiritual importance and symbolic meanings

"Landscape is seen as a symbol of the values, ideals, aspirations, hopes and dreams of a culture. People encode and decode landscape meanings about the culture, its underlying philosophies, and its self-perception. The landscape is the physical expression of the culture, and its hopes and dreams". (Motloch, 2001:16)

When it comes to the symbolic meanings of green spaces elements, Motloch suggests that:

"Vertical elements are inspiring, horizontal elements are stabilizing, massive elements lend an air of permanence, and filigree elements evoke a sense of nostalgia. Angular forms suggest energy and motion, and circular forms convey passivity and restfulness. Certain sounds and smells also have symbolic meanings, as do natural materials, including water, earth, and plants and architectural elements". (2001:120-121)

Green spaces have historically been symbolic places of meditation and pondering. Green spaces offer a place to contemplate the different dimensions of creation and their mechanisms beyond, and to witness the greatness of nature, its creatures and the creator. In most holy books paradise is described as possessing splendid rivers, wonderful vegetation, extended shading trees and sweet fruits: in the uncorrupted ancient past and as the reward for the righteous people in the hereafter. Green open spaces are taken as a tangible taste of an otherworldly paradise. In ancient pharaonic Egypt, religious ideas inspired the landscaping of gardens and even dictated the kinds of plants to be grown in them. Many of the plants had symbolic significance. Trees were sacred to certain deities, as the date palm to Re³⁶ and to Min, the doum-palm to Thoth, the sycamore fig to Hathor and the tamarisk to Osiris, while water lilies and papyrus were life-giving and dedicated to Horus and Hathor (Wilkinson, 1998). The same could be said in many other civilizations such as the famous Japanese Zen gardens, in large trees symbolise long life and wisdom and water features -such as running streams, waterfalls, fishponds and lakes- are used to 'neutralize the negative ions' carried by people when tired, fatigued or depressed (G. and S. Jellicoe, 1995). While the specific significance of a green space differs from one context to another (in arid hot desert areas, shade, is appreciated more than in colder contexts); green spaces always carry a high symbolism along with their functional benefits.

It is more likely that public suppliers of green spaces will be motivated by social benefits than private suppliers. However, the land values that are the principle motivator of private developers of green space only arise because of the use value green spaces and much of this use value derives from social benefits as discussed in this section. Land value is derived value – it derives from use and investment value. Social benefits on a larger spatial scale such as inter-group social integration will only inform the green space designs of private developers if their developments are of sufficient size to include diverse social groups.

³⁶ Re, Min, Thoth, Hathor, Osiris, Horus and Hathor are all Pharonic ancient gods..

4-4- Human Health (Physical & mental), and recreation

The world health organization (WHO) definition³⁷ for health is:

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

There is a huge emerging body of evidence that the environment around us has an important effect on the way we live our lives and our health (Douglas, 2008). Negative health impacts of nature have received a relatively large amount of attention if compared to beneficial effects, (Groenewegen et al, 2006). Researchers are turning their attention, however, to the 'positive relationship between the amount of green space in people's living environment and people's health'³⁸. The following section sums some of the health benefits of green space.

The impact of urban green space on physical and mental health

The restorative effect of environment

Ulrich (1984, 1991) uses a range of empirical studies to argue that 'the benefits of viewing green space or other forms of nature goes beyond aesthetic enjoyment to include enhanced emotional well-being, reduced stress and, in certain situations, improved health.' Morris (2003) and Kaplan (1992) argue that studies by Moore (1981) and West (1986) support Ulrich's claims; both reporting that 'prison inmates used health-care facilities significantly less often if the view from their cells was toward natural areas.'

³⁷ Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. The Definition has not been amended since 1948.

<http://www.who.int/about/definition/en/print.html/>

³⁸ See: (Ulrich, 1984; Ulrich et al, 1991; Coder, 1996; Kellert and Derr, 1998; Kuo and Sullivan, 2001a; 2001b; CABE, 2003; Vries et al, 2003; Morris, 2003; Woolley, 2003; Wolf, 2004; Cosco, 2005; Burden, 2006; Burls, 2006; Maas et al, 2006; Sanesi and Chiarello, 2006; Sanesi et al, 2006, Seeland and Nicole', 2006; Taylor and Kuo, 2006; Townsend, 2006; Alexander, 2007; Nielsen and Hansen, 2007; Hansmann et al, 2007; Mass et al, 2008; Witten et al, 2008a;2008b; Kessel et al, 2009; Kuppaswamy, 2009; Mass et al, 2009; Qureshi et al, 2009; Berg et al, 2010; Jackson & Kochtitzky, 2010; Schipperijn, 2010a; 2010b)

In his famous research regarding the relationship between natural green spaces views and post-surgical recovery, Ulrich (1984), examined records on recovery after cholecystectomy of patients in a suburban Pennsylvania hospital between 1972 and 1981, to determine whether assignment to a room with a window view of a natural setting might have restorative influences. Twenty-three surgical patients assigned to rooms with windows looking out on a natural scene was found to have shorter postoperative hospital stays, received fewer negative evaluative comments in nurses' notes, and took fewer potent analgesics than 23 matched patients in similar rooms with windows facing a brick building wall. Ulrich explains this phenomenon saying that 'it is mainly because of most natural views apparently elicit positive feelings, reduce fear in stressed subjects, hold interest, and may block or reduce stressful thoughts. They might also foster restoration from anxiety or stress'.

In his argument that 'exposure to local greenery in an urban context may reduce stress and mental fatigue', Groenewegen (2006) states that 'stressed participants who viewed images of vegetated urban scenes showed the highest levels of stress reduction, even higher than those viewing countryside, while those viewing barren urban scenes showed an increase in stress levels'. Moreover, he states that 'there is a long history of the use of gardens to improve psychological well-being and physical health'.

In their significant book "The experience of nature: a psychological perspective" Rachel & Stephen Kaplan (1989) distinguish four progressive levels of restoration that occurs when exposed to natural environments: 'clearing the head', 'recharging directed attention capacity', 'reducing internal noise', and finally 'reflections on one's life, on one's priorities and possibilities, on one's actions and one's goals' (Kaplan & Kaplan, 1989:197).

Another study which supports the restorative influence of green spaces in urban built environments is the paper of Hansmann, Hug and Seeland (2007), in this paper they argued that in contemporary modern world and specifically in 'western societies, many physical illnesses, including coronary disease and cancer, are strongly related to sedentary, physically inactive lifestyles, and chronic stress'³⁹. The study included a field survey which assessed the restorative effects of visiting an urban forest and a city park in Zurich,

³⁹ p. 213

Switzerland. Respondents were asked to rate their 'headaches, level of stress, and how balanced they felt both prior to visiting the outdoor space and at the time of being interviewed'⁴⁰. Interestingly, suffering from headaches and stress decreased significantly, and feeling well-balanced increased significantly as well. 'The recovery ratio for stress was 87%, and the reduction in headaches was 52%'. The positive effects increased with length of visit and individuals practising sports (e.g. jogging, biking, playing ball) showed significantly higher improvements than those engaged in less strenuous activities (e.g. taking a walk or relaxing).

Green spaces and long life

In their publication "The value of public space", CABA (2003), claims that green spaces not only enhance our sense of community and our attachment to a particular neighbourhood, but they also can help us live longer. The electronic article "Obesity cure - Please walk on the grass!" on the back yard nature website, with the subtitle "Green spaces and long life, cites evidence from Japan, where a study of the vital role that tree-lined streets and parks play in length-of-life, was conducted. It was found that:

"Of more than 3100 people born between 1903-1918 in Tokyo, 2211 were still alive by 1992 and the probability of their living for a further five years was linked to their ability to take a stroll in local parks and tree-lined streets".

Walking and 'green exercise'

Natural views promote a drop in blood pressure and are shown to reduce feelings of stress. Many people express this effect by saying that green space is one of the best places to get away from the stresses of life. 'Green exercise' is one of the suggested ways to obtain both physical and mental health improvements (CABA, 2003; Pretty, 2005). Walking is significantly important for health to the extent that 'some doctors even prescribe a walk in the park to aid their patients. It has been proven to reduce the risk of a heart attack by 50%, diabetes by 50%, colon cancer by 30%, and fracture of the femur by up to 40%'. (CABA, 2003)

⁴⁰ p.218-19

A place for sport

It has been estimated that some '7% of urban park users in England go there for sporting activities – that represents about 7.5 million visitors a year' (CABE, 2003). Outdoor sports such as football are part of the weekly routine for many people, especially younger people. As people get older, the types of outdoor sports they enjoy usually changes, to less active sports. But the passion for outdoor natural places does not change. All of these outdoor activities help us to keep fit by protecting the cardiovascular system and preventing the onset of other health problems.

Still in Britain, where CABE (2005b) reports that 'there is a growing concern about the health of the nation and particularly that of children and young people'. The report demonstrates some startling facts such as;

- 'Obesity already costs more in public health terms than smoking, and will overtake smoking as Britain's biggest killer in 10-15 years if current trends persist'.
- '20% of four-year-olds are overweight, and 8.5% of six-year-olds and 15% of 15-year-olds are obese'.

This significant increase in obesity is mainly linked to recent lifestyles that are characterised by being sedentary and a reduction in outdoor activity. However, it is not just the physical health that is at risk. There are 'alarming concerns too about citizen's mental well-being', given the stressful lives that most of the people now leads. 'Each year the economy loses millions of working days through stress-related employee absence'.

Clearly, these problems need to be addressed as an access to good quality, 'well-maintained public spaces' can help in improving our physical and mental health by playing sport, encouraging us to walk more, or simply to enjoy a green and natural environment. In other words, our open spaces are 'a powerful weapon in the fight against obesity and ill-health'.

Stressful life and health

Berg et al. (2010) argue that:

"Many people seek out nature in times of stress. For example, following the attacks on the World Trade Centre in 2001, managers of national parks observed a pronounced increase in the number of visits". (p.1203).

In their study titled "Green space as a buffer between stressful life events and health", published in 2010, Berg and his colleagues investigated whether 'the presence of green space can attenuate negative health impacts of stressful life events' or not. They used 'an individual-level data on health and socio-demographic characteristics for a sample of 4529 Dutch people'⁴¹. Health measurements included: a) 'the number of health complaints in the last 14 days; b) 'perceived mental health'; c) 'a single item measure of perceived general health' ranging from "Excellent" to "poor". Localities were correlated with the positions of green space in a 3 km radius around the home.

The results show that the relationships of stressful life events with number of health complaints and perceived general health were 'significantly moderated by amount of green space in a 3-km radius'. Respondents with a high amount of green space in a 3-km radius were less affected by experiencing a stressful life event than respondents with a low amount of green space in this radius. The same pattern was observed for perceived mental health, although it was marginally significant. These results support the notion that '*green space can provide a buffer against the negative health impact of stressful life events*' (Berg et al, 2010:1203).

Children's need for green space

There are certainly many reasons to think that nature plays an important role in child development – as already discussed in a previous section. There is a growing concern among researchers studying children's relationships with nature that children's access to nature is rapidly diminishing (Kellert, 2002; Pyle, 2002; Rivkin, 2000; White, 2004; Louv, 2005 quoted in Taylor & Kuo, 2006:124). In the current technological era, children's lives are increasingly filled with programmed indoor activities, with busy parents in a stressful

⁴¹ These were respondents to the second Dutch national survey of general practice, conducted in 2000-2002

lifestyle, leaving them with very little time and chance for outdoor play. Visscher and Bouverne-de Bie (2008), argue that a child-friendly city⁴² should meet four basic conditions: accessibility, safety, flexibility and opportunities for interaction with other children, and green spaces are among the best facilities to fulfil these basic requirements.

Developing children's own interpersonal skills

Kellert and Derr (1998), reports on a study that investigates the effects of children's outdoor activities 'outdoor challenge programmes in US' and interpersonal characteristics development 'children's self-esteem and sense of self'. Over 400 youths were surveyed and interviewed, the majority reported an increased sense of personal autonomy, improved self-concept, a greater capacity for taking action and being decisive and an improvement in their interpersonal skills after participating in wilderness challenge programmes which is mainly based on interaction nature (1998). In a similar study, participants reported increased self-confidence, improved sense of self-identity and increased self-awareness after their return to everyday life (Kaplan and Talbot, 1983, quoted in Taylor and Kuo, 2006).

Taylor and colleagues (1998) mention that play, which they define as "*the work of children*", has a key role in two major areas of child development; the first is the social development - which I have already covered earlier in this chapter- and the cognitive development. In the area of cognitive development, Taylor et al, state that play – generally, and outdoor play specifically- provides opportunities for the 'acquisition and use of important cognitive skills and structures'. Many theorists have argued for a close relationship between play and the development of language, while numerous studies have found relationships between aspects of children 's play and language comprehension and production (Taylor et al, 1998:5). Furthermore, some forms of play especially outdoor forms, provide children with opportunities to experiment and explore multiple problem solving techniques.

⁴² Child-friendly city is defined as a city or any local governance committed to fulfilling children's rights (Riggio, 2002, quoted in De Visscher and Bouverne-de Bie, 2008)

Green space enhances attention and concentration

There is compelling evidence for a link between green space and enhancing attention in children. One study, compared Swedish day nurseries, and found that children at the day nursery with a more natural school yard, which was integrated into the curriculum allowing children to spend a great deal of time in it, were rated higher on a measure of concentration than children with a more built-up school yard, which was used in a more traditional manner (Grahn, 2003; Cosco, 2005). In their study of evidence that contact with nature is important for healthy child development, Taylor and Kuo (2006), report that Wells (2000), examined children who had moved from relatively barren housing to greener housing, they states:

"Those children whose moves involved the greatest increase in naturalness received the highest ratings on concentration by their parents after the move."

They reported that:

"Children with outdoor classroom curricula scored higher on measures of knowledge transfer, performed better on standardized tests of academic achievement, earned higher grade point averages and demonstrated greater knowledge gain than children with indoor curricula." (Taylor and Kuo, 2006:128)

The value of green space for children with Attention Deficit Disorder

There is persuasive body of literature and research that supports the value and benefit of activity in open spaces to children suffering from Attention Deficit Disorder (ADD), especially green spaces. Interestingly, when parents of children with ADD were asked to 'nominate the activities that they had found made their children more manageable, 85% of the parents reported that green-space activities (such as football and fishing) improved the children's behaviour'. Indeed, '57% of non-green activities were said to result in worse behaviour' (Vries et al, 2003).

ADHD affects up to 7% of children. (Taylor et al, 2001), Those children are normally characterised by having chronic difficulty paying attention and focusing on tasks, can be impulsive, outburst-prone and sometimes aggressive. Taylor and his colleagues claim that 'current treatments, drugs and behavioural therapy, do not work in all cases and in many

cases offer only limited relief'. They construct their argument –built on their researches findings- that adding trees and greenery where children with ADHD spend a lot of time, such as near homes and schools, and encouraging them to play in green spaces may 'help supplement established treatments to improve children's functioning'. (Taylor et al, 2001; Kuo and Taylor, 2004; 2009)

In their interesting study Kuo and Taylor (2009), examined 'the impacts of environments on attention in children with ADHD'. Their method was to 'expose each participant to three environments in single blind controlled trials'. Seventeen children 7 to 12 years old 'professionally diagnosed with ADHD' experienced each of the three environments -a city park and two other well-kept urban settings- via individually guided 20-minute walks. Environments were experienced 1 week apart, with 'randomized assignment to treatment order'. After each walk, concentration was measured using 'Digit Span Backwards'. The results were remarkable, as children with ADHD 'concentrated better after the walk in the park than after the downtown walk'. Kuo and Taylor concludes that twenty minutes in a park setting was sufficient to elevate attention performance relative to the same amount of time in other settings, they commented by saying:

"Doses of nature might serve as a safe, inexpensive, widely accessible new tool in the tool kit for managing ADHD symptoms."

Recreational value

On any urban government webpage, under the leisure and recreation places, parks and green spaces are always listed. These green assets are usually perceived as a clean, free (or at the least affordable for the majority of residents) recreation venue. Most of these spaces accommodate children playing areas, sports pitches, walking and jogging tracks.

Sporting and recreational facilities are an important attraction not only for residents but for tourists as well and for inward investing companies. In addition, people pursuing outdoor activities are attracted by the high quality and extensive range of leisure opportunities provided by the natural environment. The provision and enhancement of facilities and resources should therefore be seen as potentially beneficial economically. Green spaces provide a good venue for exercising and sports. In the UK, it was stated by the Scottish

government in "NPPG 11 - SPORT, PHYSICAL RECREATION AND OPEN SPACE" report (1996) that:

"Exercise has been identified as a target area for action primarily because of its role in the prevention of coronary heart disease and stroke, and its protection value against other chronic diseases such as osteoporosis. In terms of mental health, exercise relieves anxiety, contributes to improved self confidence and self esteem and, more generally, enhances well being. Opportunities for people to participate in sport and in a wide range of formal and informal recreation should, wherever possible, be available for everyone, including the elderly and those with disabilities for whom access to facilities is especially important." (Scottish government, NPPG 11, 1996)⁴³

Appropriate physical exercise is now recognised as crucial to good health, as part of a healthy lifestyle.

As with social benefits, the wider health benefits of green spaces are more likely to motivate public rather than private supply. Those health benefits that are perceived by individual home buyers will be valued through property price and private developers, if the price effect is as great as suggested by some of the research I have reviewed, is indeed likely to induce private green space supply.

4-5- Safety and security

GS influence in lessening aggression and violent behaviour

Kuo & Sullivan (2001a), argues that although vegetation has been positively linked to fear of crime and crime in a number of settings, recent findings in urban residential areas have hinted at a possible negative relationship. They claim that, based on their research, residents living in "greener" surroundings have reported lower levels of fear, fewer incivilities, and less aggressive and violent behaviour. They state :

⁴³ Retrieved from: <http://www.scotland.gov.uk/Publications/1996/06/nppg11>

"Results indicate that although residents were randomly assigned to different levels of nearby vegetation, the greener a building's surroundings were, the fewer crimes reported." (p:343)

Kaplan (1987) notes that 'one outcome of mental fatigue may be an increased tendency to outbursts of anger and even violence. As contact with nature appears to mitigate mental fatigue', Kuo & Sullivan⁴⁴ (2001b) conclude that this contact may reduce aggression and violence in the inner city contexts, figure (4-5). They claim that the more the natural open spaces and green spaces the less the violence and aggression in the neighbourhood:

"Where there is less nature nearby, there is more aggression and violence."

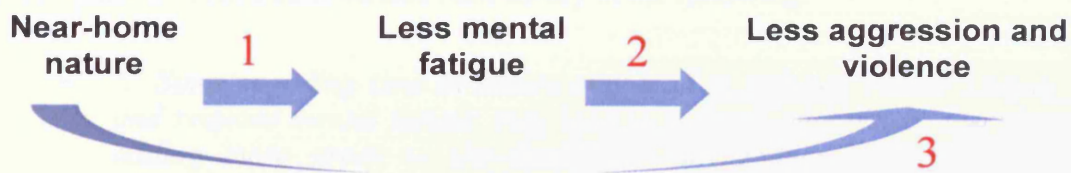


Figure (4-5) Spending time in nature leads to less mental fatigue (relationship 1), that being less mentally fatigued results in less violent and aggressive behaviour (relationship 2), so that, as a result, spending time in nature is associated with less aggression and violence (relationship 3).

Source: <http://lhhl.illinois.edu/ppt/violence.htm>

Mental fatigue may lead to aggression by impairing the ability to handle problems rationally, causing inattentiveness, increasing irritability and decreasing control over impulsive behaviour. On the other hand, the demands of poverty may place inner city residents at higher risk of mental fatigue and the aggression it fosters.

In another study, in the USA, Kuo & Sullivan compared 'levels of aggression for 145 urban public housing residents randomly assigned to buildings with varying levels of nearby nature' (trees and grass). Interestingly, they found that Residents living in relatively barren buildings reported more aggression and violence than did their counterparts in greener buildings. Moreover, levels of mental fatigue were higher in barren buildings, and aggression accompanied mental fatigue. Kuo & Sullivan's work has contributed greatly to enhancing the 'understanding of the psychological effects of natural environments' in a

⁴⁴ FRANCES E. KUO is an assistant professor at the University of Illinois, Urbana-Champaign. Her research examines effects of the environment on healthy human functioning in individuals, families, and communities. WILLIAM C. SULLIVAN is an associate professor at the University of Illinois, Urbana-Champaign. His research focuses on the psychological and social benefits of urban nature and citizen participation in environmental decision-making. Both have numerous publications concerning crime and green space.

number of ways. First, their findings have provided strong evidence for a ‘potential effect of nature that has been largely unexplored - reducing aggression and violence’. Their studies demonstrate the link between nature and reduced aggression in an experimental design. A second contribution of their work concerns the ‘density and extent of nature necessary to convey benefits’. It might seem doubtful that a few trees and grass in relatively small areas outside public housing apartment buildings could have any clear effects on residents’ levels of aggression. Yet this ‘low dose of vegetation’ has been shown to have ‘far-reaching and positive effects’ on a number of other important outcomes, including residents’ management of major life issues (Kuo, 2001a) and neighbourhood social ties (Kuo et al., 1998).

Kuo and Sullivan's have summarised their theory in the following:

".. Since spending time in nature may lead to reduced mental fatigue, and reduced mental fatigue may lead to reduced aggression, therefore adding more green to the inner city may reduce aggression and violence."

Newman's "defensible space" theory and the CPTED:

The defensible space theory⁴⁵ of architect and city planner Oscar Newman mainly encompasses ideas about crime prevention and neighbourhood safety. As defined in Newman’s book, defensible space is defined as:

"A term used to describe a residential environment whose physical characteristics—building layout and site plan—function to allow inhabitants themselves to become key agents in ensuring their security."

Newman’s main idea evolved around creating a hierarchy of spaces that provides a safer community; figure (4-6). These spaces are usually green spaces.

⁴⁵ The theory developed in the early 1970s, and Newman wrote his first book on this particular topic in 1972, titled “Creating Defensible Space”.

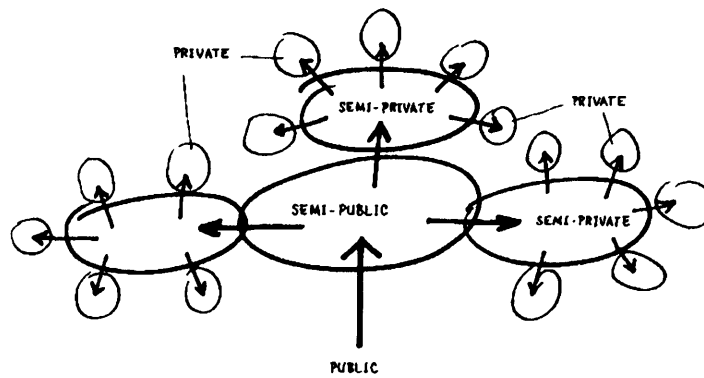


Figure (4-6) Newman's defensible space hierarchy.

Source: Poyner B. 1983:55

The appearance of Newman's Defensible Space signalled the establishment of a new criminological sub-discipline that has come to be called by many "Crime Prevention Through Environmental Design" or CPTED (Newman, 1996), it is defined by Cozone (2002) as:

"The proper design and effective use of the built environment which can lead to a reduction in the fear of crime and the incidence of crime, and to an improvement in the quality of life".

CPTED strategies mainly rely upon the ability to influence offender decisions that precede criminal acts. It involves the design and management of the physical environment to reduce the opportunities for crime and is based upon the assumption that the offender enters into a rational decision-making process before undertaking a criminal act. Criminal behaviour research shows that the 'decision to offend or not to offend is more influenced by cues to the perceived risk of being caught than by cues to reward or ease of entry' (Newman 1996, Cozone 2002, Jorgensen 2002).

Built environment implementations of CPTED seek to 'dissuade offenders from committing crimes by manipulating the built environment in which those crimes proceed from or occur in'. The three most common built environment strategies are 'natural surveillance', 'natural access control' and 'natural territorial reinforcement'. Green spaces play a vital role in the establishment of all the three strategies.

Cozone (2002) and Jorgensen (2002) agree that activated use of space is important in deterring offenders and therefore discouraging crime and spreading the sense of safety among residents. Activity can be enhanced by providing suitable physical design for public

spaces which subsequently will attract more activities and enhance the overall community safety. The results of their studies suggest that greening and naturalistic vegetation introduced into community spaces will enhance the sense of community safety.

Reducing domestic violence and Fear of Crime

Fear of crime, can deter people, not just vulnerable groups, from using even good-quality public spaces. Children and young people, for example, are often prevented from using open spaces, parks, squares and streets because of their parents' fears about crime, whilst females often face additional concerns about their own safety. There are no doubt that physical changes to, and the better management of, public space can help to allay these fears. Such changes can help everyone to make the most of public spaces (CABE, 2002). In a residential neighbourhood in southern Ontario, Canada, a community garden was created on the site of an 'old rubbish dump', previously a place that attracted local criminals and was avoided by the 1200 local residents. The development of the site, carried out using CPTED⁴⁶ principles, resulted in a '30% drop in crime' over the following summer. Moreover, the reduction in crime in surrounding buildings encouraged residents to use the streets more at night, increasing natural surveillance. As a result, crime incidents in the surrounding buildings dropped by '30% immediately and by 49% and 56% in the two subsequent years' and fear of crime has lessened. The garden has brought other benefits too, including greater interaction between different ethnic groups within the community.

Greenery lowers crime through several mechanisms. Firstly, 'greenery helps people to relax and renew' which consequently reduces aggression and violence. Secondly, 'green spaces bring people together outdoors', increasing surveillance and discouraging criminals. Relatedly, the green, 'well maintained and groomed appearance' of spaces surrounding houses and apartments is a cue to criminals that owners and residents care about their property and watch over it and each other, which deter criminals and increases safety. (Kue & Sullivan, 2001a)

In their study Kue & Sullivan (2001a), reports that in one Chicago public housing development, there were remarkably fewer occurrences of crime against both people and

⁴⁶ Crime Prevention through Environmental Design

property in apartment buildings surrounded by trees and greenery than nearby identical apartments that were surrounded by barren land. In fact, compared with buildings that had little or no vegetation, buildings with high levels of greenery had 48% fewer property crimes and 56% fewer violent crimes, they conclude that:

"The greener the surroundings, the fewer the number of crimes that occurred."

Mass et al. (2009) studied 83,736 Dutch citizens who were interviewed about their feelings of social safety. Interestingly the analyses suggest that 'more green space in people's living environment is associated with enhanced feelings of social safety in most of the districts'. Contrary to the common image of 'green space as a dangerous hiding place for criminal activity' that causes feelings of insecurity, the results suggest that green space generally enhances feelings of social safety. Mass et al (2009) urge that feeling safe is a 'prerequisite for well-being, quality of life, and good health'. They classify the judgement of the feeling of safety into both objectively 'safety measured by facts' and subjectively 'perceived safety experienced by the individual'.

Trees planting strips and medians, reduces accidents probability

(Wolf, 2003; Bratton and Wolf, 2005; Burden 2006; Wolf and Bratton, 2006; Mok et al, 2006; Dixon and Wolf, 2007), argue that 'urban street trees are crucially important in helping motorists guide their movement and assess their speed' by creating vertical walls that are framing streets and providing a defined edge that leads to speed reductions, better distinction between the motorists' environment and that shared with pedestrians. Even in the case of driving errors, street trees help 'deflect or fully stop' the motorist from taking a human life, and therefore increase the pedestrians' safety. Burden reports that street safety comparisons show 'reductions of run-off-the-road crashes and overall crash severity when street tree sections are compared with equivalent treeless streets'.

Green medians and street trees separate motorists from one another on one hand, and separates motorists from pedestrians, buildings and other urban fabric on the other hand, which increases the road users' safety. In the same vein, Dumbaugh (2005) states that

Naderi (2003) examined the safety impacts of aesthetic streetscape enhancements placed along the roadside and medians of five arterial roadways in downtown Toronto. It was found that the inclusion of features such as trees and concrete planters along the roadside resulted in statistically significant reductions in the number of mid-block crashes along all five roadways, with the number of crashes decreasing from between 5 and 20% as a result of the streetscape improvements. Burden (2006) similarly reports that green medians reduce crashes by 50% or more.

Private green space suppliers can be assumed to be particularly sensitive to security benefits. If greenery forms part of a security by design scheme then it will be included and priced into the property sale prices. If greenery can help sell a scheme by making it more secure then the demand for greater security will produce more urban green space. More general relationships between greenery and security such as Kuo's intriguing finding that it lowers the risk of aggressive behaviour, like the more general health benefits, are more likely to change behaviour of public green space suppliers than private ones.

4-6- Aesthetics

Aesthetic appreciation relates to the beauty, or ugliness of a place (Woolley, 2003) and green spaces are perceived as a vehicle for communicating aesthetic relationships. Motloch (2001) describes the approach of green spaces and landscape aesthetically;

" It interprets visual forms on the basis of some language of art, such as line, form, color, texture, rhythm, proportion, balance, symmetry, harmony, tensions, unity, variety and so on." (p.p 20)

The real value of urban green spaces in particular and open spaces generally lies partially in the peoples knowledge of it is existence, and such an existence is supported by the availability of the open green space to be seen from different angles, axes and locations, which verifies both it is existence and it is availability to be used if required.

Variety of colour, canopy and size providing different usages

Trees (of different shapes, sizes, canopies and foliage), shrubs, ground cover, palms, flowers and roses all provide variety of colour and texture which gives a location attractiveness. These variations provide different functions such as screening, defining routes, marking edges, filtering dust, softening sceneries, providing shelter and shade. Landscape elements of green space usually enhances the aesthetical preference of the space. For example, trees are used for utilitarian purposes in screening undesirable and disturbing scenes such as views that show human density problems. Climbing plants are a cheap way of screening service areas or for covering blank walls; tall shrubs are suitable along boundaries and against buildings where they can act as deterrents to graffiti.

Coder (1996), states that ‘conifers, large trees, closed tree canopies, distant views, and native species all have particular positive values in enhancing scenic quality’. Moreover, ‘large old street trees were found to be the most important indicator of pride and attractiveness in any community’.

Screening unnecessary features and acting as a visual background

Trees are highly effective at screening unpleasant street features that are needed for many safety and functional reasons. They ‘softens and screens’ utility poles, light poles, on-street and off-street parking and other features that create visual pollution to the street (Burden, 2006). Unlike human beings, trees and green spaces become more beautiful with age. Moreover, they are changing throughout the year; being fully dressed in summer, then changing colour in the autumn, then become bare in winter. Green space aesthetics are dynamic and engaging.

In the research project set in one of Chicago’s poorest communities, reported in the work of Kuo et al. (1998), the aesthetic importance of green space to a range of people was evidenced. The majority of participants in the study expressed their interest in changing courtyards to more natural space.

Aesthetic benefits are traditionally the most well understood benefits of urban greenery. They have traditionally been shorthand for the many other benefits discussed in this chapter. They add value to private developments and for this reason, private developers have traditionally built private gardens bundled into the property rights of the homes they sell. They add value to cities and for this reason, municipal authorities have traditionally built parks. As the value of greenery becomes understood in a more sophisticated way – exemplified by the health-related studies cited in this chapter – then it might be expected that the kinds and configurations of green spaces provided in a city will also become more diversified and specialist. Green infrastructure is now designed by local governments to achieve bio-diversity, local climatic and public health objectives. It may be argued that public health objectives preceded the concern with aesthetics. In which case, there is a process of reversion happening, moving from mere beautifications as an urban design objective to older concerns for the health of the urban workforce.

Greater knowledge about security, health, economy, society and climate by (green) design will lead to a greater range of physical and institutional green-space responses in cities. Later chapters go on to examine these responses in terms of the kinds of green spaces supplied and the different patterns of use and valuation by Cairo's residents.

Conclusion

Benefits of green space have been widely documented in literature and the main themes have been reviewed in this chapter. Urban greenery enhances our living environment dramatically in the many ways discussed. It provides opportunities for low-intensity, long-duration and generally cheap activities; such as walking, jogging, playing and cycling that have been recommended to combat the serious health problems of an increasingly sedentary urban lifestyle.

In this chapter a classification of the benefits and values of green spaces has been introduced. *Environmental* benefits include reducing air temperatures and urban heat island effects, providing shade, glare reduction, enhancing air quality, reducing air pollution, reducing excess water run off, cleaning contaminants, noise abatement and enhancing

biodiversity. *Economic values* include a positive impact on property value, improving businesses, creating tax revenue, combating urban sprawl, saving energy, urban food production and attracting tourists. *Social benefits* include promoting neighbourliness, improving the experience of youth and children, providing ideological and spiritual capital, creating and reflecting cultural value and providing educational opportunities. In addition there are many health, safety and aesthetical values such as a positive impact on physical and mental health, recreational value, positive influence on aggression and violence, increasing perceptions of safety, reducing accident probability, providing various aesthetical and functional uses and screening unwanted features and street scenes.

The cumulative findings of the research cited in this review is that green spaces are indeed a multi-functioning, multi-valued asset in a city. The remainder of the thesis explores the supply of and demand for this asset in the arid city of Cairo

Chapter Five

First empirical study: Measuring the supply of urban green space in Cairo

Introduction

This chapter audits the municipal supply of open space in Cairo. It presents the official government data and relates it to census data to illustrate the distribution and supply of green spaces in the capital. Green spaces in this chapter are defined as those provided by the municipality publicly managed. This chapter divided into two parts, it starts with a historical review of the role of urban green space in Egypt generally and Cairo specifically, which is followed by the first empirical study which measures the supply of urban green space in Cairo.

Part One:

5-1- Historical evolution

Pre-19th Century

It may be thought that Cairo is an arid city without a history of green spaces. This is not the case. Egypt's ancient civilisations were among the most developed, with its roots in the earliest beginnings of cultural history. It was the first to introduce many inventions to humanity such as Black Ink, First Ox-Drawn Plows, 365 Day Calendar and Leap Year, Paper, First Triangular Shaped Pyramid, Organized labor, Hieroglyphics as an early system of writing and Sails. The ancient Egyptian civilization changed the face of history in many disciplines and every now and then a new discovery, such as the famous Giza Pyramids at Giza, which are the largest Egyptian pyramids. They are the only one of the Seven Wonders of the Ancient World still in existence. New discoveries are found every now and then in these unique great constructions. It is amazing to know that the great pyramid of Khufu, on the Giza Plateau; has been oriented almost perfectly north. The largest pyramid ever built, it incorporates about 2.3 million stone blocks, weighing an average of 2.5 to 15 tons each. It is estimated that the workers would have had to set a block every two and a half minutes. This reminds us of that culture's uniqueness and superiority.

There is a large body of evidence that the ancient Egyptians had many different features of what can be considered among history's first landscape designed gardens. An ancient Egyptians depicted these wonderful landscapes on the walls of many tombs and temples (G. Jellicoe & S. Jellicoe, 1995; Wilkinson 1998) (Figure 5-1).

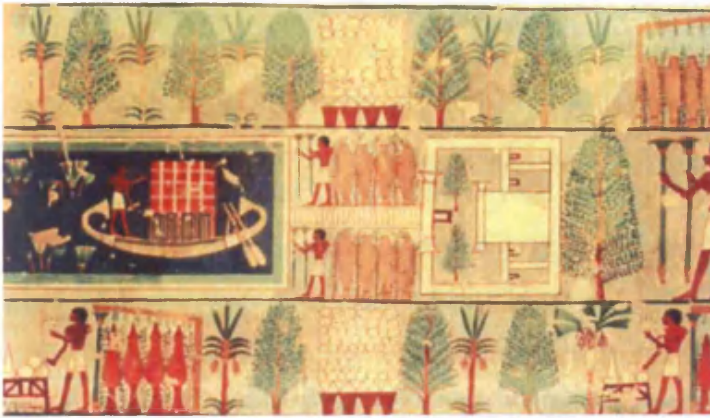
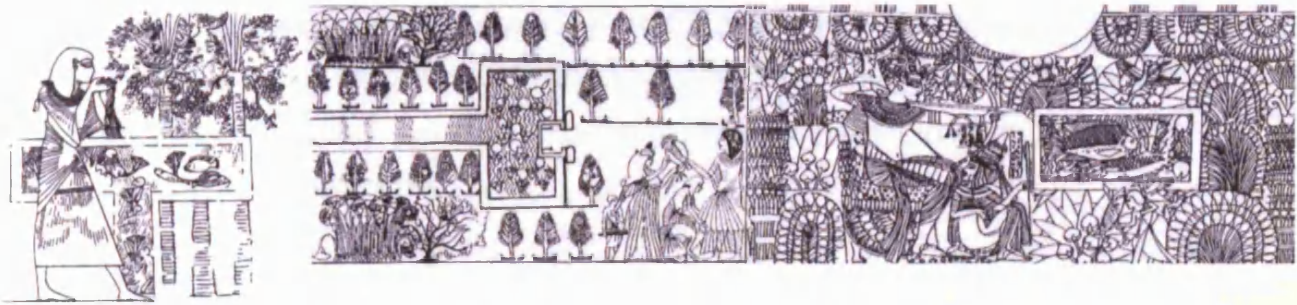


Figure (5-1) Some depictions and papyrus showing the vital role gardens played in the ancient Egyptians lives.

Source: Wilkinson (1998).

"The Greeks and Romans expressed their admiration for the gardeners and gardens of Egypt. The Egyptian hard landscape contained elements which became standards in later gardens. They built terraces long before the Assyrians startled the world by imitating a mountain landscape with their "Hanging Gardens of Babylon". Egyptians gardens were cooled by channels of water before Persian gardeners adopted this device." (Wilkinson 1998)

In ancient Egypt, it was Kings who controlled nearly all the wealth of the community, and it was they who built the temples for particular gods or tombs for themselves where many of the gardens which we know about were created. These gardens both provided a present manifestation of the kings' afterlives and declared the king's power to deliver an offering to the gods befitting his status. Hence the depictions on temple and tomb walls of wonderful orchards and gardens, full of biodiversity, where fish, birds different plants are depicted in great detail. These show that ancient Egypt built its gardens with globally sourced specimens of exotic plants that were hard to cultivate locally, like incense trees. Landscape and green spaces started long ago in Egypt, therefore as symbols of the fertility of the land and the success of the king and the gods.

The historical evidence indicates that gardens of different types were popular in ancient Egypt (G. Jellicoe & S. Jellicoe, 1995; Wilkinson 1998). They varied from enclosed yards with a few fruit trees to botanical and zoological gardens with exotic trees, ponds stocked with fish, birds and caged animals.

Cairo's contemporary severe lack of green spaces, very high densities and pollution levels is a misleading image for the old ancient city even beyond the Pharaonic period. Cairo was not always the characterless, overcrowded, park-less city, the city's historical records unmistakably suggest otherwise (Abu-Lughod, 1965; Rabbat, 2004; Hamdy et al, 2007).

In fact, the city of Cairo (al-Qahira) was originally founded around an orchard (bustan), equivalent to a park in the modern city. This happened when Jawhar al-Siqilli, the Fatimid army general in 969, was charged by Caliph al-Muizz li-Din Allah to establish a new royal city. The general chose an area almost two miles north of the then capital of al-Fustat around the Kafuri orchard (al-Bustan al-Kafuri) and laid out the royal enclave that came to be known as al-Qahira (Rabbat, 2004).

The proximity of the city to the River Nile allowed the powerful and wealthy persons during the subsequent eras of Fatimid, Ayyubid, and Mamluk periods to make use of its eastern bank. The borders of the seasonal ponds that formed after the river's annual flood in the low -lying west of the city were used to establish huge private orchards and gardens for the recreation of the city's wealthy⁴⁷. Most of these gardens and orchards were privately used by their powerful and wealthy owners and were rarely opened to the public except in some very rare occasions, like special feasts, festivals and royal marriages ceremonies.

A type of urban open space in the historic city that was more publicly oriented was the square (maydan). These open urban spaces flourished in the medieval period, especially under the Ayyubids and the Mamluks and became important urban spaces in Cairo (Abu-Lughod, 1965; Hamdy et al, 2007). In spite of being large, open and covered with grass, these mayadin were not meant for the use of the public. They were royal establishments

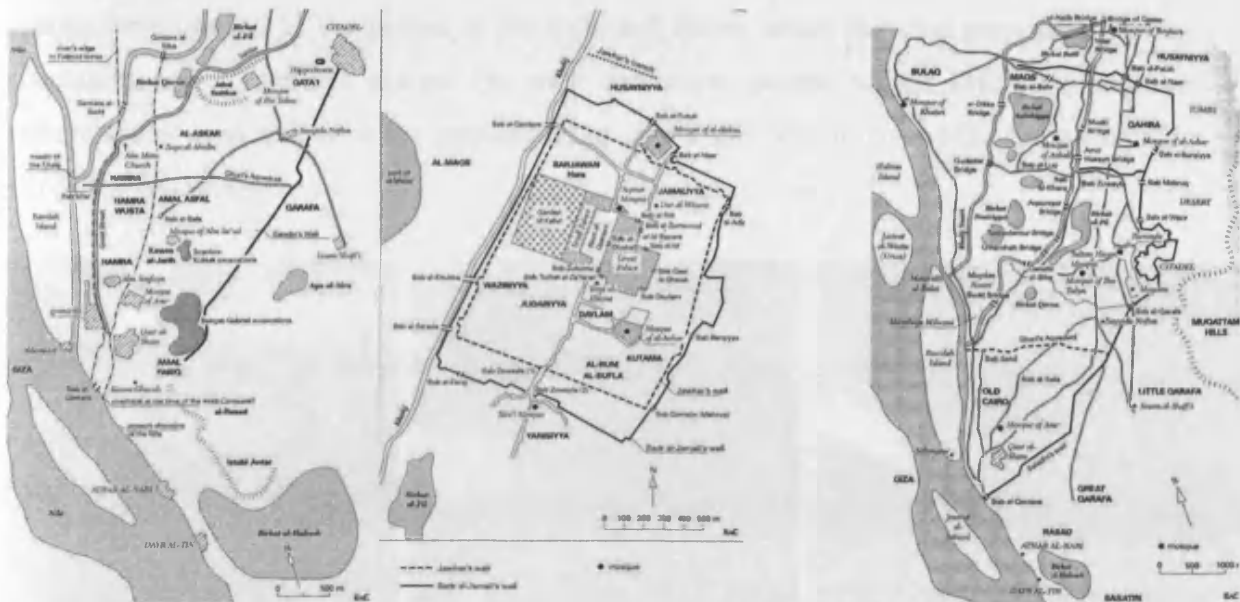
⁴⁷ It was very common that the governing family and men in power are endowed lands, orchards and palaces. Among the Most famous in the pre-medieval as Rabbat (2004) reports was the orchards of Sayf al-Islam (a brother of Salah al-Din al-Ayyubi) which lays to the west of where the two magnificent mosques of Sultan Hasan and al-Rifa'i stand today and extended towards the no longer extant Birkat al-Fil (Pond of the Elephant).

mainly dedicated to military parades and equestrian exercises, which were considered to be the backbone of the Mamluk military organisation upon which their regime depended both to defend their territories and to have strong and complete control of internal affairs. So the more publicly accessible green spaces in the historic city were, in fact, founded on security concerns.

Most of these spaces – private and military/governmental - were outside the city proper. They formed a sort of green belt or cordon (cordon vert) to the enclosed area between the River Nile and the city boundaries (Rabbat, 2004). These spaces were easy prey to and the first victims of any urban expansion between the thirteenth and the end of the nineteenth century. At this time, the city was growing in several directions, but mainly towards the river and towards the north, as the Mokatem Mountain hindered expansion to the east, (Figure 5-2).

“No large open green space existed in the urban core of medieval Cairo, and to some extent this was true of most cities of the central Islamic land between the eighth and nineteenth centuries.” (Rabbat 2004)

This observation of Rabbat’s is due to several factors; the most crucial of them being the arid climate prevalent in most Middle Eastern cities, which made maintenance and irrigation of any significant green space a difficult and costly procedure. Medieval Cairo was situated 3 miles to the east of the River Nile, and long canals had to be constructed and wells dug at various intervals to provide the city with water.



Fustat (the old name for Cairo), Fatimid 12th century Cairo map founded in 642

Figure (5-2) Evolution of early Cairo.

Source: Raymond (2000)

No ruler in medieval times seems to have believed it worthy to spend money and effort providing openly accessible public space, and the people do not seem to have expected such an endowment. It seems that the people did not place any weight on public green spaces that were not religious. All attention was paid to religious buildings, charitable institutions and civic services⁴⁸.

Another important factor in the lack of green space in historical Cairo is cultural and religious influences. These have much affected the typology and morphology of urban spaces in Islamic cities, where seeking the highest standards of privacy has always been a priority in spatial configuration of buildings and rooms within buildings. Most of the spaces, especially green spaces for recreation and pleasure, were enclosed and located in the core of a house, where complete privacy was guaranteed to dwellers. Courtyards played the most pivotal role in fulfilling people's needs at these times (Figure 5-3).

There is not a lot of literature that speaks in detail about the various functions of Cairo's rare open spaces or green spaces (basatin) in particular and their dual character as both private gardens and public parks on special occasions. All that is known is that these

⁴⁸ Civic services such as public drinking fountain (Sabeel) and elementary school (khotab).

spaces were opened to the public in festivals and feasts, when rich and poor took part as spectators and sometimes actors. On such occasions, people would line up along the waterways or rent spaces in the tree-shade, or ride a sail boat in river Nile (Abu-Lughod, 1965; Rabbat, 2004).



Figure (5-3) Courtyard houses of Islamic ancient Cairo.

Source: Archival pictures of al-Sehemei courtyard house

A particular innovation in the development of green spaces in Cairo in the pre-19th century history was when gardens began to be laid out in the multifunctional courtyard that always existed in Cairene palaces and residences. This began in the ninth-century Fustat houses. They contained flowers and medicinal herbs, evergreen trees, palm trees and vines. Many historians have noted that gardens and orchards surrounding Cairo bestowed a special magical perception which was praised all the time. However, except the hidden gems within the courtyard houses, the more visible green spaces were not found within the urban city fabric. This situation began to change with the beginning of the 19th century's Mohamed Ali renaissance.

19th century developments and renaissance adaptations⁴⁹

"It is traditional to date Egypt's entry into the modern world from 1798, the date of the French expedition, and the transition to a new phase of the country's history is confirmed by the accession in 1805 of the reforming pasha Muhammed Ali (1805-1848)". (Raymond, 2000:289)

Muhammad Ali, who has been called the "*father of modern Egypt*," was able to attain control of Egypt because of his own leadership abilities and political shrewdness. Under his rule (1805-1848), Egypt entered the modern world. Muhammad Ali's development strategy was based on agriculture. He expanded the area under cultivation and planted crops specifically for export, such as long-staple cotton, rice, indigo, and sugarcane. The surplus income from agricultural production was used for public works, such as irrigation, canals, dams, and barrages, and to finance industrial development and the military. The development plans relied upon the state gaining a monopoly over the country's agricultural resources. In practical terms, this meant the peasants were told what crops to plant, in what quantity, and over what area. The government bought directly from the peasants and sold directly to the buyer, cutting out the intermediaries or merchants (Marsot, 2001).

As he favoured more rural residences, he built himself a number of country palaces on the peripheries of the city. Most of these palaces sparked later urban development and were converted into what would become successful suburbs, such as the palace and garden established north of Cairo in Shubra. Work began in 1809, and the pasha moved there the next year, making it his primary residence. The palace was built on the edge of the Nile, and it was reached by an avenue planted on either side with acacias and sycamores – described as The champ-Elysées of Cairo. It was the meeting place of Cairo's native and European high society, figure (5-4). The palace was abandoned after the Pasha's death, but urban development followed, and in 1909 a double row of rental houses stood along the old avenue, provided with a tramline, converting the royal suburban area to one of Cairo's now most congested and green-less districts.

⁴⁹ This section is a compilation of a number of readings, such as: (Abu-Lughod, 1965; Abu-Lughod, 1971; Raymond, 2000; MARSOT, 2001; Hutchison, 2010, p. 97-101 and <http://www.country-data.com/cgi-bin/query/r-4039.html>, cited in 04-05-2010)

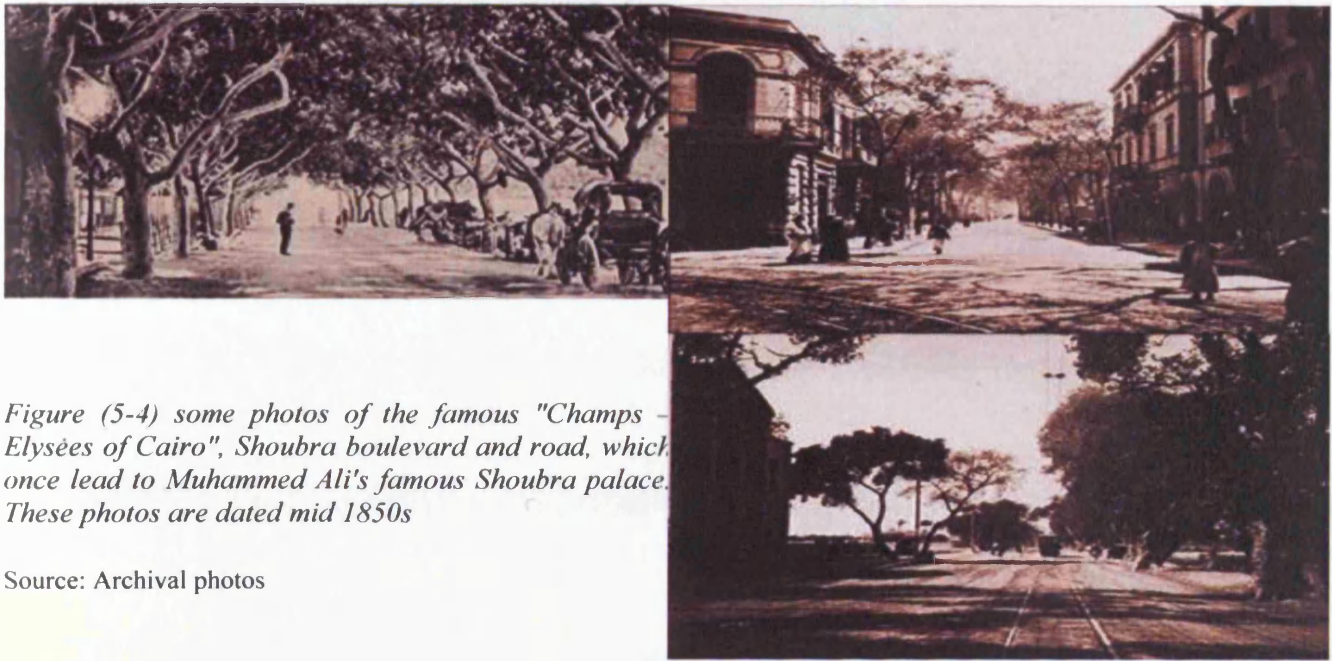


Figure (5-4) some photos of the famous "Champs – Elysées of Cairo", Shoubra boulevard and road, which once lead to Muhammed Ali's famous Shoubra palace. These photos are dated mid 1850s

Source: Archival photos

Other palaces acted as poles to urban developments and were absorbed into the expanding city at the end of the nineteenth century: Qasr al-Dubara, Qasr al-Ayni (which was transformed into the most famous municipal and university hospital in Egypt) and Qasr el-Rawdah, which was built by Ibrahim Pasha (Muhammed Ali's elder son) on the island with the same name, and is today club Méediterranée hotel (Raymond, 2000).

Many of the projects undertaken and much of the progress accomplished after 1830 may be attributed to Ibrahim pasha, who died in 1848. A number of public works were undertaken to prepare the way for future developments. The mounds of debris surrounding Cairo were levelled along the north and west borders. And the grading and planting carried out under Ibrahim pasha of some 160 hectares in the zone between the city and the Nile river behind the flood dike facilitated the urban development projects ultimately undertaken by Ismail pasha, figure (5-5). The same went for the work of filling in the lowlands (flooded when the Nile was in spate), that were so numerous in Cairo: Birkat al-Fil (partially), Birkat al-Ratli, Birkat of Qasim bey, and especially Azbakiyya pond. The drainage of this pond by means of a circular canal (around 1837) and its filling in made it possible to create a European-style garden, overlooked by palaces by hotels (Raymond, 2000).

This idea was adopted from the Ottoman empire sultans' developments in Istanbul, the most famous of which is the Dolmabahçe Sarayı (Palace), founded by Sultan Abdelmajeed on the Bosphorus waterfront of Istanbul⁵⁰.

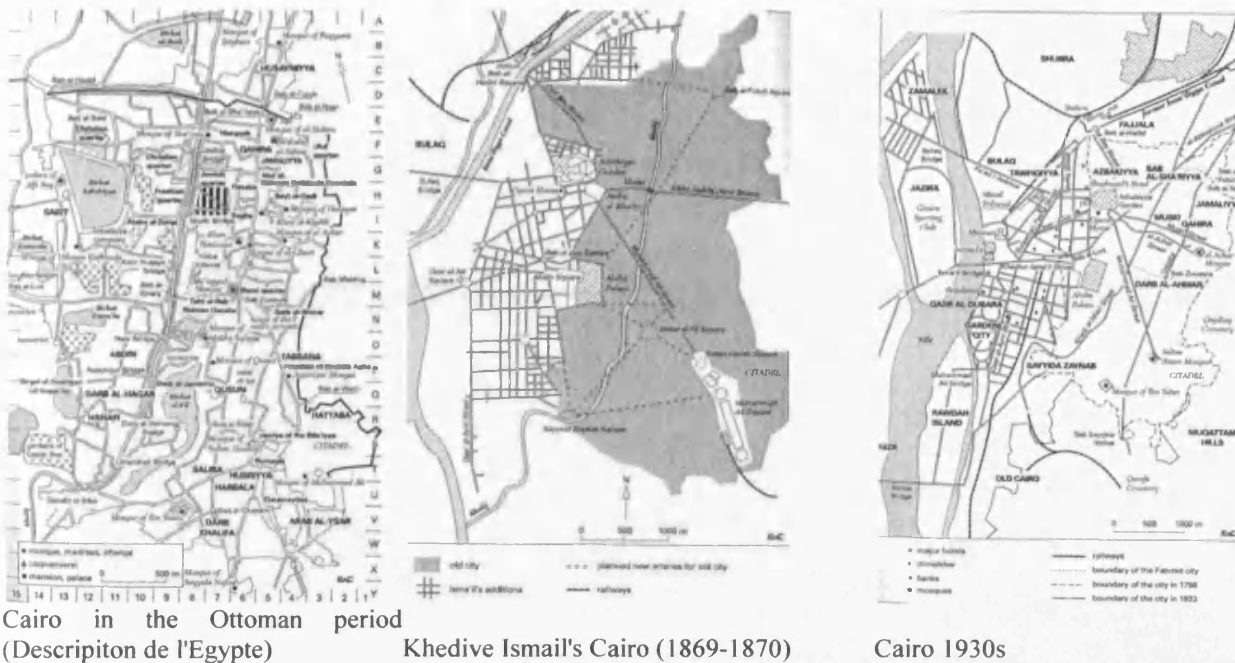


Figure (5-5) Evolution of Cairo from 19th century until 1930s.

Source: Raymond (2000)

Ismail Pasha (1863-1879), was the first to make an overall plan for the city's development; he had a great desire to westernize his capital. In a visit to Paris in 1867 he is remembered to have said: "Over the past thirty years Europe's influence has transformed Cairo. Now we are civilized".

In his visit to Paris he met Paris' renovation leading urban planner Baron Haussmann and toured his finished projects and work sites and made contact with Pierre Grand. Grand directed Cairo's street services for many years. He also met Barillet Deschamps, who created the Bois de Boulogne in Paris and went on to design the Azbakiyya garden, which was a large square placed at the meeting point of the old Cairo and the new developments of Khedive Ismail. The garden was designed as an English-style garden on the model of the Parc Monceau, with small lakes, grottoes and bridges. The garden was inaugurated in 1872, with the khedive's attendance; the garden offered the public various amenities:

⁵⁰ Personal communication, information provided by the official tourist guide in Dolmabahçe Sarayı, during the author's visit to Istanbul in December 2009.

shops, photographer's studio, a tobacco stand, a shooting gallery, restaurants, cafes, a Chinese pavilion and pedal boats (Raymond, 2000).

The new urbanism –led by Khedive Ismail- was predicated on an organization of space in which the street system had primacy, an urban geometry based on the grid and a prior knowledge of the structures to be built, figure (5-6). The new concept of urban development emphasised perspective and alignment, and imposed a new architecture based on building with standard apartments organized on a western model. All these developments led to a major evolution in the rate and style of city development. Two Cairos were the result – old and new side by side; the aristocratic and the public, the wealthy and the poor.



Figure (5-6) Khedive Ismail's and Colonial Cairo photos, late 19 century

The open spaces of the historic and renaissance city have transformed into new uses, either land subdivisions on the filled bonds and swaps, such as (Birkat al-Fil), or transformed such as Azbakiyya garden which was originally a public square. Inequalities appeared between the old and new quarters, and these was reinforced during the Colonialism era, starting in 1882. The city has been described as "*a cracked vase whose two halves can never be put back together*". During the British occupation of Egypt (1882-1936), which lasted half a century, the most striking phenomenon was the rapid growth of Cairo's population. The rate of population growth for the period of (1798-1882) was only 26%. Between 1882 and 1937, by comparison Cairo's population grew from 374,000 to 1,312,000, an increase of 250% over just fifty years (Raymond, 2000).

In this period there was a lot of attention given to agriculture and vast works were undertaken in the Nile Valley, including repairs to the Delta dams, and construction of the first Aswan dam in 1902. The relative agricultural prosperity that the country had, explains why emigration from the countryside to the city remained fairly light. After World War I,

emigration to Cairo began to increase, motivated by the slowing down of agricultural production and the speedy urban developments in Cairo (Marsot, 2001).

During this period there was a large presence of foreigners in the city, mainly allocated in the colonial districts. It was reported, by Raymond (2000), that in 1907 there was 151,414 foreigners living in Cairo. Most of them were Greeks, Italian, British and French and most formed self-contained communities.

Urban projects executed within and around Cairo (the filling of the last ponds, the levelling of hills) increased the absorption capacity of the old city, whose quarters were able to take in an important number of the new arrivals. As old districts approached their saturation capacity, hundreds of thousands of new Cairenes turned to the western and northern districts for open space to settle on. Cairo's built up area thus increased from some 1,000 hectare in 1882 to 16,331 in 1937. The search for new land encountered a variety of obstacles. The River Nile to the west with its annual flooding made flood-plain land inhospitable. Open areas to the north and northeast were too far from the centre of the city, and the lack of water hindered urban development. The Aswan dam, built in 1902, answered both the desire to increase the Egyptian agricultural production, and helped control the Nile's flood. This meant the ability to stabilize the banks of the Nile on both shores and on the islands of Jazira and Rawdah so that new residential quarters could be built there. It meant also that bridges could now be constructed, allowing Cairo to extend westward.

Until 1937, Cairo's population grew at an annual rate of 1.5-2%, while in the following decades it increased to almost 4%, after spiking at 4.8% in 1937-1947. Raymond (2000) reports that the city's population doubled during the period of 1882-1914 (thirty two years), and doubled again in 1917-1942 (twenty five years), more than doubled in 1947-1966 (only nineteen years). As a consequence of the demographic leap and very rapid scale of growth, the city had to expand in order to accommodate the swelling population. The first and easiest option was expanding on the open spaces and greenland, which rapidly took place. The result was to create the first metropolis city in Africa and leave a legacy of one of the most crowded, dense cities in the world with one of the lowest rates of provision of green space.

The accelerated rate of growth was mainly due to two factors, whose effect have combined and reinforced each other: 1) natural increase, 2) rural-urban migration. The first for a long time was moderate, but as a result of the improvements in the city's sanitary conditions, the death rates declined dramatically causing the increase in growth rates. The second factor of rural-urban migration accelerated due to the complete neglect of rural areas for decades, with all state-organised improvements and developments concentrated in the capital. People had little choice but to stream away from rural areas to Cairo searching for a more decent life and better living conditions, and motivated by Nasser's vigorous policy of industrialization, which created many new urban jobs. It amounted to a sort of "invasion" of Cairo.

To absorb so much population growth, the city was obliged both to expand and to increase its density. It extends now for more than 35 kilometres from north (Shubra) to south (Helwan). The city has pushed into areas previously devoted to agriculture, a fact of great concern to urban planners and government officials, according to Galila ElKadi⁵¹, 8,900 hectares of farmlands were lost to development between 1947 and 1982. The phenomenon seems now to have slowed down for reasons of scarcity of farmlands, and the recent firm application of persevering legislation and regulations .

The worst tragedy for the Cairo region's green open spaces and farmlands may yet be to come, however, as the red bricks used mainly for unlicensed constructions, are made by stripping the clay layer from the agricultural soil. This is a trick that many landowners have used in order to convert their farmlands from agricultural use to residential – yielding them great profit. This is a non-reversed loss of farmlands and green space and the gradual loss of green colour from Cairo's city ballet.

To conclude, Cairo's aridity was partly but inconclusively improved by the new gardens and orchards established in the nineteenth century by Muhammad Ali, and his successors. It began with the draining of the seasonal ponds to the south and west of the city and the stabilisation of the riverbanks on both sides, which had a greatest influence on the city's geography, providing the city with splendid areas of new land. The new gardens and orchards were royal possessions endowed for the royal family members, great ministers and wealthy people and were relatively large, well designed and landscaped gardens

⁵¹ Professor of Urban Planning, Cairo University, in Raymond (2000)

surrounding palaces. This is considered to be the first true westernising gesture in residential Cairo's architecture, the most noteworthy of them being the palaces of Shubra and Gazira.

In recent decades the rapid and chaotic growth of the city has accelerated the destruction of most of the palaces and their surrounding gardens. After the revolution of 1952, green spaces and parks were given very little attention of the new military government priorities. At the same time, Cairo's urban growth was reaching its climax fuelled by heavy national rural-urban migration, and the first victims were the green spaces, palaces and old historic villas surrounded by private gardens. In the absence of legislations and the existence of municipal corruption, lack of awareness and inefficient monitoring systems, squatters, slums and spontaneous urban settlements began to colonize vast parts of the city, enlarging the city's problems, complicating its spatial and land tenure arrangements and stripping it of open space.

After the economic opening-up of the late 1970s and 1980s many of the few left-over gardens and verdant promenades, especially along the river banks, have been acquired and managed governmentally or sold to luxury hotels, private clubs and restaurants. Many of the small patches of agricultural land which were scattered here and there in the city have disappeared in the last few years under the pressures of an ever-swelling population with its unrelenting demands for more housing, more roads, and more services.

To recapitulate, it can be said that there was no tradition of public urban green spaces in the pre-medieval Cairo city pattern. Green spaces were privately owned and either placed in the centre of houses or appended to the city on the banks of the Nile. The latter served a public function on special occasions. In the 19th century khedivial Cairo, the imported landscape ideas for orchards and gardens surrounding palaces became a significant model, which in some cases were successfully adapted to the local environment such as Azbakya garden, Maryland park, Orman and Giza zoo. The extinction of these parks and private gardens is truly a tragedy for contemporary Cairo.

It have been argued by Rabbat (2004), that the most important lesson to learn from the historical record, is the strategy for survival of the different types of green spaces beginning with Orchards of the early centuries and ending with the private small villas

gardens of the early 20th century. All have disappeared because they offered attractive sites for the development of more profitable real estate. Contractors and state agencies saw them as targets, already plotted, irrigated and often neglected and therefore easy and cheap to acquire. Rabbat raises the important question:

“Can we devise -a design strategy - in addition to the much-needed legal and zoning devices - that would insure the survival of parks in the heart of the ever-growing metropolis? That is the real challenge facing the new generation of Cairenes.”

Although the focus of this thesis is not the design of policy as such, my research uncovers at least one possible answer to this question: privatisation and the enclosure of green space as a so-called club good. From an urban design point of view this is a surprising solution to the problem of under-supply of open space. Indeed, to offer this answer requires a reconsideration of the urban designer’s view of the world. In particular, it requires us to understand that open space is shared space and that shared space can be shared by different groups of consumers. Cairo’s history of green spaces shows that open space cannot be defined by ownership – but by usage and that there are different types of organisational arrangement to supply open space needs. Drawing on the city’s historic examples, however, it should perhaps not be a surprise that enclosed spaces with access restricted by payment or membership are currently a crucial component of the city’s green space stock.

Part Two: Empirical study:

5-2- Spatial distribution of municipal public GS in Cairo

Figure (5-7) shows the spatial distribution of municipal public urban green spaces among the city of Cairo. The Figure was created by the interpretation and correlation of public green spaces from an IKONOS satellite image (obtained for the sake of doctoral research). The image was chosen to be in the month of May in which vegetation in the city is the most flourishing. Satellite data, municipal records and corroborating GIS data were correlated using ARCGIS 9.2 software package. Public space is defined in the Figure pragmatically, as the spaces owned, managed and run by the municipality. It is identified on the basis of supervised image classification, records of the boundaries of publicly owned parks, and interpreted Google maps. The method is described in more detail in Chapter Two (page 27-28). The map shows space that people have access to by virtue of their rights to the city and access to the resources need to pay the daily entry fees. It does not include green space that requires additional rights to be purchased through membership of a commercially organised club. This definition is refined in the discussion in Chapter Six.

It can be seen from the Figure that many parts of the city do not have any public green spaces. For vast areas, no green spaces could be found at all.

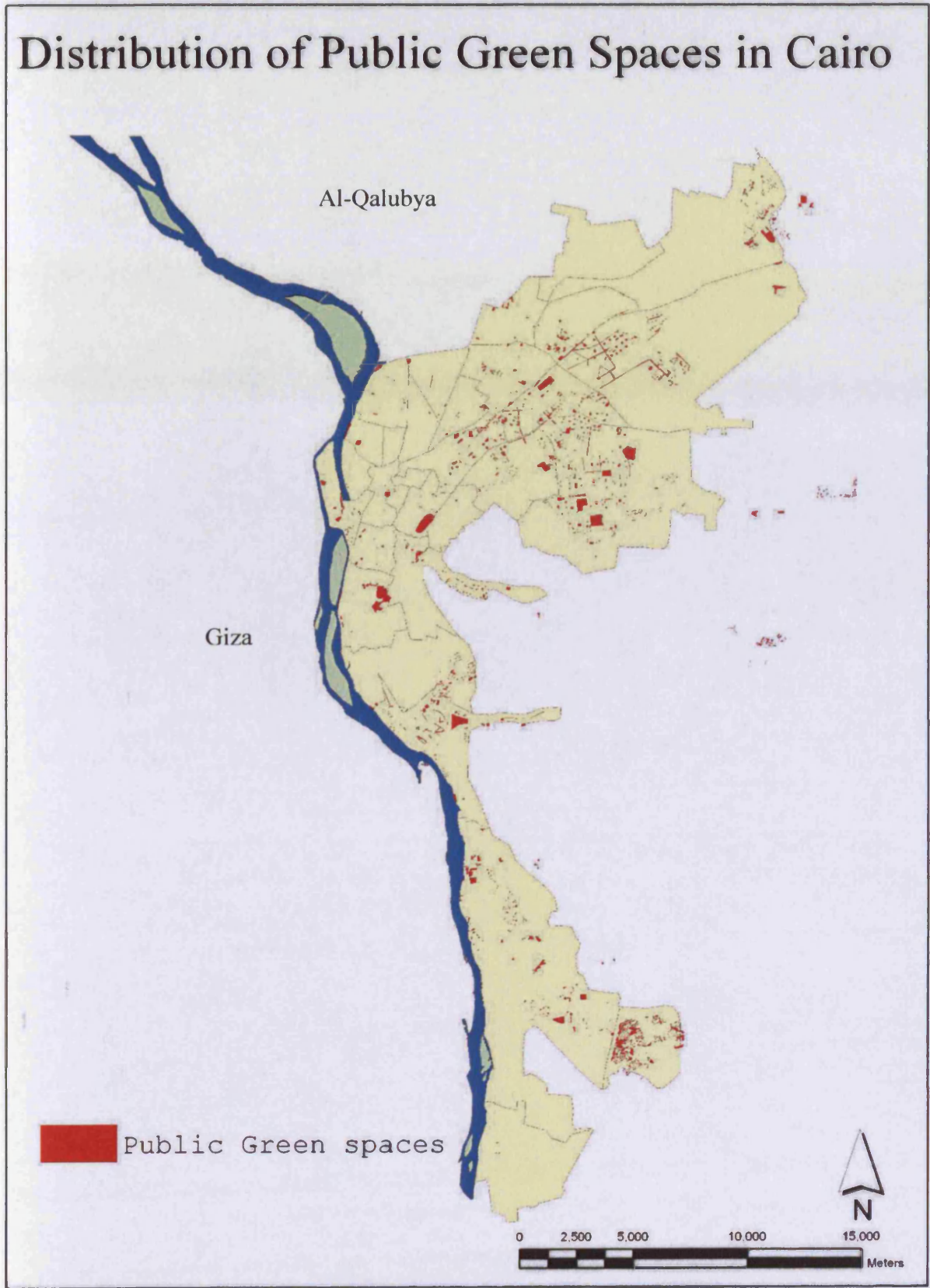


Figure (5-7) Distribution of public green spaces in Cairo

Figure (5-8) places a 300m service area around each of the public green spaces in figure (5-7) (maps were performed by researcher using Arc GIS 9.2)⁵². The 300m buffering system adopted in the analysis gives a broad indication of access to green space in the city excluding natural and man made boundaries like canals, rivers, different plateaux levels, highways, block housing, tunnels, bridges, fenced spaces and so on. This is problematic when looking at accessibility locally and for specific green spaces. For example, Al-Azhar Park has only one entrance for the public and is located on a hill with no access from any other side except the one with the entrance. This clearly enlarges the walking distance to the park dramatically. However, the purpose of the present study is to make general conclusions about green space supply and a simple offset of 300 m gives at least some indication of the amount of city area within walking distance of public green spaces in the city.

⁵² See the methodology Chapter Two (p.26) for details of the Satellite image analysis.

Buffer of 300m for Public green spcae

Figure (5-8) More than 54% are deprived from any green space within a 300m walking distance.

Comparisons

Elzafarany (2004) states that the amount of green spaces (based on officially reported figures) per person in London is twenty times the amount in Cairo, in spite of the fact that the urban built area of London is nearly 4 times that of Cairo. He notes that the problem is even more critical on the national level, when comparing Egypt with more arid contexts like that of Saudi Arabia, Emirates and Angola, Egypt comes last in the amount of green spaces per person, in spite of having the great river Nile running through its lands.

Historically Egypt generally and Cairo specifically was famous for its parks and tree-sided boulevards. That now seems to have changed. Where the green colour is absent in the urban colouring pallet of Cairo, cities in comparable countries, suffering equal or more arid

climates have been adding to their urban green spaces more successfully. Table (5-1) shows comparisons between some international capitals and Cairo. Madrid which possess a climate not too dissimilar to Cairo, scores the least among the European capitals, with 11.5 m²/person, equivalent to more than 6 times Cairo's figure. The average for the European cities is 51 m²/person.

Table (5-1) Comparison between Cairo and several European capitals in the amount of Green space to which the public has access

Berlin (1996)	23.6	Helsinki (1996)	122.4	Madrid (1996)	11.5
Vienna (1996)	124.7	London (2004)	29	Cardiff (1981)	44
Copenhagen (1996)	35	Luxemburg (1996)	17.8	Cairo (2005)	1.72
Minimum	11.5	Maximum	124.7	Average of cities (mean)	51

Source: European commission regional policy – Assessing the quality of life Europe's cities,
URL:http://ec.europa.eu/regional_policy/urban2/urban/audit/indicators/land.htm

In the next section, I examine the distribution of this scarcity across and between Cairo's various districts.

Municipality districts distributions

Greater Cairo used to consist of 3 different governorates: Cairo, Giza and Qalubia. This research is concerned only about Cairo the capital of Egypt, The governorate of Cairo's formal boundaries and district distribution was changed in late 2007 and early 2008, from 31 districts to 28, with the south 3 districts now excluded. The new Cairo boundaries have also cordoned the east extensions of the city, whereas before, the eastern boundary extended very far out into the desert. Census data for the year 2006 was officially published in late 2008 and census data were recorded in respect to the old 31 district distribution. The research in this thesis makes use of the 31 district system.

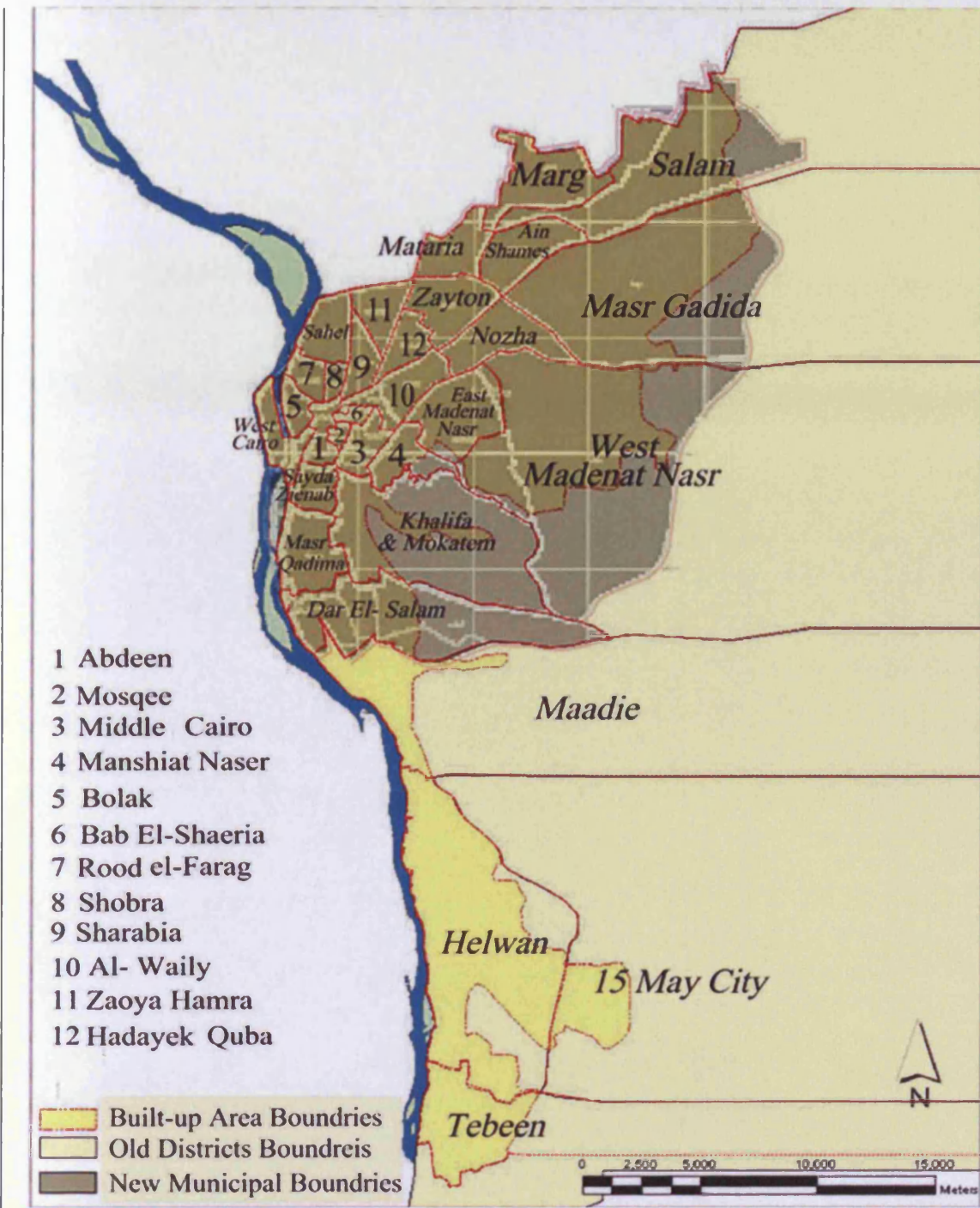


Figure (5-9) Municipal districts distribution before 2008 and after

Source: Association of National Planning- Cairo, while overlay is done by the author

5-3- Urban Green spaces supply analysis

The analysis of the urban green space municipal supply is demonstrated on three different levels. The first is of the whole city, showing the evolution of both the green areas and the amount of green spaces per person. The second level of analysis is at the district level, where the area of green spaces in each district is estimated, expressed as a total and as a percentage of the total urban area in the district. A comparison with districts densities is also made to help explain the amount of urban green space per person at the districts level. Two different district level measures of green spaces are made. The first is the amount of green space per person, while the other is a typology according to the total green space area. The third level of analysis is on the level of individual green spaces.

City level

(a) Evolution of total green space area

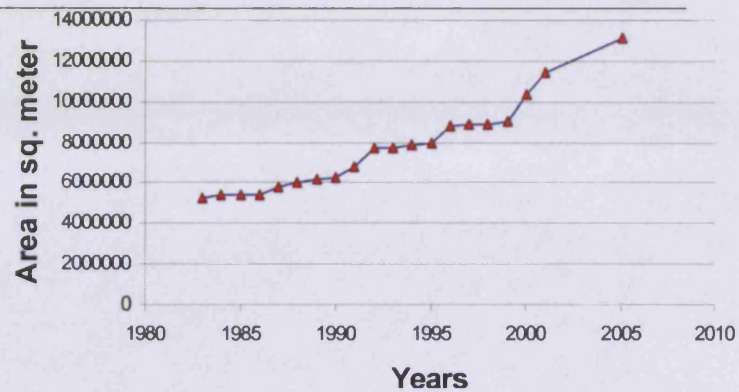
Table (5-2) and figure (5-10), show the annual evolution of the total area of municipal green spaces in Cairo in the last 2 decades. The data are drawn from Elzamelly (2006), who based his analysis on the governmental reports provided by the Cairo Cleanness and Beautification Agency (CCBA). It can be observed that the city suffered dramatically from the acute under-supply of green spaces especially in the years 1984-86, where the amount of green spaces did not increase at all for the whole 3 year period, in spite of continuing massive population growth. This under-supply problem continued during the 1990s when there were not significant additions to the total area of green spaces.

A significant but weak improvement can be noticed in 2005, which was due to several factors such as: a) the CCBA adding to their total GS areas, the services and car parking areas attached to the GSs; b) CCBA statistics counting some green spaces that have not actually yet been developed, planted or used; c) adding the nursery areas to the total amount of GS, even though these areas are not open for public use; d) the launching of new parks and gardens, such as Alazhar park, which added a total area of 361,200 m² to the city according to the CCBA records. All these factors help explain the growth in official green space area from the early 2000s, however this increase in CCBA figures did not reflect a real increase in the actual total green space areas in the city.

Table (5-2) Evolution of green spaces in Cairo city

Year	Area	Year	Area	Year	Area
1983	5257875	1990	6301400	1997	8885100
1984	5431125	1991	6778625	1998	8888250
1985	5431125	1992	7736400	1999	9019500
1986	5431125	1993	7736400	2000	10335993
1987	5781475	1994	7865025	2001	11408875
1988	6018600	1995	7984025	2005	13119651
1989	6210050	1996	8827350		

Source: Elzamely 2006

Figure (5-10) A chart for the Evolution of green spaces in Cairo city

Source: Elzamely 2006

(b) Evolution of the amount of green space per capita

Table (5-3) and figure (5-11), shows the evolution of the amount of green spaces per capita, according to the CCBA records. It shows an observed decline in the amount of green spaces per person in 1986, which was a threatening indicator. The municipality appears to have responded to the decline and since then the curve was rising slowly. Other reasons for the continued rise include a gathering politicisation of the greening issues through public awareness of sustainability issues, and the growing demand for GS. Thus an upthrust could be tracked in 1989, mainly because the municipality was trying to beautify the bitter reality and tended to exaggerate reported figures. This happened by several means such as adding the green strips on the sides of highways, even if they are not cultivated or suitable for growing trees and plants. Following the same policy in 2000 the municipality have developed some sections of the river Nile banks, and added these areas to their annual report figures, even though most of these areas are privately used as fenced arboretums and orchards for growing ornamental plants and flowers, and they are not accessible to the public. This is acceptable if the inventory is one of bio areas, but misleading if it is meant to indicate the quantity of green areas available to the city's residents for recreation.

The apparent increase does not seem to reflect any real improvement in the quantity of green space in the city. It is mainly political dressing, to convince the public that there is an improvement.

Table (5-3) Evolution of the amount of green spaces per person in Cairo city

Year	Area	Population	Amount of GS per
1983	5257875	5688415	0.92
1986	5431125	6007280	0.90
1990	6301400	6291693	1.00
1996	8827350	6800992	1.30
2000	10335993	7109997	1.45
2001	11408875	7487851	1.52
2005	13119651	7628090	1.72

Source: Elzamely 2006

Evolution of GS amount per capita

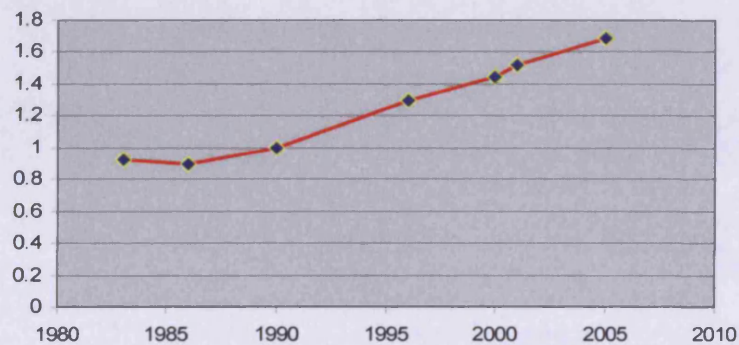


Figure (5-11) A chart of the Evolution of amount of green spaces per person in Cairo city

The direction of the graph in Figure (5-10) might be encouraging but the slope needs to be very much greater to move Cairo significantly towards supply levels comparable with other arid countries.

The next section addresses the distribution of green spaces at the district level, which gives a better understanding of the spatial distribution of served and deprived places in the city.

Districts level

(a) Green spaces areas in different districts

Table (5-4), tabulates for each of Cairo's 31 (old) districts, the total area of green space, as measured from government statistics; population; the computes green space per person; built area as measured from satellite image and supporting GIS sources; green space as a percentage of this built up area; and population density.

The green space percentage of the built up area was calculated by dividing the area of green space in each district by the total built area of the district. Areas of green spaces were reported in CCBA annual reports for 2005, and the district's built areas were calculated from the IKNOS satellite image, for the same year, and calculation done using ArcGIS 9.2 software.

Some of the key findings and important figures can be summarised as follows:

- Mataria district not only has the highest density of 908 person/hectare, but has the second least figure of the amount of GS per person with only 0.09 m² per person, while Marg has the least with 0.02 m² of GS per person. Mataria is a typical case of the early developments following the revolution; it is a typical case of pattern Four of the early private developments (which is explained in more detail in Chapter Six). It is a brutal example of the failure of both the market and the public institutions responsible for the urban green space supply. This district and others, such as Ain Shams, are examples of the tragedy of the commons, where the increasing demand for land for urban expansion has sacrificed all green land and open spaces in the area.
- Dar Al-Salam draws another significant key finding, having the highest population among the city's districts with 828,493 person, according to the 2006 census data. The tragedy is that this district is mainly a huge illegal encroachment of the city's green land. The district suffers from an acute lack of services in general and green spaces in particular and is a typical case of pattern seven in the neighbourhood green space based methodology.

- A contrasting example drawn from the other side of the spectrum, comes from Masr Al-Qadida (New Egypt) district, which has the highest figure regarding the amount of GS per person and is the only district that exceeds 10 m² per person. Moreover it has the highest percentage of GS to built-up area, with nearly 18% of its area occupied by green space. Furthermore, it possesses the lowest density figure in the city with only 25 persons/ hectare. This district is a typical case of the colonial developments of pattern two of the neighbourhood GS based typology, where both the government and the market have succeeded in supplying GS.

What can be concluded is that the poorer the district the higher the densities and the less the amount of green spaces. The next chapter introduces in more detail the institutions responsible for the supply of GS and the types of neighbourhood that have evolved. It introduces several examples and provides more explanation about the reasons for success and failure in providing GS.

Table (5-4) Cairo's Districts GS areas %s of total built area, amount of GS/person and population densities

	District name	Area of GS ⁵³	Population ⁵⁴	GS/ Person (m ²)	Built area (m ²)	% of GS	Density person/hectare ⁵⁵	Density person/feddan ⁵⁶
1	Bolak	17,008	62155	0.27	2,400,923.	0.71%	259	109
2	15 May city	1,046,150	126515	8.27	9,603,365.	10.89%	132	55
3	Abdeen	95,428	71653	1.33	3,056,113.	3.12%	234	98
4	Ain Shames	228,541	631314	0.36	8,192,542.	2.79%	771	324
5	Al- Khalyfa	94,276	213281	0.44	10,974,211	0.86%	194	82
6	Al-sayeda Zainab	103,494	145387	0.71	3,678,772.	2.81%	395	166
7	Al-Waily	263,560	145505	1.81	6,815,726.	3.87%	213	90
8	Bab El-Shaeria	10,123	54712	0.19	976,280.4	1.04%	560	235
9	Dar Al-Salam	304,598	828493	0.37	15,080,155	2.02%	549	231
10	El-Mosqee	69,772	24822	2.81	803,709.9	8.68%	309	130
11	EL-Tebeen	92,569	66096	1.40	15,763,741	0.59%	42	18
12	Hadaek Quba	126,797	298546	0.42	3,873,183.	3.27%	771	324
13	Helwan	1,819,791	620688	2.93	51,355,546	3.54%	121	51
14	Maadie	320,467	179636	1.78	13,708,001	2.34%	131	55
15	East Madenat Nasr	2,320,684	379021	6.12	39,454,692	5.88%	96	40
16	Manshiat Nasser	24,150	71181	0.34	3,956,130.	0.28%	180	76
17	Marg	6,984	371148	0.02	11,005,506	0.06%	337	142

53 The source of the Areas of green spaces 2005, is the Governmental reports of CCBA (Cairo Cleanness and Beautification Agency)

54 The source of the estimated population 2005 is the governmental report of Cairo's governorate development map, Cairo governorate, 2007

55 Where 1 Hectare = 10000 m²

56 Where 1 Feddan = 4200 m²

18	Masr Qadeema	1,221,740	226731	5.39	8,598,480.	2.79%	264	111
19	Masr Qadida	1,098,400	109338	10.05	43,840,419	17.97%	25	10
20	Matriaa	49,919	554693	0.09	6,111,664.	0.82%	908	381
21	Middle Cairo	418,830	91359	4.58	3,815,258	10.98%	239	101
22	Nozha	977,091	176860	5.52	8,953,589.	10.91%	198	83
23	Rood El-Farag	74,145	164286	0.45	2,559,636.	2.90%	642	270
24	Sahel	279,383	319013	0.88	5,535,519.	5.05%	576	242
25	Salam	341,499	570444	0.60	26,963,613	1.27%	212	89
26	Sharabia	107,791	236598	0.46	3,678,164.	2.93%	643	270
27	Shobra	106,252	77308	1.37	1,327,808.	8.00%	582	245
28	West Cairo	778,172	79976	9.73	4,545,369.	17.12%	176	74
29	West Madenat Nasr	461,100	49230	9.37	10,853,073	4.25%	45	19
30	Zaoya Hamra	71,166	347977	0.20	4,821,381.	1.48%	722	303
31	Zayton	189,771	334124	0.57	8,078,324.	2.35%	414	174
	TOTAL	13,119,651	7,628,090	1.72	340,380,90	3.85%	224	94

The percentage of green areas to the total urban built area in the city as a whole is 3.85%. The distribution is very unequal as Figure (5-7) and table (5-4) show. There are 6 districts with a total population of 1,338,554 inhabitants between them, that each has less than 1% of their built areas green. At the other end of the distribution, West Cairo has 17.12% of its built area under greenery.

Figure (5-12), shows a scatter plot correlating the relationship of amount of GS/person against GS percentage of built up area in each district. Significant findings include the following:

- It is clear that most of the city's districts are situated in the quadrant of low GS/person and low percentage of GS to built up area (more than 20 districts). This reflects the general scarcity of GS across the city.
- Interestingly, a number of districts are high in the percentage of GS/ person, while they are relatively low in percentage of GS to the built up area, such as west Madinet Nasr, east Madinet Nasr and Masr Qadima. This is due to the low densities of these districts which contributed in the relatively high figures of GS/person, compared to the other districts.
- Three districts a middling level both the GS/person and the percentage of GS to the built up area, these districts were 15 May City, Nozha and Middle Cairo. This might be again because of low densities in these districts, moreover these are among the newest districts in the city, where planning was practiced and legislations and regulations were followed in developing these districts.

- Only 2 districts scored high figures in both the GS/person and the percentage of GS to the built up area: Masr Qadida and west Cairo. These 2 districts are mainly colonial developments with westernised ‘Garden City’ school of planning influence which created plenty of venues for GS, with a hierarchal functional patterns by design

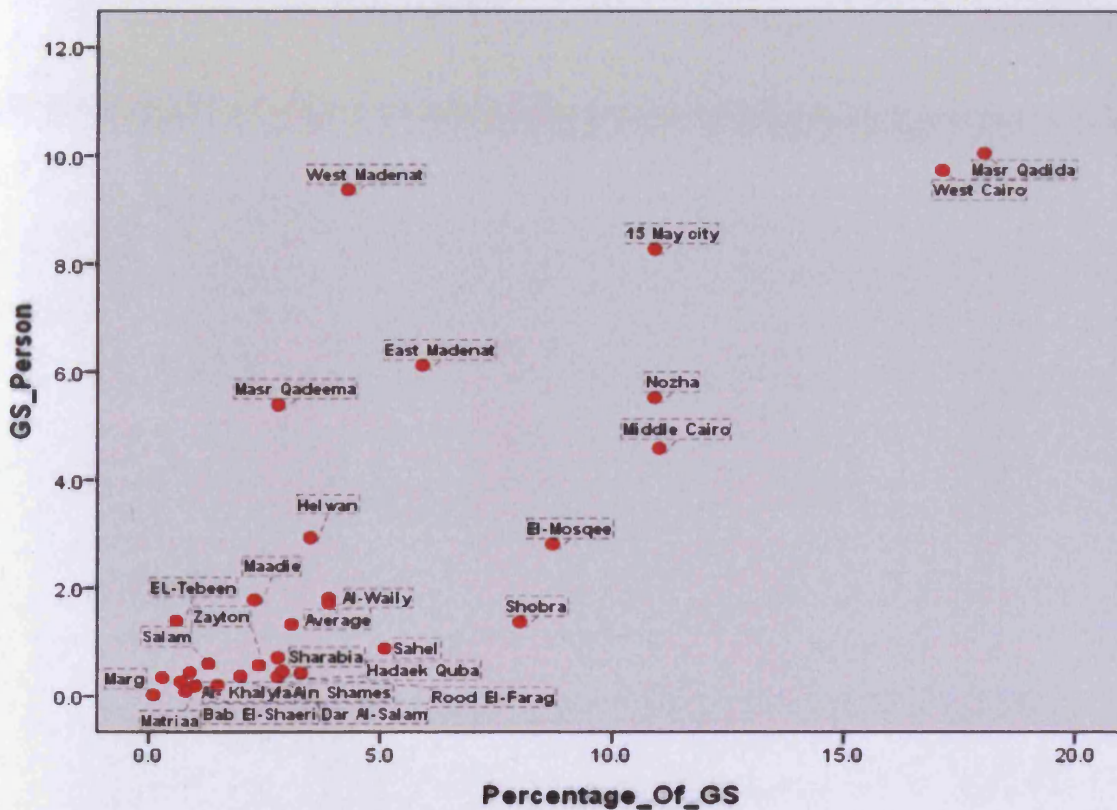


Figure (5-12) A scatter plot showing GS/person (in m^2) against GS/built up area (%)

Densities are high within most of the city's district, reaching 907 person/ hectare in Matria, where the area of green space is only 0.82% of the total built area of that district. Figure 5-13, shows the general trend for the relationship between densities measured in person/hectare and green space/person, where it is found that the higher the districts' densities the lower its the amount of GS/person. And the contrary could be said as well regarding the low density districts, which possess higher figures of GS/person. Matria seems to perform worst, having the highest density in the city, with one of the lowest figures for GS/person. A similar condition is found in a number of other districts including Hadaek Quba, Ain Shams, Zaouya Hamra and Sharabia, where all have a population of more than 600 person/ hectare, but do not exceed $1 m^2$ /person of GS. On the other hand

districts with low densities such as 15 May City, West Madinet Nasr, West Cairo and Maasr Qadida, have remarkably high figures in terms of GS/person - approaching 10 m²/person, while densities are among the least in the city, some districts having less than 100 person/ hectare.

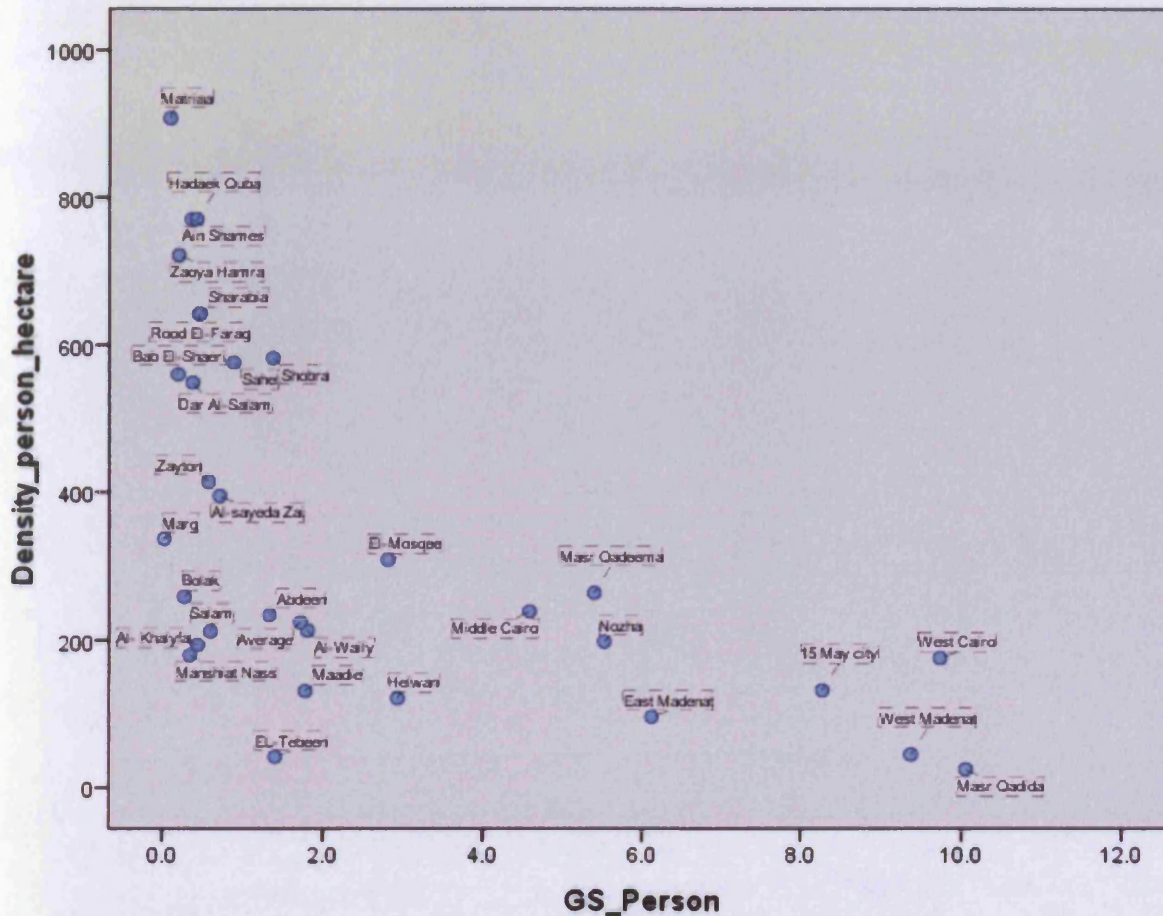


Figure (5-13) A scatter plot showing GS/person (in m²) against Densities per hectare

(b) Ranking of districts according to the green space totals

Table (5-5) and figure (5-14), rank districts according to the total green space. Only 7 districts of the total 31 of Cairo have Green areas more than 50 hectares, and only one district is above 200 hectares. Another interesting pattern in this table is that up to West Cairo in the rankings, there are only small differences between the districts. From West Cairo down, the differences become much greater. There are therefore two clusters of district: those with low amounts of green space and little difference from their nearest

performing district; and those with higher amounts and greater variation from their nearest performing districts. The latter are the more peripheral districts.

Unsurprisingly the colonial and relatively new developments possess the largest areas of green space compared to the other city districts; however it is important to correlate these areas with district population in order to have a realistic impression of provision. As an example, Helwan district, possesses the second highest amount of green spaces among the city's districts, however when correlating this figure with the population, it appears that the amount of green space per person is less than 3 m² per person, which is relatively low compared with other similar districts regarding the total area of green space such as Masr Qadida. 15th May City, scoring 8.3 and 10 m²/person respectively.

The district green space statistics are not, therefore a wholly accurate figure to rely on in comparing green spaces between different parts of the city as it neglects the total area of the district boundary, the densities within these districts and the types of the supplied green spaces. It is still a useful first-stop indicator, however of the provision of green space supply in these districts.

Table (5-5) Ranking of Cairo's district by Green spaces areas

District	GS Area (m ²)	A ⁵⁷	Population	GS/p	District	GS Area (m ²)	A	Population	GS/p
Marg	6984	0.7	371148	0.02	Ain Shames	228541	22.9	631314	0.36
Bab El-Shaeria	10123	1.0	54712	0.19	Al-Waily	263560	26.4	145505	1.81
Bolak	17008	1.7	62155	0.27	Sahel	279383	27.9	319013	0.88
Manshiat Nasser	24150	2.4	71181	0.34	Basateen & Dar Al-Salam	304598	30.5	828493	0.37
Matriaa	49919	5.0	554693	0.09	Maadie	320467	32.0	179636	1.78
El-Mosquee	69772	7.0	24822	2.81	Salam	341499	34.1	570444	0.6
Zaoya Hamra	71166	7.1	347977	0.2	Middle Cairo	418830	41.9	91359	4.58
Rood El-Farag	74145	7.4	164286	0.45	West Madenat Nasr	461100	46.1	49230	9.37
EL-Tebeen	92569	9.3	66096	1.4	West Cairo	778172	77.8	79976	9.73
Al- Khalyfa & Mokatem	94276	9.4	213281	0.44	Nozha	977091	97.7	176860	5.52
Abdeen	95428	9.5	71653	1.33	15 May city	1046150	104.6	126515	8.27
Al-sayeda Zainab	103494	10.3	145387	0.71	Masr Qadida	1098400	109.8	109338	10.05
Shobra	106252	10.6	77308	1.37	Masr Qadeema	1221740	122.2	226731	5.39
Sharabia	107791	10.8	236598	0.46	Helwan	1819791	182.0	620688	2.93
Hadaek Quba	126797	12.7	298546	0.42	East Madenat Nasr	2320684	232.1	379021	6.12
Zayton	189771	19.0	334124	0.57					

Source: this table was compiled by author, where:

- GS area from the municipal CCBA report 2006
- Population data from the 2006 census data.

⁵⁷ Green space area calculated in hectare

Ranking of Cairo's district by Green spaces areas

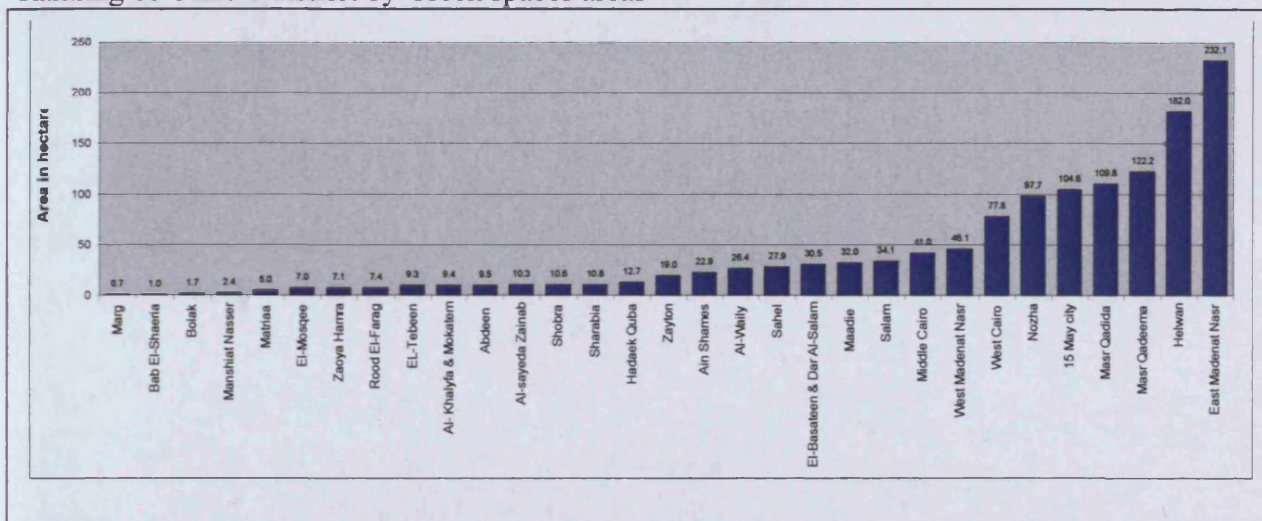


Figure (5-14) Ranking of Cairo's district by Green spaces areas

Source: Author's analysis

(c) Typology according to percentage of GSs' areas to the total built area

The percentage of green space to the total built area is a useful indicator in assessing the variation of supply across districts.

Comparing these figures with the UNEP indicators discussed in Chapter Three, the (green space in the city should not be less than 10%), only 5 districts meet or exceed this standard. The other 26 districts are below it. By looking at the population totals, we can say that:

- Only 7.6% of Cairo's population live in districts possessing areas of green space more than 10% of their total area. (584,048 of the total of 7,628,090 person)
- More than 81% of Cairo population live in districts possessing areas of green space less than 5% of their total area. (6,243,878 of the total of 7,628,090)
- More than 92% live in districts possessing areas of green space less than 10% of its total area. (7,044,042 of the total of 7,628,090)
- 10 districts have less than 2% of built up area as GS. The population of these ten districts in total is 3,140,180 person, which consists of 41% of Cairo's whole population.
- The average of GS to the total built up area for Cairo's districts is 3.9%. However,

20 districts (two thirds) are below this average, with a total population of 6,049,143, which is equivalent to 79% of Cairo's total population..

- The figures are apparently biased because of the high percentages of two districts,; Masr Gadida scoring the highest percentage of GS to built area (18%), followed by west Cairo district (17.1%). On the other hand, Marg district scored the least percentage (0.06%).

Figure (5-15), ranks Cairo's districts by the percentage of green spaces of the total built area of the city. The highest 2 districts score nearly 17% and 18% respectively. These districts are famous for being constructed during Cairo's renaissance period in the colonial era, where the westernisation of the new developments were the prevailing trend.

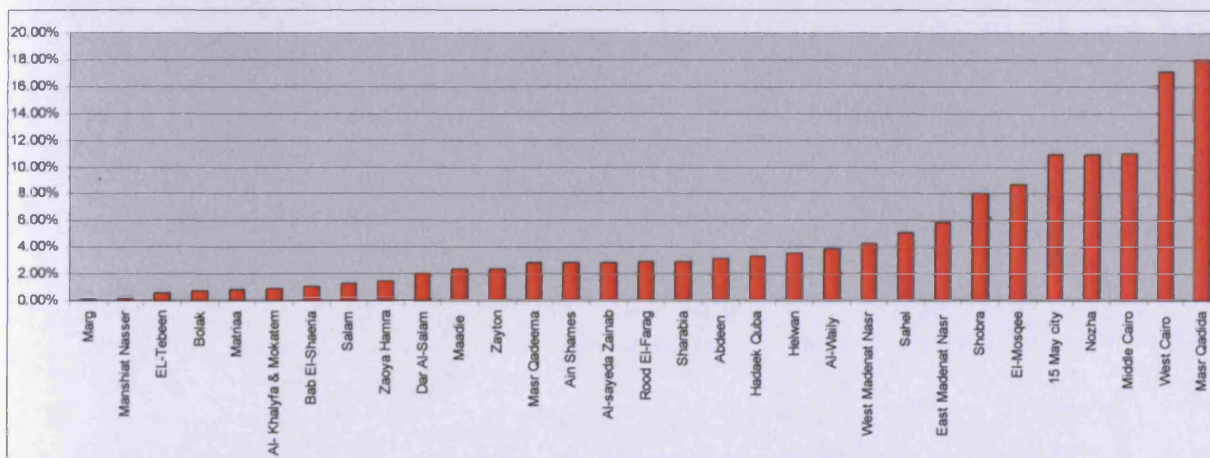


Figure (5-15) Ranking of Cairo's districts by the percentage of green areas of the total built area

Source: Author's analysis

(d) Ranking of districts by the amount of green space per person

Although the average green spaces per person in Cairo of 1.72 m² is itself very low, it hides even worse deprivation in many districts. More than half the districts are far beyond this average, while at the extreme of the distribution, the inhuman figure of 0.02 m² is reported in one district of the city. Table (5-6), and figure (5-16), shows Cairo's districts ranks by amount of green space per person.

Table (5-6) classification of districts by the amount of green space per person

Below 0.5 m ² /person		More than 2 m ² /person	
Marg	0.02	El-Mosquee	2.81
Matriaa	0.09	Helwan	2.93
Bab El-Shaeria	0.19	Middle Cairo (Darb Ahmar - Gamalya)	4.58
Zaoya Hamra	0.20	Masr Qadeema	5.39
Bolak	0.27	Nozha	5.52
Manshiat Nasser	0.34	East Madenat Nasr	6.12
Ain Shames	0.36	15 May city	8.27
El-Basateen & Dar Al-Salam	0.37	West Madenat Nasr	9.37
Hadaek Quba	0.42	Shobra	1.37
Al- Khalyfa & Mokatem	0.44	EL-Tebeen	1.40
Rood El-Farag	0.45	Maadie (Maadie- Torra)	1.78
Sharabia	0.46	Al-Waily (Thaheer - waly)	1.81
More than 0.5 m²and below 2 m²/person		West Cairo (Kasr el-Nile - Zamalek)	9.73
Zayton	0.57	Masr Qadida	10.05
Salam	0.60		
Al-sayeda Zainab	0.71	Average	
Sahel	0.88	Average	1.72
Abdeen (Abdeen - Azbakya)	1.33		

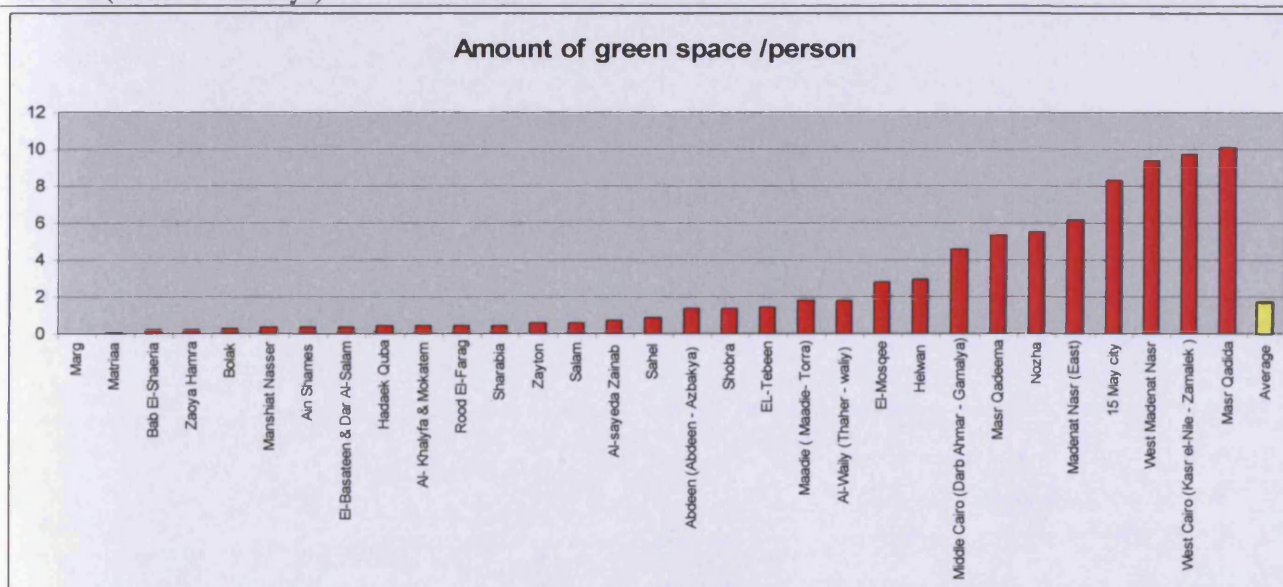


Figure (5-16) Ranking districts by the amount of green space per person

Source: Author's analysis

Table (5-7), shows that more than half of Cairo's population have only 0.5m²/person, which is far below the city average of 1.72 m²/person. In fact, 70% of the City's population have less than this average figure.

Table (5-7) Amount of green space per person

Description	Population	Percentage
Less than 0.1 m ² /person	925,841	12.14%
Less than 0.5 m ² /person	3,834,384	50.27%
Less than 1.0 m ² /person	5,203,350	68.21%
Less than average (1.72 m ² /person)	5,418,409	71.03%
Less than 2.0 m ² /person	5,743,550	75.2%
More than 4.0 m ² /person	1,239,030	16.29%

Source: Author's analysis based on table (5-5)

Size of green space

As the earlier comment about Al-Ahzar park showed, it is not just quantities that matter but other attributes of green space too. Most significant is size. In the case of the largest 2 parks in Cairo, these comprise nearly half the major municipal supplied green spaces in the city, not only in their districts. Table (5-8) shows the distribution of Cairo's municipal public gardens and parks, showing both the area and location of each GS. This leads to an acute accessibility problem, not withstanding their size and the district's overall performance in the supply rankings. Table (5-9), and figure (5-17) classify green spaces by area size.

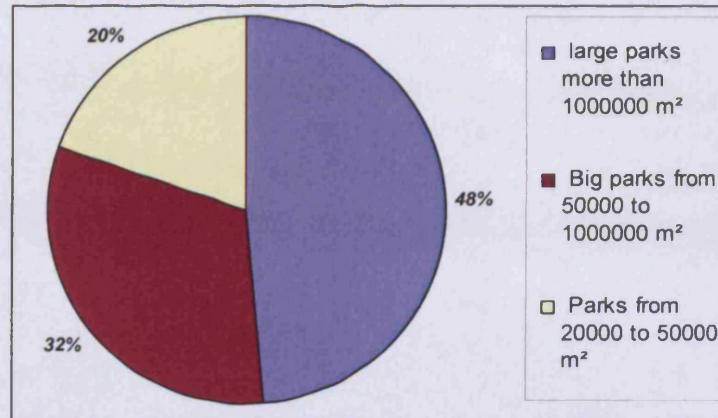
Table (5-8), Detailed list of Parks and gardens areas in Cairo

Name	District	Area	Name	District	Area		
large parks more than 1,000,000 m²			Less than 10,000 m²				
1	Fostate garden	Masr qadima	1,050,000	1	kobry elkoba	zayton	9,870
2	Waffa and Amal	Madinet nasr east	1,050,000	2	elkoba elfedwiea	waity	8,925
Big parks from 50,000 to 100,000 m²			3	darelaolom	sayda zienab	8,925	
1	Azhar	Darb Ahmar	361,200	4	elmaktba	salam	8,400
2	international	Madinet nasr west	231,000	5	omar mokhtar	zayton	8,400
3	Tokyo	Helwan	157,500	6	e'wa ain shams	ain shams	8,400
4	Gaba	Nozha	121,800	7	elfateh	nozha	8,400
5	child library	Madinet nasr east	92,400	8	elhorya	maadie	8,000
6	(6 october)	Helwan	84,000	9	neighbourhood 18	15 May city	7,000
7	Arb elmohamdy	Waiely	75,600	10	somaeel	madinet nasr east	6,300
8	bostan elzayton	Madient nasr west	75,600	11	Ahmed ramy	masr qadima	6,300
9	Mubark	Helwan	63,000	12	abtal	Maadie	6,300
10	elGabel	15 May city	55,000	13	hayaet elestethmar	madinet nasr east	6,300
11	eloroba	madient nasr west	50,400	14	elnasr	masr qadima	5,775
Parks from 20,000 to 50,000 m²			15	elbostan	elbasateen	5,250	
1	neighbourhood 22	15 May city	47,000	16	elnargs	zaytoun	5,050
2	Japanese garden	Helwan	42,100	17	wekalla	waily	4,725
3	the airport	Salam	42,000	18	elset khadra	HELWAN	4,620
4	Azpakeya	Mosque	42,000	19	eklshesheny	sahl	4,200
5	neighbourhood 4	15 May city	41,600	20	elabour	hadyek elkoba	4,200
6	Fish garden	zamalek	39,900	21	elaml	zaoya	4,200
7	Suzan Mubrak	Rood elfarag	37,800	22	elmanyal	masr qadima	4,200
8	elzomr	madinet nasr east	38,500	23	slalam	slalam	4,200
9	the station	Helwan	35,700	24	sentral	nozha	4,200
10	neighbourhood 7	15 May city	35,000	25	garden city children	kasr Nile	4,200
11	neighbourhood 22	15 May city	34,000	26	helmatafeya	zmalek	4,200
12	zohria	zamalek	33,600	27	neighbourhood 13	15 May city	4,200
13	the forest	15 May city	32,000	28	zhrat elsalam	salam	4,200
14	the airport	15 May city	30,000	29	neighbourhood 11	15 May city	4,000
15	elhorya	zamalek	29,400	30	elabour library	masr qadima	3,500
16	alahlya	Helwan	29,400	31	maydan elfarmsawy	thaher	2,100
17	Aga-ghan	Sahel	29,400	32	military force	waily	2,100
18	the family garden	masr qadida	29,400	33	elabour	zamalek	2,000
19	Ain Helwan	Helwan	29,400				
20	square 7	madient nasr east	29,400				
21	elzohour	Helwan	23,100				
22	ibn sandar	zaytoun	21,000				
23	elnahr	zamalek	21,000				
24	elshaimaa	nozha	21,000				
25	10th ramdan	madinet nasr west	21,000				
26	elfateh	Helwan	21,000				
27	elryadee	zamalek	20,790				

Source: (CCBA, 2006)

Table (5-9) Classification by area typology

Type and area of Green space	Total area	% of T area	Number
- Large sized parks more than 1,000,000 m ²	2,100,000	48.6%	2
- Medium sized parks from 50,000 to 100,0000 m ²	1,367,500	31.6%	11
- Parks from 20,000 to 50,000 m ²	856,490	19.8%	27

Figure (5-17) Percentage of Cairo's total green space in different size categories

It can be concluded from the analysis of size, that actual patterns of access experienced by citizens will vary considerably according to the size distribution of green areas in their districts. This is, in fact, revealed in the buffering map already presented.

5-4- Reflection and conclusion

All the previous analyses and measurements, proves with no doubt that there is a real problem of green space scarcity in Cairo. The issue of the green spaces supply is thus confirmed as a crucial issue to address in order to enhance the worsening built environment of the city. To add interpretation and context to the static statistics presented, this section reflects more qualitatively on the supply issue.

Urban expansions into green areas has contributed to Cairo's green space shortage. This can be classified into 2 phases. The first was 2-3 decades ago, encouraged by the weakness of laws and legislations and the absence of effective enforcement of these weak laws. During this time, environmental and sustainability issues had no place in the municipal agenda. The second phase is the contemporary situation. This is more complicated, as the demand for scarce spaces in the city is high but encroachment onto green areas still happens. Laws are more restrictive and with a deeper understanding of environmental and

sustainability issues, the municipality is trying desperately to find any vacant area to use as a green area. This is a difficult task since the first encroachments left few spaces where public essential services can be extended.

Primitive policies and ignorance of the importance of landscape to built environments contributes to the under supply situation described in this chapter. It appears that even the limited spaces created have not generally followed any systematic distributional policy, either in attempting to provide a common standard of access across the city or in respect to size distribution. The institutions governing the supply of green space have varied over time as I discuss in the next chapter. A greater degree of central control has been exerted since the 1980s and in the next chapter the results in terms of green space provision are discussed. For the city as a whole, however, the situation can be described as haphazard. At various times, both the market and the government have been major contributors to the pattern of undersupply as the next chapter elaborates in some detail. The city's green space problem has been driven by changing individual and political orientations. This is not surprising when it is considered that the heads of the involved agencies are chosen politically and generally have no related background; most of the time they are chosen as retired generals as a kind of a reward for them serving the governing system.

There is an apparent absence of the adoption of any strategies or policies in the city and one implication of the analysis of this chapter is that it will be crucial to have a plan for the next few years if there is to be any chance in significantly changing Cairo's' green space deficit.

Related to this is the general problem of poor maintenance of publicly managed green spaces. This is particularly important in an arid context where attention must be given to watering and tending. What actually happens is not encouraging and many spaces are suffering neglect and are in need of maintenance and reinvestment.

Dumping and littering is an enlarging problem that is dangerously threatening common areas in the city including green spaces. It seems to intensify every year and has reached a point at which the municipal workers' efforts to clear up the mess are not enough. The debris is just piling up in public spaces, degrading scarce green space and discouraging people from using them.

There is evidently inefficiency in municipal agencies' management of green spaces. For example:

- Municipal data on GSs is primitive and unreliable for monitoring the supply problem.
- There is a tendency to exaggeration in order to hide the bitter reality, especially in formal reports or the media.
- Official statistics clearly count some of the so-called green spaces that have not actually yet been developed, planted or used.
- There is no digital documentation of green space information. Official data are paper based, and there is no systematic collection and analysis of spatial data for the localities of the green spaces managed by CCBA which is the agency responsible for the management and maintenance of green spaces in the city. These spatial data might be found in other ministries or governmental agencies, but the problem is in the communication between these different governmental bodies.
- Public figures on green space not only over-estimate the amount supplied by government but fail to record the considerable amount of green spaces supplied privately (addressed in the next chapter). Since the latter are unevenly distributed between districts, the municipality appears to have very little accurate insight into the real nature of the status of supply of this vital public good.

To conclude, urban green spaces are the lungs of any urban environment and it is apparent that Cairo is in a bad state of health. The chapter has examined the history of green space in Cairo; reflected on its demise in recent times; and reported key indicators of the city's green space supply performance. In the next chapter, I deepen this analysis by looking at way in which different parts of Cairo have at various times been governed by different development institutions. The approach taken is to create a neighbourhood typology that captures the different periods in which the green space supply regime is distinct in some way. In this way, we can go some way to explaining the patterns of greenery deprivation that the current chapter has documented.

Chapter Six

Second empirical study: Cairo's neighbourhood typology

To take the analysis of green space supply further, and in particular, to attempt to relate green space performance to the institutions governing the production of the built environment, this chapter uses a neighbourhood typology. Classifying Cairo's districts simplifies the data by compressing 31 unique parts of the city into seven representative patterns. The next section justifies the use of neighbourhood typology and the subsequent sections analyse the institutions in each type and discusses the green space outcomes.

6-1- The need for Neighbourhood Classification

A demanding theme in contemporary comparative urban research is the extent to which urban neighbourhoods differ or are similar in their properties. As there are two different tendencies in urban analysis in this respect. On one hand, there are studies that assume the presence of a considerable degree of uniformity and similarity between any city's neighbourhoods (Bourne and Lorus, 1999). Such uniformity produces a city's distinguishing individual character. On the other hand, it is quite obvious that neighbourhoods within a city differ in many aspects – otherwise the idea of neighbourhood would have little meaning. Whether a study is interested in similarities or differences, it is necessary to adopt some kind of taxonomy or classification to assess the degree of similarity or differentiation among them. A classification may be the result of study into differences or it may be an instrumental method for making the study of some urban phenomenon more tractable. Thus, classification of neighbourhood types and typologies is useful and informative for advancing debates on urban design, growth and communities. Song & Knaap, (2007) point to the following benefits of neighbourhood classification:

- *Facilitates understanding*, as human cognition is usually improved when complex ideas and multiple attributes are simplified, reduced, organized and structured in a few well-defined categories which can be dealt with. Classification is the first principle in science.
- *Facilitates quantitative analysis*, for example in defining and using sets of characteristics as independent or dependent variables in regression equations.
- *Necessary for effective development and implementation of public policy*, because any design guideline, land-use regulation or urban legislation are typically generated from certain cases and enforced for certain zones within a city. Thus, it is crucial to have knowledge of similar city zones for studying and researching common sets of deficiencies and problems on one hand, and developing suitable generalisable solutions on the other.

6-2- Principles of Neighbourhood Classification:

In recent years, urban designers have classified neighbourhoods using a variety of methods; this section explores some of the efforts.

In their research in 1993, Southworth & Owens examined development patterns in the metropolitan fringe of metropolitan San Francisco. Using case studies of eight San Francisco sub-areas they formulate typologies for several different dimensions of urban design. Then they used these typologies to identify trends in development patterns and offer policy recommendations for planners and practitioners of urban design. (Southworth & Owens, 1993 quoted in Song & Knaap, 2007)

Hayden (2003) presents a historical account of neighbourhood designs in the US between 1820 and 2000. The typology used includes borderlands, picturesque enclaves, mail-order and self-build suburbs, edge nodes and rural fringes. Her typology is based partly on features of urban design and partly on the cultural-historical factors that lead to their development.

Wheeler (2003) analyzes development patterns in Portland, Oregon, and Toronto, Ontario, from the 1800s to the present. Using a typology of development patterns that includes, 19th-century grids, streetcar suburb grids, garden suburbs, automobile suburbs and New Urbanist neighbourhood, Wheeler identifies five design values as particularly important for sustainable urban form: compactness, contiguity, connectivity, diversity and ecological integration. Wheeler then assesses each of the design typologies, using qualitative methods, and suggests that the 19th-century Grid rates the highest on most of the five principles. These three studies use neighbourhood typologies based on visual interpretations of maps and images rather than quantitative measures of urban design features.

Following the growth of GIS data and technical capabilities, quantitative attempts to classify neighbourhoods have become increasingly common. In an analysis of pedestrian behaviour, Handy (1996) identifies three types of neighbourhoods: traditional, early-modern and late-modern neighbourhoods (Handy, S. L. 1996, quoted in Song & Knaap, 2007). She found variations in the design of street layouts, housing and garage setbacks,

level of integrating multi-family housing, and commercial establishments in different neighbourhoods. For example, the traditional neighbourhoods have rectilinear grids, the late-modern neighbourhoods have curvilinear layouts and the early-modern neighbourhoods have a combination of both. She then showed that pedestrian activity is greatest in traditional neighbourhoods.

Bagley et al. (2002) employed demographic (socio-economic, attitudinal, lifestyle and travel-related data collected through surveys) and land use (roadway network and public transit) data collected through site surveys of five San Francisco area neighbourhoods as the basis for their analysis. They identified two distinct dimensions through factor analysis: *a traditional factor* which is associated with higher population density, more convenient public transit, smaller home size, fewer backyards and less parking, and *a suburban factor* which is associated with higher speed limits, longer distance to the nearest grocery store and park, greater ease of cycling and less grid-like street networks. Rather than being either 'traditional' or 'suburban', neighbourhoods can score high or low on both dimensions and the factor analysis model probabilistically places any neighbourhood into either category. The same could be achieved through a binary regression model. They use the categorisation to conclude that the concepts of tradition and suburbanness might be better viewed as two separated dimensions instead of two extreme ends of one dimension.

Ngoc (2008) adopted a different basis for neighbourhood classification in the Vietnamese urban context, using a taxonomy of eight different types of neighbourhoods as a basis for analysing the relationship between housing development activities and the ownership and mode of development of land.

Hobden et al. in a study of Surrey, British Columbia (2004), classified green spaces with respect to various characteristics including; pathways, major and minor easements, overhead lines and size of green space.

The primary purpose of neighbourhood classification is the desire to use these classifications in behavioural research. The research in this thesis investigates both the behaviour of Cairo's population with respect to green spaces (Chapters Seven and Eight) and the supply of green space (this chapter). It will be helpful, therefore, to create a

classification for Cairo's neighbourhoods based, among other factors, on the nature of green spaces supply.

6-3- A typology of Cairo's neighbourhoods

The neighbourhood typology is based on two sets of indicators socio-economic and urban characteristics on one hand and the urban green space supply and characteristics on the other.

The first set is of district socio-economic and urban character factors. These include the following. District population; urban fabric; history of district location before development (whether it was green fields, hills, riverside, etc); legal basis of development (illegal developments on unauthorized governmental lands that have grown spontaneously to colonize vast areas, with infrastructure provided retrospectively as a precaution against health and catastrophes and other hazards).

The second set is of the district's urban green space characteristics factors that include the following. The area of accessible district urban green space; urban green space percentage of total area; amount of accessible urban green space per person (per capita); historical and current modes of supply of urban green space;

These variables were considered in a manual classification which involved identifying common patterns among Cairo's neighbourhoods, and with restrictions over the boundaries of the 31 districts. The overriding classification objective was to distinguish between different areas of the city on the basis of their green space morphology and economy. This was, therefore, an analytical exercise in itself as opposed to being a purely instrumental methodology. The purpose was to divide the city into areas with certain recognisable features in respect of the green space characteristics and the institutions that gave rise to them. Given the subjective nature of this analysis, it was considered inappropriate to use statistical classification tools such as factor analysis and to rely on the author's expertise in visually inspecting maps, air photos, satellite imagery and other data for each district.

Figure (7-1) shows the distribution of the seven patterns that emerged from the classification. The patterns are:

Pattern (1): Historical ancient Cairo

Pattern (2): Renaissance and colonial urban developments

Pattern (3): Early Governmental block housing

Pattern (4): Early private sector developments

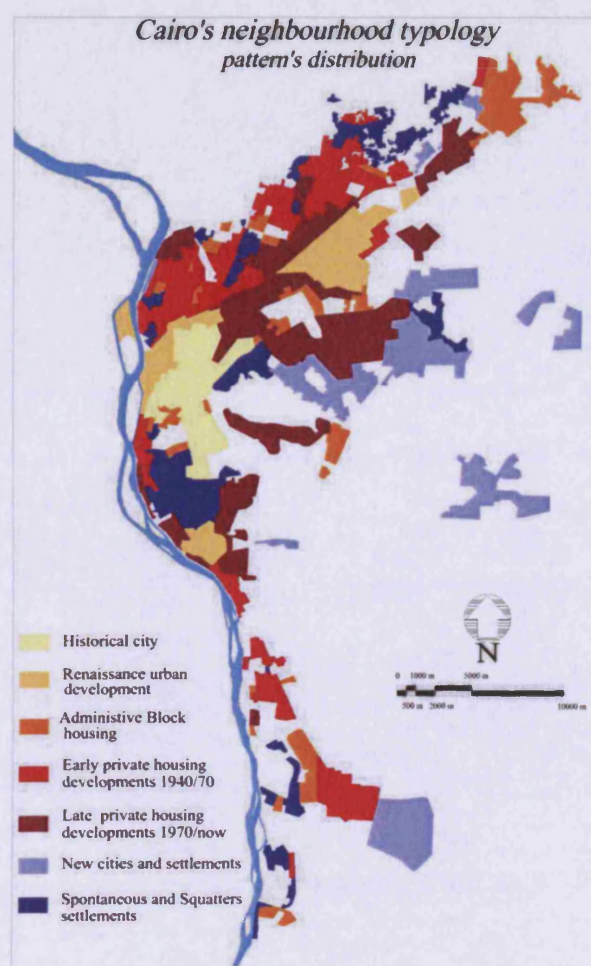
Pattern (5): late planned Governmental and private sector developments

Pattern (6): New developments (new cities and settlements)

Pattern (7): Spontaneous & squatter growths

Figure (6-1), *Cairo's neighbourhood typology patterns spatial distribution*

Source: The researcher



The rest of the chapter analyses the institutions governing green space supply in each type of neighbourhood and the resulting pattern of green space provision. It draws conclusions about the degree to which the different actors and institutions of supply – principally government and market – have been successful or unsuccessful in providing the city with

greenery. The analysis proceeds as a short characterisation of each neighbourhood type; followed by the presentation and discussion of statistical patterns of supply across the neighbourhood types.

Pattern (1): Historical ancient Cairo

The old city of Cairo dates back to over a thousand years. This pattern is characterised by its compact tissue, fluctuated street patterns and courtyard buildings. This pattern developed spontaneously under the influence of cultural, religious and climatic factors. Compact tissue provides shaded spaces in a hot and arid city, while the fluctuation of streets was meant on one hand to purify the sand saturated winds coming from the adjacent desert areas, and on the other hand to decrease the wind's acceleration. Most of the buildings have inner courts to which most of the buildings' windows open. This was for religious and cultural reasons on the one hand, and to provide better ventilation and more shade on the other hand. These inner spaces (courtyards) acted as private green spaces in the centre of the houses. Green spaces in the city have been produced privately as part of an organic, spontaneous built environment shaped by climate and culture therefore.

Rich merchants and royalty supplied their own greenery under the institution of private property rights. This was supplemented for the masses by green spaces provided by religious organisations, principally, mosques. Within this pattern, modern local government has added two large municipal parks, which account for the dominance of public green space in this category. Figure (7-2), shows an air-photo of a typical neighbourhood of this type, showing examples of remaining privately enclosed green spaces and one of the largest municipal parks, Al-Azhar Park. The government supplied public park, like most in Cairo, is supplied as pay-on -entry public space. The price is high for most Cairo residents reaching (5 EGP/person). In the case of Al-Azahar park, the price-exclusion effect is moderated to some degree by giving local residents a right to a cheaper entry. Al-Azhar park nevertheless represents a pragmatic modern variant of the ancient method of supplying public space for all: it is supplied as a club good and opened for access on terms acceptable to its owners (a partnership between the municipality and the Aga Khan Foundation).

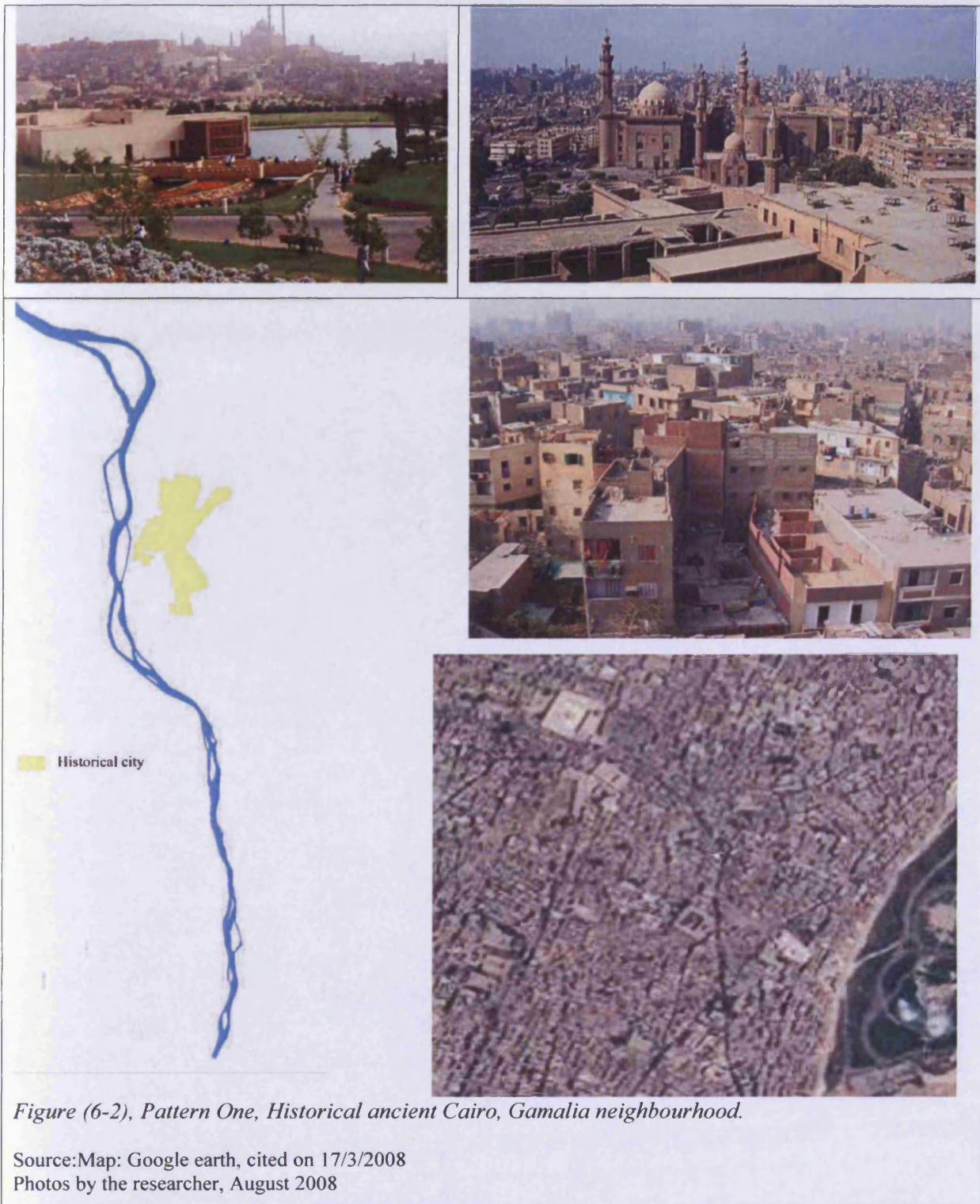


Figure (6-2), Pattern One, Historical ancient Cairo, Gamalia neighbourhood.

Source: Map: Google earth, cited on 17/3/2008
 Photos by the researcher, August 2008

In this pattern, the market has historically been able to supply greenery to those who can afford large-lot developments but has undersupplied it to those who cannot afford to pay for their own gardens. Recently the government has addressed the market failure with its large parks. But given the very high density, particularly of these parts of the city more

than (425 person/hectare), the institutional response has been to ration 'public space' by pricing – with attendant problems of accessibility for the poor.

Pattern (2): Renaissance and colonial urban developments

These areas are characterised by a planned network morphology with government-organised planting of streets and other public spaces and the creation of formal parks and of green spaces around public buildings. The network urban organization of the areas is characterised by the presence of a number of urban nodes which are joined by boulevards and wide streets most of these streets are tree-lined. This pattern was the result of the introduction of the new urban planning theories in the late 19th and early 20th century during the colonization era. The pattern is famous for the presence of foreigners, embassies and diplomats' residences and its greenery is part of its unique urban fabric.

Given the size of the cadastral lots, and the concentration of high income residents, these neighbourhoods have also attracted concentrations of private recreation clubs such as the Heliopolis, Lido and Ghaba clubs. These provide green space for more wealthy people throughout Cairo, who travel to these private recreational spaces. These clubs are discussed in more detail later in the chapter.

The presidential castle stands in one of these neighbourhoods and is surrounded by tree-lined green median roads, especially on the route to the airport. The air photo in Figure (7-3) shows the historical legacy of the extravagant street planting, which gives so much character to these areas. This type of neighbourhood therefore is an above average mix of both public and private green space and both the government and market have been successful in supplying green space to this part of the city.



Figure (6-3), Pattern Two, Colonial and renaissance, old Maadi district map,

Source: Map: Google earth, cited on 21/2/2009

Pattern (3): Early Governmental block housing

These post-revolution (1952) government-built neighbourhoods, adopting a Soviet block housing model which was characterised by rigidity, dullness, repetitiveness and the loss of identity, have very little planned green space. It is a cost-minimising utilitarian planning and the absence of greenery can be thought of as government failure.

People had no alternative, especially the migrants from other regions of the country, at these times but to live in these narrow small boxes. The lack of facilities and concentration of relative poverty has resulted in many serious problems in these districts. Illegal expansions to accommodate population growth brought densification and further public service deprivation leading to problems of crime, lack of education and health service as well as lack of greenery. Densities in this pattern are very high reaching 640 person/hectare in some places.

When the government constructed these block residential buildings, it did not allow for green spaces. This left space for the illegal urban expansion in the shape of privatization of the public spaces between blocks for residential purposes. It is not uncommon to see three room horizontal and two stories vertical extensions to the blocks, where residents and informal developers have organised the illegal extension to their living accommodation. Open spaces are also used for other illegal uses like breeding birds and animals and commercial activities and garbage dumping (garbage collection is paid for in Cairo, while throwing it in these neglected spaces is free). Some illegal uses have resulted in additional greenery, however. Much of the limited green space that can be found has been created by the private capture of public spaces, the photo in Figure (6-4) is of a garden illegally enclosed by a ground floor tenant in Helwan.

In this pattern, therefore, the government has failed to supply green space at a systemic level. This is true of the original government institutions that built the areas and is also true of the subsequent and current government institutions, which have been unable to re-engineer the physical designs and property rights in order to introduce greenery. The only green spaces that exist have been supplied privately by informal arrangements and squatter encroachment of public domain areas between buildings. Officials seem to operate an informal quasi-illegal system of charging rent for occupied public space. This certainly

happens when construction occurs and it is likely that it happens too with illegal gardens (an interesting topic for further research). If this is the case, we can view this as an institutional innovation that has the effect of facilitating the private production of micro green spaces in neighbourhoods where there is gross undersupply through government failure.

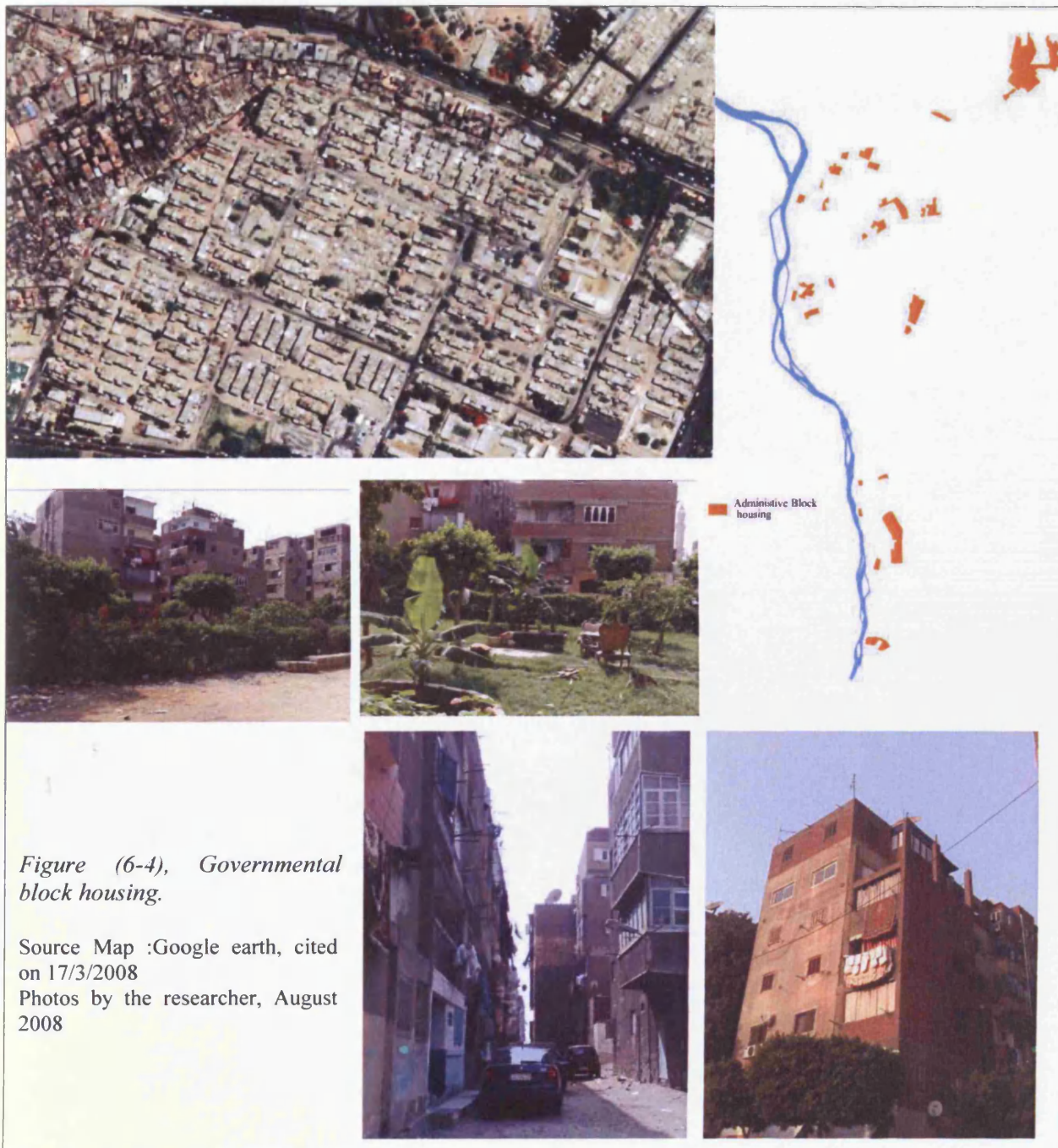


Figure (6-4), *Governmental block housing.*

Source Map :Google earth, cited on 17/3/2008

Photos by the researcher, August 2008

Pattern (4): Early private sector developments

These neighbourhoods were developed between the late 1940s and 70s with weak planning and control resulting in massive encroaching of green fields and the nearly total absence of green spaces.

This was politically driven urbanization as, after the military revolution in 1952, migrants came from all over the country seeking a better life in the capital. This migration happened with the blessing of the new government, which encouraged rapid suburban subdivision and settlement on a massive scale in order to boost its power base. It even constructed two industrial poles to the north and south of the capital, changing the morphology of the rich and attractive districts of Hewlan and Shobra, where most of the princes and wealthy powerful people had castles or villas. These two areas were previously famous for their urban greenery and modern character. The castles and private villas were invaded and its territories were subdivided into very small parcels and sold to the migrants who flooded into these former garden suburbs to work in the new industries. Associated with this rapid rise in demand, the housing market began expanding in uncontrolled development spreading urban growth throughout the relatively cheap periphery of the city.

During these years of rapid expansions, the government was busy with the war against Israel and governmental functions such as controlling development were very weak. Governmental agencies were paralyzed in facing the rapid uncontrolled urban growth which led to infinite number of illegal urban expansions both vertically and horizontally. Weak legislations and law forcing agencies did not protect governmental lands and even the existing buildings began to expand upwards with illegal stories. All these factors contributed to the complicated problematic situation that faces the city now and the neighbourhoods that took shape during these days of haphazard private development are characterised by a compact urban fabric, virtually devoid of green spaces and with very high population densities (reaching 710 person/hectare).

Public planning was limited to designating urban expansion areas and providing skeletal infrastructure, the legal infrastructure for land conveyance and so on. Both government and market failed in this period to supply adequate green space. Because of the size of lots and the income level of settlers, the market provided very little private green spaces in the form

of private gardens attached to houses or recreational clubs. The satellite image in Figure (6-5) shows a very congested 'green-less' neighbourhood.



Figure (6-5), *Early private sector developments*,
Source Map :Google earth, cited on 17/3/2008

Pattern (5): Late planned Governmental and private sector developments

This is government-planned urban fabric from late 1970s onwards, with a designed hierarchy of road systems, open space and housing. It was designed on the basis of housing at five stories and the gardens and green spaces reflect this planned-for density. However, corruption and the absence of planning control led to buildings rising to 10 and 12 stories, leading to densities of between 80-165 person/ hectare.

The crowded neighbourhoods that have emerged meant that the planned open spaces – like the roads – became congested and in some case encroached upon. A few green spaces remain open access, but the sweeping majority have changed as a result of the over-use. More particularly, the open-access property rights have evolved under new institutions that have sought to cope with the threat of degradation. Most of the green spaces are now enclosed by fences. Some are pay-on-entry. Others, amazingly, are no-entry; fenced either by the municipality or by surrounding residents to protect a piece of greenery they enjoy seeing from their apartments. Others, governed by informal clubs of surrounding residents and paid for by informally-collected assessments, have become *de facto* clubs. Like the illegal private garden enclosures in block-housing neighbourhoods, they have been captured, in this case by groups of neighbours, who supply what the municipality cannot: sustainable finance and governance and thereby, sustainable pockets of green in a high density, overcrowded neighbourhood. Figure (6-6) shows the planned hierarchy of green spaces.

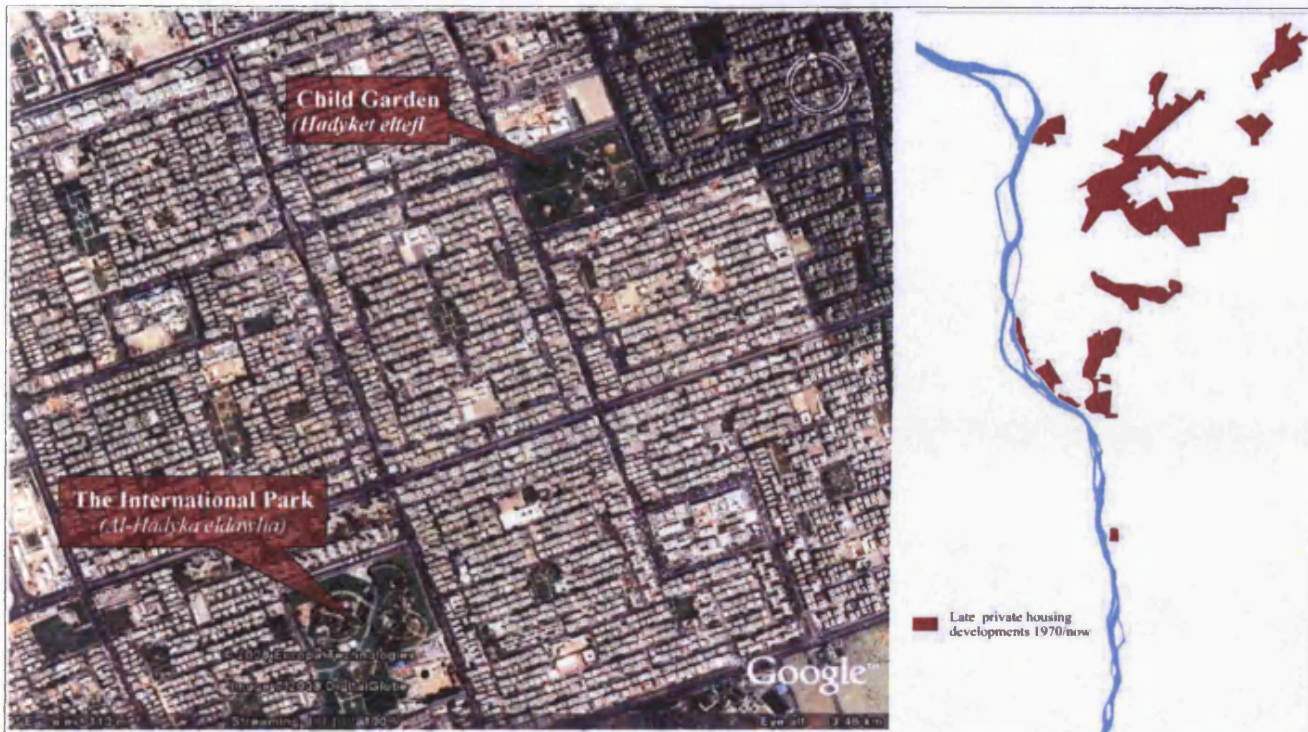


Figure (6-6), Madinet Nasr, district is a recent urban development, full of high quality private GS, captured above is some military GSs on Salah Salem street.

Source Map :Google earth, cited on 17/3/2008
Photos by the researcher, August 2008

Pattern (6): New developments (new cities and settlements)

These suburban and ex-urban areas comprise of mainly publicly planned and large scale developments mostly by private sector investors. They are in peripheral locations connected to highways. They house different income groups but mainly medium to high income residents and have plenty of green space by design. Apart from pattern 2, this pattern has the highest percentage of green space amongst the neighbourhood types. There are several reasons for the abundance of greenery here.

First, publicly provided green space remains largely uncongested because these areas are distant from the ultra-high density inner-city. Here the densities are around 70 person/hectare compared to 165 person/ hectare in pattern 5, for example. It should be noted, however, that these new settlements are still far beyond reaching their full capacity and it may be that further development compromises the relatively high levels of current provision.

Second, by and large, the planned for density has been implemented – in contrast to pattern 5. It appears that an adequate balance between supply and demand has been achieved by government planning and regulated private development. These peri-urban communities work something like clubs – only the leakage of benefits is prevented not by physical and legal exclusion but by the exclusionary effect of distance.

Third, some of the public green spaces are, as in other areas of the city, made excludable and maintained by entrance fee. There is less need to do this, however, because of the lower risk of over-use.

Fourth, these neighbourhoods also contain large villas with private gardens and gated and golf-course communities in which parks are provided contractually, bundled-in to property rights of homes. One of the observations in such developments is that spaces enclosed between buildings are highly maintained, organised either by the investors for a monthly payment collected from the residents or by the residents themselves by establishing a committee for managing the community's common assets and liabilities of cleaning, garbage collection, building and utilities maintenance, and common public spaces and recreational facilities.

The institutional pattern in this type of neighbourhood is therefore an interesting mix of municipal provision on the basis of local tax revenues, private property rights and entrepreneurial club property rights. It is conjectured that these institutions will remain stable until either the area densifies; or adjacent areas densify (which will increase congestion of the open spaces); or the municipality no longer can afford to maintain the copious supply of green spaces – perhaps because of a rise in the cost of irrigation or labour. If the latter happens, it might be predicted that institutions governing some of the open-access spaces would evolve into either pay-on-entry or resident-run club spaces

(captured or transferred by arrangement or in partnership). Figure (6-7) shows the very generous open space standards made possible by club-enclosure and peripherality. In these neighbourhoods, at their current stage of urban evolution, neither market nor government has failed to supply adequate amounts of green space.

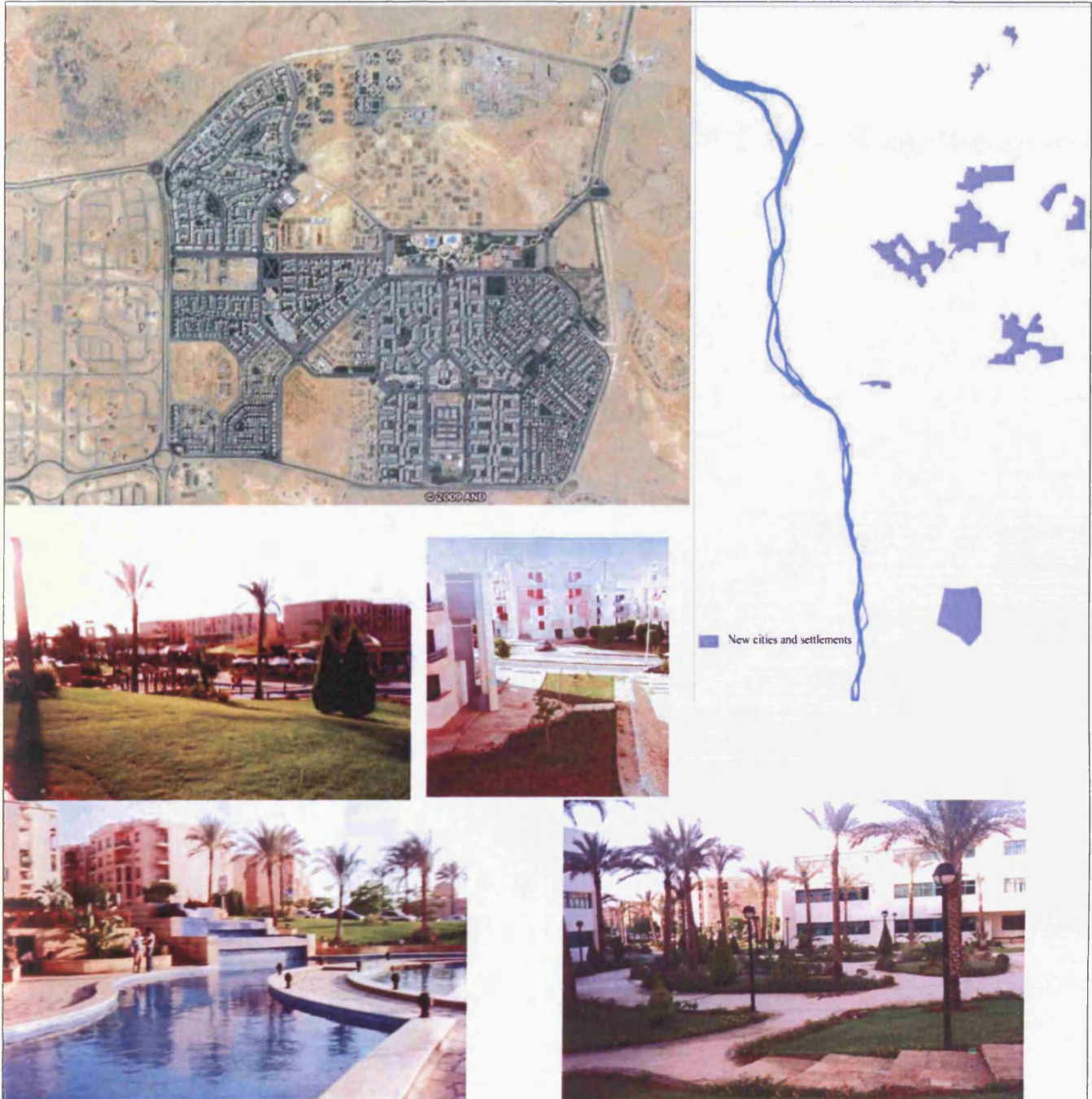


Figure (6-7), New Cairo, new urban developments in the last 15 years

Source: Map :Google earth, cited on 04/05/2009

Photos are taken by Mr. Emad Essam Eldin, late 2008 early 2009

Pattern (7): Spontaneous & squatter growths

These are squatter encroachments of green fields that started in the early 1960s, reached their growth apex in the late 1980s but are continuing to grow at a rapid pace (Figure 7-8). Vast areas of richly fertilized lands, developed over thousands of years by the deposition of rich sediment black clay in the delta area, have been lost for ever this way.

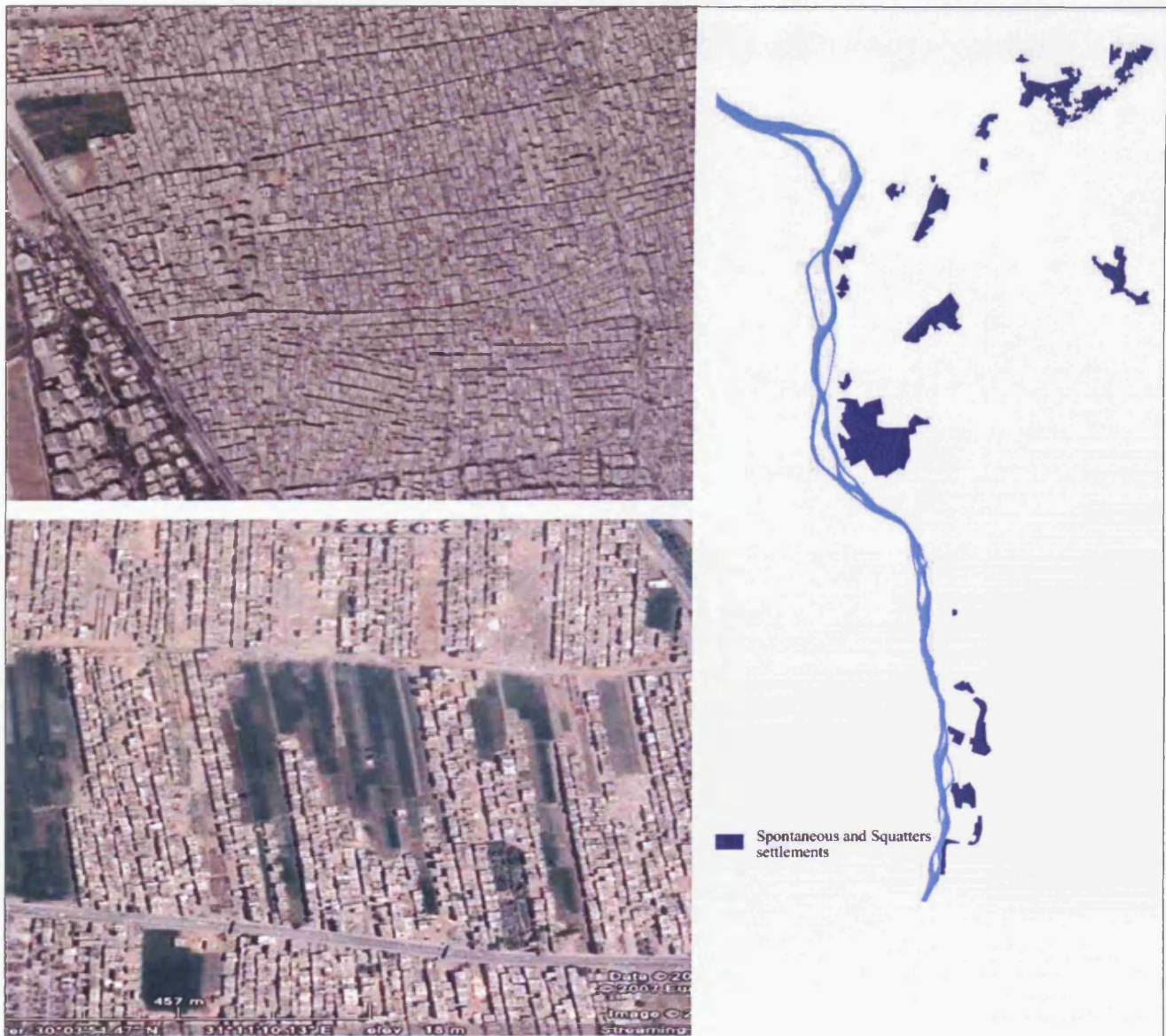


Figure (6-8) Spontaneous urban encroachment and expansions on the green fields

Source Map :Google earth,

The massive encroaching of the greenfields is the result of the acute demand for urban land on the one hand, and the relatively cheap price of green land on the periphery of the capital

on the other. The compactness of Cairo means that vacant land within the built up area is rare and highly priced.

The urban fabric of this pattern is characterised by a linearity that reflects the underlying and ancient pattern of fields and agricultural property rights. The roads are very narrow, not exceeding in some cases 4m. This is both unsafe and unhealthy. The shape of blocks took the same shape of the fields, where water canals ran in between separate fields to irrigate them. The canals have transferred into paths and streets, which explains their narrow width. In spite of intensive governmental efforts to face the problems of both encroachment and management of the urban areas thus created, expansions onto Cairo's shrinking stock of greenfields and spaces is still occurring on a problematic scale.

A second pattern of squatter settlement is the encroachments of the hillsides and the building under the unstable mountain of Mokatem – the latter being a suicidal settling strategy (Figure 6-9). Every now and then, huge boulders fall from the mountain to burry houses and their residents.

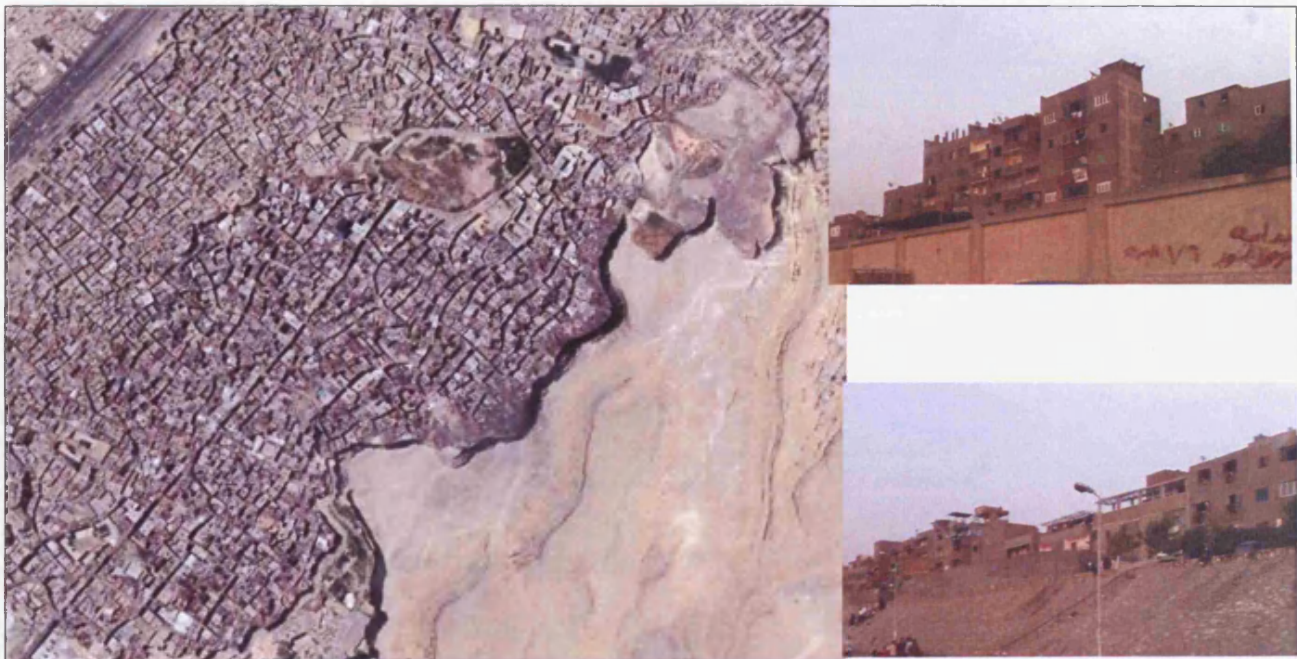


Figure (6-9) Manshiet Nasser, serious illegal, spontaneous and unsafe urban expansions on Makatem hillsides, fatal danger on the cliff

Source Map :Google earth, cited on 17/3/2008

Photos by the researcher August 2008

A third type of the squatter housing is Cairo's unique grave yards dwellings (Figure 6-10), which were once estimated to accommodate more than 1.5 million person.



Figure (6-10), living in grave yards!

Source: Photos by the researcher August 2008

Green space in all three types of squatter area is very localised (individual trees and pocket gardens) and like the block housing neighbourhoods, are created by private capture of the public domain.

This is an extreme case of market and government failure. The informal land market simply does not have the mechanism to price demand for open space. On the other hand, government planning does not work in these areas. There have, however, been some attempts at greening, through demolition and relocation. Several programmes have attempted to demolishing squatter housing and move people to governmental planned housing and replacing the vacated land by parks and recreational facilities. All these attempts have failed because of many factors; most important of which is the very poor quality and remoteness of the substituting housing units. People tend not to either appreciate or accept these, and they still prefer to live in their slums rather than being exiled to remote places. Moreover, the municipality has gained a bad reputation for not keeping its word, as in many cases people did not get what they were promised. Such unreliable agreements have threatened negotiations and experiments for more than two decades and the peoples' mistrust has deepened.

6-4- Distribution of Public and private green space in the seven types of neighbourhood

Figure (6-11), shows the distribution of urban green spaces among the 7 neighbourhood types of Cairo city. The figure was created by overlaying the visual analysis and classification of green space map created from the interpreted satellite image, over the city's neighbourhood typology.

Deprived and well-served places can be detected from the figure. Patterns one, five and six possess higher percentages of public space. The reasons have been discussed in the first half of this chapter: Pattern one has Cairo's two largest parks. Pattern five was rationally planned by municipal planners with an orderly urban space hierarchy. Pattern six was also rationally planned, but by a combination of private and public planners. Pattern seven, the squatter settlements can clearly be seen to have a severe lack of public spaces.

The green space map measured from remotely sensed data has further been analysed to identify private and public green space categories. The classification into private and public was achieved by using both the municipal paper-based data provided by CCBA, the Satellite image geo-data base which contained the localities of the private spaces in Cairo and finally the tracing of GS from the satellite image and using the researcher's local knowledge of Cairo's districts' and spaces.

When we do this, as shown below, five of the seven Cairo neighbourhood patterns have significant amounts of privately open space.

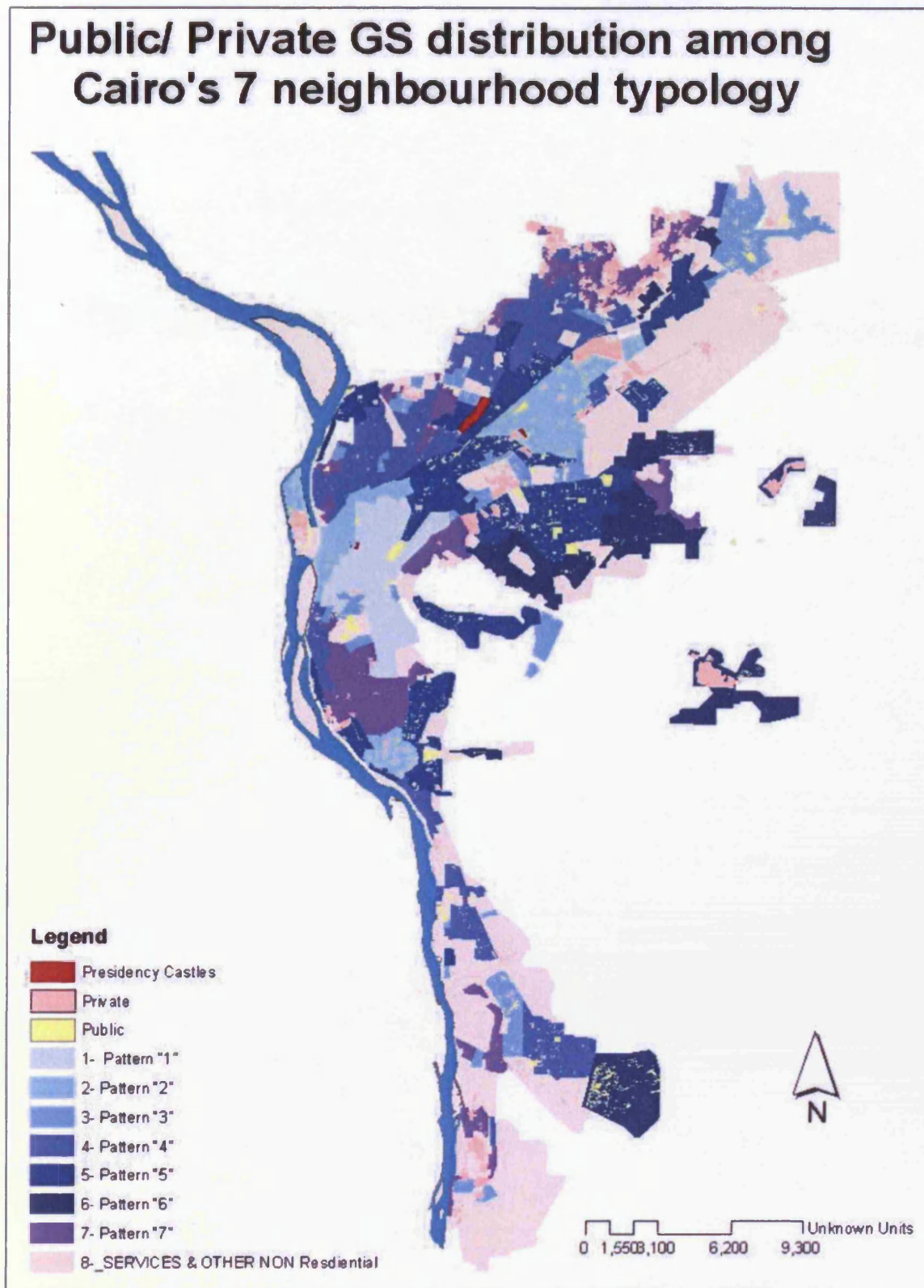


Figure (6-11), Distribution of GS types among Cairo's 7 neighbourhood typology patterns
 Source: The researcher

Figure (6-12), shows the distribution of private green spaces, which are defined in this section to mean those with access restricted by private or shared property rights (other than rights over daily access gained by the payment of daily tolls). It should be noted that this differs somewhat from the pure theoretical categories of open space discussed in chapter three. Urban green spaces were there classified into; public planned, developed and governed unenclosed green space, public planned and managed, privately funded (self efforts) unenclosed green space, public planned, developed and governed enclosed green space, public planned and built green spaces with spontaneous club management, public planned and private built green space, private planned and built unenclosed public green space, private planned and built club space and private planned and built green private space. These are mapped conceptually to the theoretically informed public/ private continuum of public, local public, club and private goods. The definition of 'private' in Figure (6-12), as with Figure (5-7)⁵⁸ in the previous chapter (public green spaces) can also be mapped conceptually on to this theoretical continuum but data limitations require a less sophisticated definition.

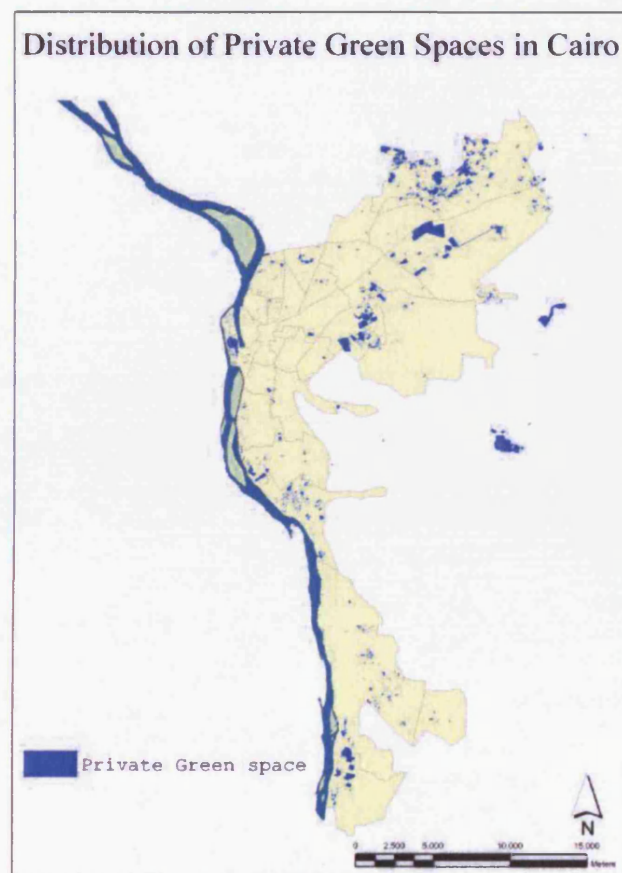


Figure (6-12), *Distribution of private GS*

Source:
The researcher

⁵⁸ See page 153

The private spaces in the analysis in this chapter include the following spaces:

- Sports clubs (the most popular), for example (Al-Ahly, Al-Shams, Helliopolis etc)
- Profession's clubs (teachers, engineers, police etc)
- Military premises. There are many of these in Cairo - estimated to occupy nearly 850 hectares (Elzafarany, 2005). and parts of them have been converted into private military clubs and gardens.
- Administrative building spaces not for public use
- Golf courses
- Public service or Administrative building privately owned green spaces (hospitals, universities and halls where the general public are excluded)
- Privately owned green spaces attached to houses (front and back-yards, of which there are very few in the city and court-yards).

An example of private green space in the most important sub-category, private sports clubs is Al-Ahly Sports club. This has two branches in Cairo (Figure 6-13). This club alone has over 100,000 members, each of whom pay an annual fee of nearly 400 EGP (\approx £50). There are an estimated 237⁵⁹ private sports, youth and leisure centres in Cairo, providing green space to their members as an entrepreneurially organised club good. The largest in area is Al-shams club (the sun), of 1,548,251 m², which is larger in area than any municipal public space in the city.



Figure (6-13) Alahly sports private club, Madinet Nasr branch.

Source: Photograph by the researcher, August 2008

⁵⁹ According to Cairo's indicators report, 2003. Published by Cairo governorate. It is worth mentioning that getting this data was very difficult as there is no accurate updated information for private clubs activities.

Public green spaces in this chapter, can be classified into the following:

- Municipal gardens and parks
- Mosque and church green spaces
- Medians
- Squares

An example of the numerically most important category of municipal gardens and parks is Al-Azhar Park, (see Figure 6-14), a 36 hectare park opened for public in 2005 on the site of central Cairo's ancient municipal refuse dump. It was financed by a \$30M grant from the Agha Khan Trust for Culture. The park is the third largest public park in Cairo. It is public in the sense that it was provided through a private-public partnership body – the land coming from the municipality and the development costs from the charitable Trust. However, once built, it has been managed by a private municipal partnership organization and financed on the basis of fees. It is a gated park which the general public pay 5 EGP/person to enter, plus car parking fees (making it accessible only to the middle and high income).

The terms of the Agha Khan Finance package did, however, secure subsidised entry for residents living in its immediate proximity of Aldarb-Alahmmar district. Residents need to show their national ID cards at the point of entrance to obtain a discounted entrance ticket. Another distributional benefit of this park was realised during its construction phase, when most of the workers were brought from the adjacent district of Aldarb-Alahmmar, which was suffering from a serious unemployment problem.

The project's aim was to develop the area by creating a major new open space venue for Cairo's residents. In this, it seems to have been a significant success. What makes Al-Azhar park a best practice and a unique model to follow, is not only the spectacular and carefully articulated design, but also the positive externalities that the park has created for the whole district, significantly elevating the quality of life and improving the built environment in terms of ecology, health as well as aesthetics. The transformation is all the more marked since the park's site was originally a refuse dump, which was threatening the urban environment and the residents' health.



Figure (6-14) Al-Azhar park, Opened to the public in 2005

Source: Google earth, cited on 2007

From the interpreted satellite image associated geo-database, the total area of urban green spaces in Cairo city is estimated to be 2750 hectares (1hectare = 10,000 m²). Of this, 33% is estimated to be public space and 67% to be private space. Table (6-1) summarises the private/public split estimated by interpreting the remote sensed image.

Table (6-1) Public-private percentages of the total urbane green spaces

	Area of GS in m	Area in hectare	%
Private	18492145	1849	67%
Public	9011781	901	33%
Total	27503926	2750	

The estimated amount of green space in the different categories of the private space typology is shown in Table (6-2). Private sports clubs make up nearly one third of the private green spaces in the city, covering 648 hectares. Although the military occupy an estimated 800 feddan (337 hectare) of compounds in the city (ElZafarny, 2005), only 32 Hectares of this appears (from the satellite analysis) to have been developed into green space.

Table (6-2) classification by type of private urban green spaces

Type of private space	Area in m ²	Percentage	Area in Feddan (/ 4200m ²)	Area in Hectar (/ 10000m ²)
Private Sport club	6,480,296	35.04%	1,542.9	648
Green fields	6,230,684	33.69%	1,483.5	623.1
Military lands (Only green spaces)	319,846	1.73%	76.1	31.9
Privately owned	5,461,318	29.53%	1,300.3	546.1
Total	18,492,145	100.00%	4,402.9	1,849.2

Table (6-3) and Figure (6-15 a&b) shows, the distribution of the private and public green spaces among the city's seven neighbourhood patterns, giving green space totals for each neighbourhood type and green space expressed as a percentage of the total area of each type of neighbourhood. Significant findings are as follows.

Surprisingly the fourth pattern of the early private developments has the least percentage of the total green spaces of only 3.2%. This is a surprise because a prior, it might have been assumed that the squatter settlements would be bottom of the list. However, the cause of green space scarcity in both type and area are essentially the same, as discussed earlier in this chapter: runaway urban encroachment with little government control or formal market organisation. The seventh pattern, the squatter and spontaneous areas, come a close second therefore, with 4.6% greenery.

When it comes to public green spaces, all the patterns scored less than the norm of 10%. Clearly, the city is underperforming in terms of its stated goals and accepted norms. However, the well-developed system of private and club green spaces add significantly to the city's stock. For reasons already noted, the fourth pattern has the least percentage of public green space (1.2%); and this is followed by the seventh pattern (1.3%).

Only two patterns exceeded the 10% green space norm, and these are the patterns with the lowest in population densities. The colonial renaissance neighbourhoods (second pattern) scored the highest percentage of green spaces of 24.9%. Behind this comes the new cities and developments of pattern six (13.3%). Both of these types of neighbourhood were developed with relatively strong planning, albeit under very different institutional regimes. Both were modernising regimes in their own way, with the neo-classical renaissance tree-lined boulevards modernising the ancient city fabric and the new cities colonising the desert with master planned estates.

The estimation of the amount of private and public space is an important part of this research and it was a surprise to find that although the squatter and spontaneous pattern seven is very low in green space percentage, nearly 2/3rds of it is private. Some of this is due to the greenery of the grave yards neighbourhoods, which can be viewed as privately provided green space – supplied by the families who own and maintain their family plots. The squatters living on the plots typically act as guardians of the yards and may help maintain the green planting. This shows resilience of the impoverished residents and is evidence that some, at least, value green space enough to organise and pay for small pockets of private provision.

In contrast, the first pattern- ancient and historical Cairo - has 5.6% percentage of green spaces, 6/7 of which is public. As noted, this is due to the presence of two of Cairo's largest parks located in this pattern.

The top ranking green neighbourhood type, pattern 2 – renaissance and colonial developments - has the highest percentage of private spaces, and this is due to the high income of the residents and their affordability to pay for high quality private spaces. Two thirds of the 25% of green space is private space; leaving only 8% for the public use – mainly in tree-lined streets and squares.

The preceding discussion shows the weakness of using a single space standard norm, as all the seven patterns scored considerably low percentages of public green spaces than the norm of 10%. However, this does not take into account private space, which is an important source of greenery in Cairo. Neither does it capture the amount of open access space, since nearly all publicly provided government parks in the city are charged for at the point of entry.

Table (6-3) Green spaces percentages among the 7 different patterns

	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7	
Total GS areas	992169.5	5721203.3	1265864	1443830	4486589	4713145	1542676.3	
Total urban area	17841274	22989079	24411865	44674641	65543842	35490156	33479555	
Area of GS	Private	134403.3	3853751.6	398589.6	910654.4	2803705	2473978	1100727
	Public	857766.2	1867451.7	867274.2	533175.1	1682884	2239167	441949.3
Percentage of GS	5.6%	24.9%	5.2%	3.2%	6.8%	13.3%	4.6%	
Distribution	Private	0.8%	16.8%	1.6%	2.0%	4.3%	7.0%	3.3%
	Public	4.8%	8.1%	3.6%	1.2%	2.6%	6.3%	1.3%

Figure (6-15A), Distribution of GS types among Cairo's 7 neighbourhood typology patterns

Source: The researcher

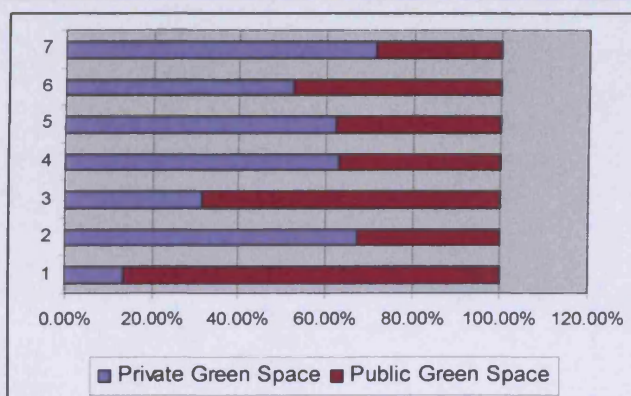
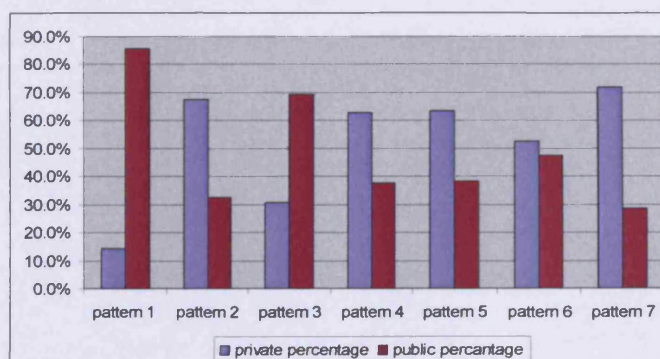


Figure (6-15B) Comparison of the private and public percentages of green spaces among Cairo's 7 patterns

Source: The researcher



6-5- Conclusion:

In this chapter I have analysed the supply of green space in Cairo's various types of neighbourhood. These were classified into seven patterns, distinguished by their morphology and the institutions that created and shaped them. Each pattern has been described in terms of its characteristic green space morphology and levels of supply and these were related to the mode of development. Comments were made about the failure or success of government and markets (private transactions) in delivering green space in each neighbourhood type.

This qualitative analysis was followed by a quantitative analysis of the quantity of green space in each neighbourhood pattern and the division of this into private and public space. I conclude that approximately two thirds of the green spaces in Cairo is supplied through institutions that assign access via private or formally shared property rights. In other words, two-thirds of the city's green space is provided as either private goods or entrepreneurially-organised club goods.

Even the public green spaces, in reality and in terms of economic theory, are supplied as a club good, being enclosed with access rights priced on entry.

The overall conclusion from this chapter is that green space in Cairo is indeed scarce. I have measured this scarcity with greater accuracy than the existing official figures. I have done so in such a way that also include private and club green space. Government and private individuals have, over the years, had various successes in providing the city with greenery. On the other hand, both government and markets have dismally failed at various times to create sufficient open space. The successes and failures under the evolving institutions of urban planning and management are captured in space and create an equal spatial distribution of green across the city.

What can be said is that government is now clearly trying to address the scarcity, but under very difficult circumstances of lack of both finance and spaces. The redevelopment of the city's ancient refuse dump as a big park was an inspired achievement. However, the park was gated and charged for. I interpret this as a necessary institution to ensure the continued provision of good quality open space in a crowded and arid city.

Set in this context, the provision of private club spaces are not much different to the city's municipal parks. What can be said about them positively is that enclosure and charging makes it possible for entrepreneurs to supply additional green space to the city. They are a market response to green space scarcity. Without them, the city would be browner and poorer. Enclosure may well be among the best ways to supply urban green spaces in arid and high density contexts, in order to maintain and preserve the quality and value of greenery.

That still leaves the question of the large proportion of the city's residents who are excluded from (a) private recreational clubs and (b) enclosed municipal parks. How can they fulfil their essential needs of greenery and public spaces?

The next two chapters therefore undertake further analysis, this time concentrating on the demand side. They seek to reach a better and a clearer understanding of the dilemma of urban green space demand and supply in the arid city of Cairo. This analysis is based on questionnaire data, which adopts the seven neighbourhood patterns as a sampling base, and that gives an in-depth diagnosis and analysis of the adequacy of pattern of green space supply that has been investigated in the current chapter.

Chapter Seven

Third empirical study: Measuring demand, usage & valuation of GS among Cairo's residents

Introduction

Having examined the supply of green spaces in Cairo in the previous two chapters, this chapter and the next focus on demand. How do Cairo's residents view and use green spaces in their crowded city? In their report issued in 2009, the UK-based CABE⁶⁰ stressed the importance of urban green spaces, by stating that:

"Green space in urban areas has arguably never been valued as much as it is now, as both the public and government begin to recognise its role way beyond providing local amenity"

⁶⁰ CABE = UK Commission for Architecture and the Built Environment

The advantages of green space were reviewed in Chapter Four. In the next two chapters I report on how Cairo's residents value these alleged advantages: by stated preference and revealed preference. The source of data is a household questionnaire administered to 715 households drawn by systematic survey from across Cairo as detailed in Chapter Two.

It is hard to improve what you cannot measure. For a long time one of the major problems facing attempts at green space improvement in Cairo was the lack of data. I have shown in Chapter Five and Six that measurements and records of existing green spaces and their spatial distribution among the city are inadequate because of the administrative source of data. Most data about open space are either in tables or text that describes individual green spaces. The real gap in knowledge is in both the spatial correlation of such descriptive data with other attributes of localities on one hand, and people's attitudes towards and use of green spaces, their opinions and perception and response to the supply situation analysed in the previous chapters, on the other hand.

The questionnaire gathered six different groups of data: demographic information; neighbourhood characteristics; motives and sensations associated with GS; stated preference questions; usage and activities in GS; and revealed preference questions regarding usually visited green space, which relates to the research questions previously mentioned in Chapter One (pages 16-18).

Presentation and reporting of the questionnaire data

The methodology adopted in analysing the questionnaire data involves identifying a set of main research questions and their sub-questions, and then presenting appropriate selective statistics to address these questions. As a result of the richness and complexity of the variables affecting the green spaces demand /supply within Cairo city, the questionnaire analysis has been divided into two parts. The first is a descriptive statistical analysis (this chapter). The second part (next chapter) is a regression-based analysis, which investigates the influences of a set of independent variables on various indicators of green space preference and behaviour (and more generally, valuation). In the present chapter descriptive statistics are presented without estimating population parameters for the city as a whole. Although the sample is not a random sample of the city as a whole, the selection of households within each grid is pseudo-quasi and the systematic design makes it possible

to make reasonably robust inferences to the city as a whole. However, it seems unnecessarily fussy to construct interval estimates of the descriptive statistics and they are simply reported in this chapter as descriptive of the sample. In the next chapter, when I derive more sophisticated information via regression models, inferential estimates are given (of the regression parameters) and these can broadly be taken as representative of the city as a whole.

Both chapters together are intended to produce the most comprehensive and in-depth analysis of the demand for green space in an arid city yet undertaken.

The following, therefore, presents survey results relating to the main research questions and their underlining sub-questions. These are woven together to investigate the different patterns of green space demand in Cairo's different neighbourhood types. The list of questions addressed is as follows:

Research Question 1: Demand and Perception

- 1-1 Are green spaces evenly distributed across Cairo's districts?
- 1-2 Are green spaces perceived to be safe places for females?
- 1-3 How accessible is green space and do people use their nearest facility?
- 1-4 How do people value green spaces subjectively? What do they feel about them?
- 1-5 How essential to people's daily lives are the feelings evoked by green spaces?
- 1-6 Do peoples' motives vary for going to green spaces with different neighbourhood typologies along the city?
- 1-7 Are people aware of the environmental, mental and physical health importance of urban green spaces?

R.Q.2: Problems of GS

- 2-1 How do Cairo residents as a whole perceive the problems of existing green spaces?
- 2-2 Does problems of distance, scarcity vary between neighbourhood types?

R.Q.3: Satisfaction

- 3-1 Are people satisfied with the quantity of GS in their neighbourhoods?
- 3-2 Are people satisfied with the quality of GS in their neighbourhoods?

3-3 Does local GS fulfil residents' needs?

3-4 Scarcity is the major reason for not fulfilling people's needs?

3-5 Do users have to pay to reach, utilize or access GSs? Does this influence their satisfaction and mode of consumption?

3-6 Does green space satisfaction vary systematically with income level?

R.Q.4: Preference of green space type

4-1 What is the preferred size and style of parks?

4-2 Do people's stated preference for style of green space vary with their 'local green space market' experience (neighbourhood typology and type of green space they usually visit)?

4-3 Are public city parks the mostly visited and demanded GS in the city?

4-4 Does monthly income affect the type of GS usually visited, and the mode of consumption?

R.Q.5: Private GS

5-1 Does scarcity and fear of over consumption result in people's preferring fenced, gated and controlled green space?

5-2 Are entrepreneurially supplied private club green space, an effective institution for providing more and better GS?

5-3 Are private spaces more equipped for elderly, children and special needs users than public spaces?

5-4 Do private space have more activities occurring within the space than public spaces?

R.Q.6: Willingness to participate in enhancing local GS

6-1 Are people willing to pay for good quality shared space inspite of their poorness? Are they willing to contribute and participate in any development to enhance their built environment quality?

R.Q.1 Demand and Perception

1-1 Are Green spaces evenly distributed across Cairo's districts?

An answer to this question can be gained from a triangulation of three types of indicator: A- the spatial distribution of GS on Cairo's map; B- The extra distance that people have to cover to reach their usually visited green space; C- Interviewees description of the GS in their neighbourhoods. This information supplements the supply side analysis in previous chapters that was based on a combination of official data and remotely sensed data.

A- Spatial distribution on Cairo's map

Figure (7-1A), shows that urban green spaces are unevenly distributed among the city's different districts. The unevenness is displayed in a more pronounced way in Figure (7-1B), which shows the distribution of green space buffered by a 300m catchment area. It is very clear that some neighbourhoods in the city are well served with green space, while other vast areas are completely deprived. The reason for these inequalities has been discussed at length in the Chapter Six: the different development eras in which these neighbourhoods appeared; the weakness of legislation and regulations in past decades; the relationship between physical and institutional design. .

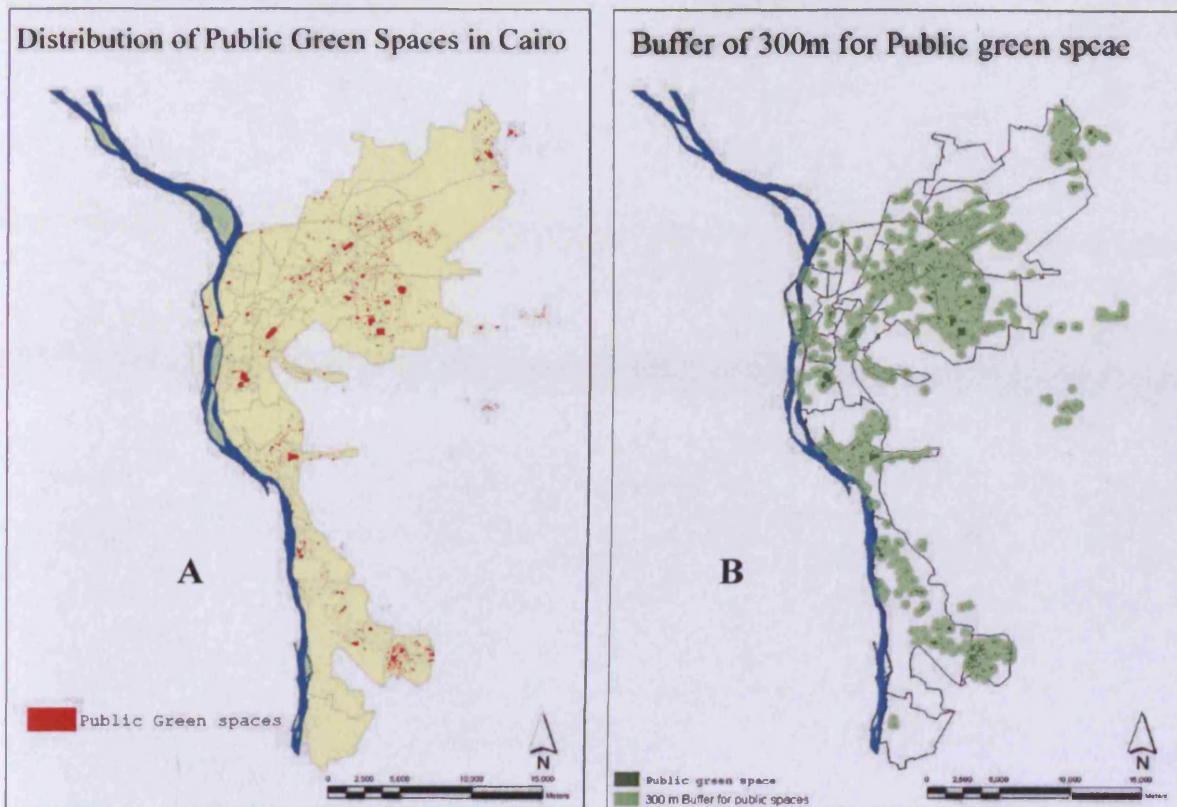


Figure (7-1), A- Distributions of Public Urban green spaces in Cairo, shows the uneven distribution among the city's neighbourhoods.

B- 300m Buffer distribution for public GS, highlights the deprived areas in the city.

Source: The researcher's interpretation of a Cairo's IKONOS satellite, 2005. Image was purchased in 2007

B- Variation in distance to nearest green space and difference between distance to usually visited and nearest green space

By analysing the reported walking distances that interviewees had to cover to reach the nearest green space, even if it is not the usually visited green spaces, it can be seen that the distances vary dramatically. In addition, a large range between minimum and maximum walking distances in all neighbourhood patterns is very apparent. The median distance varied across the patterns from 20 meters in Pattern six (new cities and settlements, to 1,350 m in pattern seven (spontaneous and squatter developments), see table (7-1). This provides evidence that green spaces are unevenly distributed among the city's districts and that this difference is systematically associated with the period in which the districts were developed.

Pattern six showed the best provision, with nearly 67% of respondents stating that they have a green space within a walking distance of 150 m. The figures for the other

neighbourhood patterns not only show an unevenly spatial distribution of green space accessibility among the city's population, but reveals areas of significant green space deprivation as well.

Table (7-1) Descriptive statistic for the walked distances among the different patterns

	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7
Valid	92	91	88	86	87	90	94
Missing	14	15	18	20	19	16	12
Mean	524 m	409 m	837 m	921 m	608 m	316 m	1657 m
Median	250 m	150 m	300 m	500 m	300 m	20 m	1350 m
Std. Deviation	688.554	595.286	1233.033	1239.713	765.836	954.806	1375.376

Table (7-2) shows that, 38.3% of the respondents have to cover a distance of more than 900 m to reach the nearest green space!, This is a distance that cannot reasonably be covered by children or the elderly. On the other hand, 34.4% face a distance of less than 150 m to the nearest green space; Green spaces are demonstrably unevenly distributed within the city's neighbourhoods.

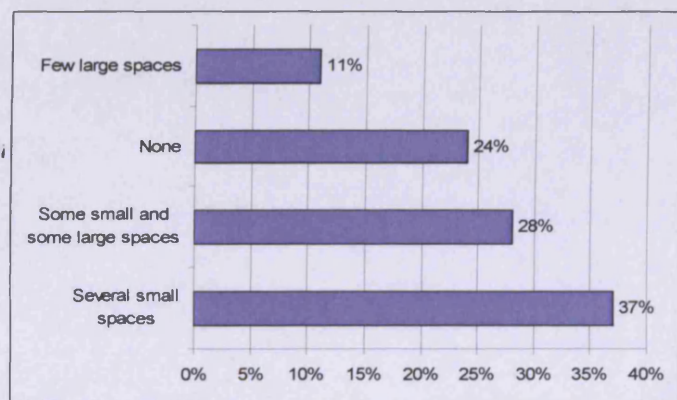
Table (7-2) Walked distance to the nearest green space distributed among Patterns

Pattern		Distance					Total	
		less than 150 m	from 151 to 300 m	from 301 to 600 m	From 601 to 900 m	more than 900 m		
Historical Cairo	Ancient	Count	29	25	18	3	26	101
		% within Pattern	28.7%	24.8%	17.8%	3.0%	25.7%	100.0%
		% within Distance	11.8%	25.3%	23.1%	16.7%	9.5%	14.1%
Colonial Renaissance developments		Count	46	18	11	1	25	101
		% within Pattern	45.5%	17.8%	10.9%	1.0%	24.8%	100.0%
		% within Distance	18.7%	18.2%	14.1%	5.6%	9.1%	14.1%
Administrative housing block		Count	36	12	11	3	39	101
		% within Pattern	35.6%	11.9%	10.9%	3.0%	38.6%	100.0%
		% within Distance	14.6%	12.1%	14.1%	16.7%	14.2%	14.1%
Early Private developments 1940 - 1975		Count	33	9	6	6	52	106
		% within Pattern	31.1%	8.5%	5.7%	5.7%	49.1%	100.0%
		% within Distance	13.4%	9.1%	7.7%	33.3%	19.0%	14.8%
Late Private developments 1975 - now		Count	28	19	19	1	36	103
		% within Pattern	27.2%	18.4%	18.4%	1.0%	35.0%	100.0%
		% within Distance	11.4%	19.2%	24.4%	5.6%	13.1%	14.4%
New cities and settlements		Count	68	10	4	0	20	102
		% within Pattern	66.7%	9.8%	3.9%	.0%	19.6%	100.0%
		% within Distance	27.6%	10.1%	5.1%	.0%	7.3%	14.3%
Spontaneous and squatters settlements		Count	6	6	9	4	76	101
		% within Pattern	5.9%	5.9%	8.9%	4.0%	75.2%	100.0%
		% within Distance	2.4%	6.1%	11.5%	22.2%	27.7%	14.1%
Total		Count	246	99	78	18	274	715
		% within Pattern	34.4%	13.8%	10.9%	2.5%	38.3%	100.0%
		% within Distance	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

C– Variations in Interviewees' description of urban green spaces in their districts.

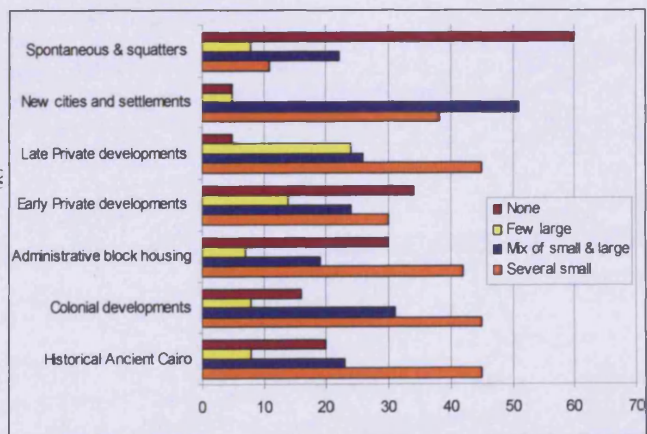
In order to assess the different typologies of green space supply within the different neighbourhoods, interviewees were asked to describe the urban green space in their neighbourhoods. The choices were; several small spaces; a mix of small and large spaces; few large spaces; and no spaces. Figure (7-2) shows, the distribution of the responses. 24% (nearly a quarter of the sample) claimed that there are no green spaces in their neighbourhoods. This, by itself, is conclusive evidence for the uneven distribution of green spaces.

Figure (7-2), Percentages' Distribution of different typologies of green space in Cairo.



Cross tabulating these data with neighbourhood type, supports the analysis of variation in supply in Chapter Seven (Figure 7-3).

Figure (7-3), Green spaces distribution among neighbourhood patterns



This is elaborated in Table (7-3), which shows the distribution of the types of green spaces by neighbourhood pattern. The Table shows that:

Table (7-3) *Distribution of the green spaces distribution types among different neighbourhoods*

		Several small	Mix of small & large	Few large	None	Total
Historical Ancient Cairo		45	23	8	20	96
	% within pattern	47%	24%	8%	21%	
	% within GS distribution type	18%	12%	11%	12%	
Colonial developments		45	31	8	16	100
	% within pattern	45%	31%	8%	16%	
	% within GS distribution type	18%	16%	11%	9%	
Administrative block housing		42	19	7	30	98
	% within pattern	43%	19%	7%	31%	
	% within GS distribution type	16%	10%	9%	18%	
Early Private developments		30	24	14	34	102
	% within pattern	29%	24%	14%	33%	
	% within GS distribution type	12%	12%	19%	20%	
Late Private developments		45	26	24	5	100
	% within pattern	45%	26%	24%	5%	
	% within GS distribution type	18%	13%	32%	3%	
New cities and settlements		38	51	5	5	99
	% within pattern	38%	52%	5%	5%	
	% within GS distribution type	15%	26%	7%	3%	
Spontaneous & squatters		11	22	8	60	101
	% within pattern	11%	22%	8%	59%	
	% within GS distribution type	4%	11%	11%	35%	
Total		256	196	74	170	696

- 73% of the respondents that stated that they do not have any green spaces in their districts were situated in only three patterns: the third pattern (administrative block housing), the fourth pattern (early private developments) and the seventh (spontaneous settlements & squatters). The last of these scores nearly half of the 73%, by scoring 35%.
- The ‘several small spaces’ response was common in most neighbourhood types. Only the fourth pattern (early private developments) and the seventh (spontaneous settlements & squatters) scored low on this response. This is due to the general scarcity of green spaces in these neighbourhood typologies – there is little undeveloped space left over for even small informal spaces.
- A mix of small and large spaces, was significant only in pattern six of the new cities and settlements. This suggests that this is a pattern that is achieved only by active government planning of large lot developments in peripheral locations. Pattern six has a unique pattern of respondents, with 90% stating that they have either small spaces or a mix of large and small ones. Only 5% in this pattern stated that they do not have any green spaces. This is probably due to a small number of interviewees in new settlements, living near green space that is still under construction.

- ‘Few large green spaces’ was a significant response in the fifth pattern (late private developments) with 32% of respondents selecting this description living in this pattern. This is due to the nature of planning of these neighbourhoods, where a number of high quality large parks and gardens were created by design.

To conclude, from the previous analysis, green spaces have proven to be unevenly distributed among Cairo's neighbourhoods.

1-2 Are Green spaces perceived to be safe places for Females?

There is a general prevailing perception in Cairo that open spaces are not safe for females and female security is therefore an important dimension of green space demand in the city. This perception is rooted in the ethnic culture. However, surprisingly nearly half the interviewees (46%) agreed that green spaces are safe for females to go to, with only 43% stating that green spaces are not a safe place for females. This weakens support for the prevailing perception and is the first unexpected finding in this research. Moreover, when cross tabulating the gender of interviewees with the females' safety question, it was found that 53% of the female respondents agreed that green spaces are safe places for them to go to. When analysing the responses from different neighbourhood patterns, it was found that pattern six (new settlements and cities), which is considered to be the most remote from the central security and police stations and still in the developing process with plenty of vacant lands and surrounded by deserts, scores the highest in terms of female safety. This disproves another prevailing perception: that females are particularly un-safe in the new settlements, see figure (7-4).

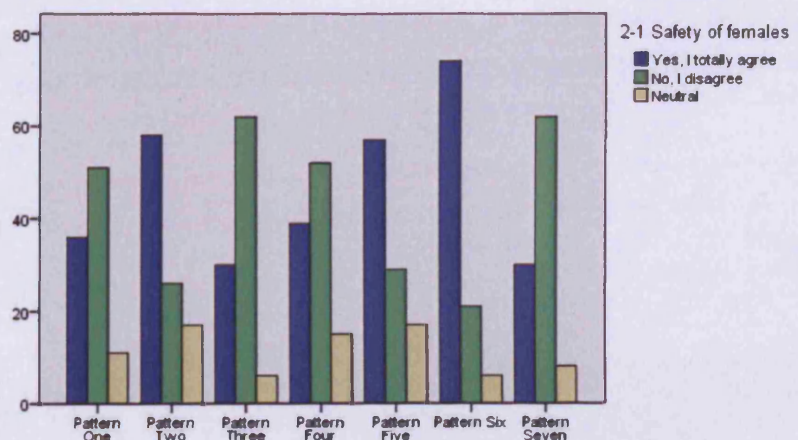


Figure (7-4), Cross tabulation of neighbourhood patterns and the female safety responds

Table (7-4) shows that pattern two (colonial developments) and pattern five (late private developments) scored the second highest in terms of viewing green spaces as safe for females. On the other hand, in patterns one, three, four and seven the majority state that green spaces are not a safe place for females. This result may partly arise because in patterns two and five, a large percentage of interviewees use private green spaces. We may deduce from this that there is some evidence for an association between private green spaces and perceived safety.

Table (7-4) Pattern and Safety of females Cross tabulation

		Safety of females				
		Yes, I agree	No, I disagree	Neutral	Total	
Historical Cairo	Ancient	Count	36	51	11	98
		% within Pattern	36.7%	52.0%	11.2%	100.0%
		% within Safety of females	11.1%	16.8%	13.8%	13.9%
Colonial developments		Count	58	26	17	101
		% within Pattern	57.4%	25.7%	16.8%	100.0%
		% within Safety of females	17.9%	8.6%	21.2%	14.3%
Administrative housing	block	Count	30	62	6	98
		% within Pattern	30.6%	63.3%	6.1%	100.0%
		% within Safety of females	9.3%	20.5%	7.5%	13.9%
Early developments	Private	Count	39	52	15	106
		% within Pattern	36.8%	49.1%	14.2%	100.0%
		% within Safety of females	12.0%	17.2%	18.8%	15.0%
Late developments	Private	Count	57	29	17	103
		% within Pattern	55.3%	28.2%	16.5%	100.0%
		% within Safety of females	17.6%	9.6%	21.2%	14.6%
New cities settlements	and	Count	74	21	6	101
		% within Pattern	73.3%	20.8%	5.9%	100.0%
		% within Safety of females	22.8%	6.9%	7.5%	14.3%
Spontaneous squatters	&	Count	30	62	8	100
		% within Pattern	30.0%	62.0%	8.0%	100.0%
		% within Safety of females	9.3%	20.5%	10.0%	14.1%
Total		Count	324	303	80	707
		% within Pattern	45.8%	42.9%	11.3%	100.0%
		% within Safety of females	100.0%	100.0%	100.0%	100.0%

Set against this finding, however, is the finding that females were ranked last in terms of intensity of use of green spaces. This shows that there are clearly barriers to female use of green space. When asking about the intensity of different users of urban green spaces, females are recorded the last among the five different types of users (families, young people, children, elderly people and females). When asking interviewees to rank the users of green spaces, results for the first rank was as following, Families 38%, young people 32%, children 16%, elderly people 11% and females scored a surprising 2%. See figure (7-5)

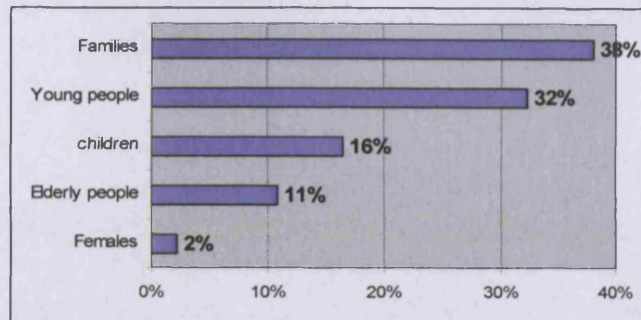


Figure (7-5), Distribution of top users of green spaces among Cairo's neighbourhoods

Females rarely visit green spaces individually, as family or a male relative or friend must usually accompany them and they are therefore included in other users' categories, such as families or young people. From this it can be concluded that females face problems that hinder their proper usage of open spaces, and this will be further elaborated in detail when discussing the perceived problems in Green spaces later in this chapter.

1-3 How accessible is green space and do people use their nearest facility?

To tackle this question I investigate the number of GSs around the householder's residence within 10 walking minutes; distance to the nearest GS; difference in time between the nearest and the usually visited GS (extra time); and whether the interviewee can see GS from his/her home or not.

- How many urban GS are there around interviewee's houses in a walking distance of 10 minutes?

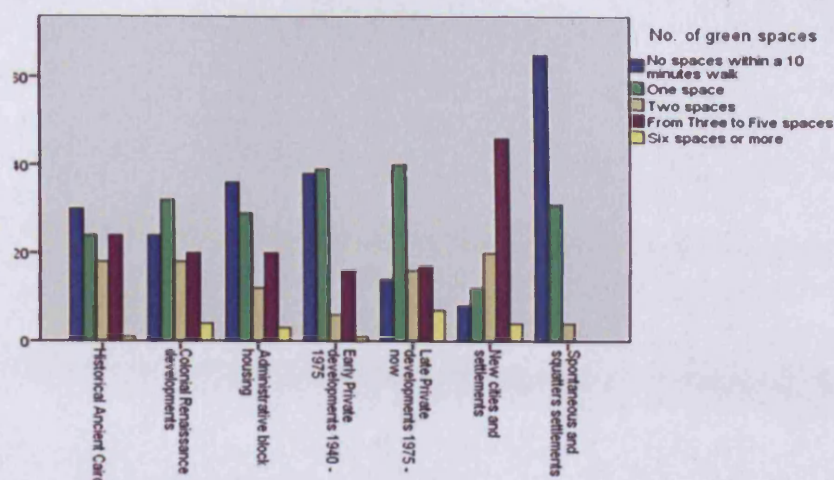
This question was designed to measure the number of GSs around the interviewee's houses within a walking distance of 10 minutes, regardless of the type of GS (whether public or private), the hierarchical rank (city park, neighbourhood garden, play yard, etc) or whether it is the usually visited green space or not. It was made very clear to the interviewee that the question includes any kind of green within a walking distance of 10 minutes - within which an average distance of 500m could be covered. Some astonishing results have emerged from the analysis:

- More than 31% of respondents do not have any green space within a walking distance of 10 min.; in other words, they do not have any green spaces around their homes within a circle of radius 500m, see table (7-5).
- 30.5% of respondents have only one space within a walking distance of 10 minutes.
- Only 2.9% have six or more spaces within a walking distance of 10 minutes
- At the extreme, among the 100 respondents in the seventh pattern of spontaneous and squatter areas, 65% stated that they do not have any green spaces within 10 minutes walking distance, while 31% stated that they have only one space, while only 4% (4 respondents), mentioned that they have two spaces within 10 minutes walking distance, with no respondents stating they have more than two spaces, see figure (7-6)

Table (7-5) Crosstabulation of the number of GSs within 10 minutes walking distance and neighbourhood typology patterns

Pattern	count	No spaces	One	Two	Three to Five	Six or more	Total
Historical Cairo	Count	30	24	18	24	1	97
	% within Pattern	30.9%	24.7%	18.6%	24.7%	1.0%	100.0%
	% within No. of green spaces	14.0%	11.6%	19.1%	16.8%	5.0%	14.3%
Colonial Renaissance developments	Count	24	32	18	20	4	98
	% within Pattern	24.5%	32.7%	18.4%	20.4%	4.1%	100.0%
	% within No. of green spaces	11.2%	15.5%	19.1%	14.0%	20.0%	14.4%
Administrative block housing	Count	36	29	12	20	3	100
	% within Pattern	36.0%	29.0%	12.0%	20.0%	3.0%	100.0%
	% within No. of green spaces	16.7%	14.0%	12.8%	14.0%	15.0%	14.7%
Early developments 1940-1975	Count	38	39	6	16	1	100
	% within Pattern	38.0%	39.0%	6.0%	16.0%	1.0%	100.0%
	% within No. of green spaces	17.7%	18.8%	6.4%	11.2%	5.0%	14.7%
Late developments now	Count	14	40	16	17	7	94
	% within Pattern	14.9%	42.6%	17.0%	18.1%	7.4%	100.0%
	% within No. of green spaces	6.5%	19.3%	17.0%	11.9%	35.0%	13.8%
New cities and settlements	Count	8	12	20	46	4	90
	% within Pattern	8.9%	13.3%	22.2%	51.1%	4.4%	100.0%
	% within No. of green spaces	3.7%	5.8%	21.3%	32.2%	20.0%	13.3%
Spontaneous squatters settlements	Count	65	31	4	0	0	100
	% within Pattern	65.0%	31.0%	4.0%	.0%	.0%	100.0%
	% within No. of green spaces	30.2%	15.0%	4.3%	.0%	.0%	14.7%
Total	Count	215	207	94	143	20	679
	% within Pattern	31.7%	30.5%	13.8%	21.1%	2.9%	100.0%
	% within No. of green spaces	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Figure (7-6), Number of green spaces within 10 minutes walking, distributed on the neighbourhood patterns



- Distance covered to the nearest green space

Table (7-6), shows the classified distances that interviewees have to cover in order to reach the nearest green space by neighbourhood type. Cross-checking the responses to this question with those of the previous one (number of green spaces within 10 minutes walk) reveals similar results. These can be summarised as follows:

- Residents in patterns two and six have to walk the least distance to the nearest green space(s), where 45.5% in the former, and 66.7% in the later have to walk less than 150m to reach the nearest GS. This fits with the supply-side analysis reported in previous chapters, which revealed these two patterns as possessing the highest green space percentage among all patterns.
- In contrast, residents in the fourth and seventh patterns have to walk the largest distances, with 49.1% in the former, and 75.2% in the later having to walk more than 900m to reach the nearest GS.

Table (7-6) Distance covered to the nearest green space, distributed by neighbourhood pattern

	< 150 m	151 to 300 m	301 to 600 m	601 to 900 m	> 900 m	Total
Historical ancient Cairo	28.7%	24.8%	17.8%	3.0%	25.7%	100.0%
Colonial Renaissance developments	45.5%	17.8%	10.9%	1.0%	24.8%	100.0%
Administrative block housing	35.6%	11.9%	10.9%	3.0%	38.6%	100.0%
Early Private developments 1940 - 1970	31.1%	8.5%	5.7%	5.7%	49.1%	100.0%
Late Private developments 1970 - now	27.2%	18.4%	18.4%	1.0%	35.0%	100.0%
New cities and settlements	66.7%	9.8%	3.9%	.0%	19.6%	100.0%
Spontaneous & squatters settlements	5.9%	5.9%	8.9%	4.0%	75.2%	100.0%
Total	34.4%	13.8%	10.9%	2.5%	38.3%	100.0%

- The median distance among the 715 respondents (from all over Cairo) is 601m. This figure raises a number of queries, the most crucial of which is how such a distance could be covered by a child or an elderly to fulfil their essential needs of open space.
- A second query is the implication of the nearest green space being unsuitable to meet a household's needs. The nearest space might be a private space with restrictions on public entry. Or it might be poor quality. For both reasons, the user might face even greater distances to cover. A quote from a respondent living in a Type four neighbourhood shows that having a nearby green space sometimes is not sufficient:

“There is only one municipal garden just 75m away from home in our neighbourhood, being fenced and closed for years now. The public have no access to it. I usually go and sit beside the fence in the street in the shade of the trees.”

- The third issue these distances raise is the implicit cost of access. In principle, the higher the cost of access, the less the number of visits.
- Pattern 6, the new cities and settlements, has a 312m average distance. This is the lowest distance (lowest access cost) recorded, but it is still high compared to international norms⁶¹, which typically have 300 m as the limit for green space access.

Figure (7-7), graphs the distances covered to reach the nearest green spaces. Significant results emerging include the following:

- The average distance to reach the nearest GS in pattern seven was 1658m - more than a mile -, and in patterns three and four it was also high at 801m and 910m respectively.
- A distance of 600m was the median distance to the nearest green spaces, which is double the international norm of urban open green spaces distance of 300m.

⁶¹ See chapter three

- Only pattern six scored a figure near the international norms. Pattern two surprisingly has an average distance of 405m, inspite of the large amount of green space the pattern possesses. This might be due to the privatization, fencing and gating of these spaces that means that for some people, it is quite a distance to reach the entrances of these spaces.

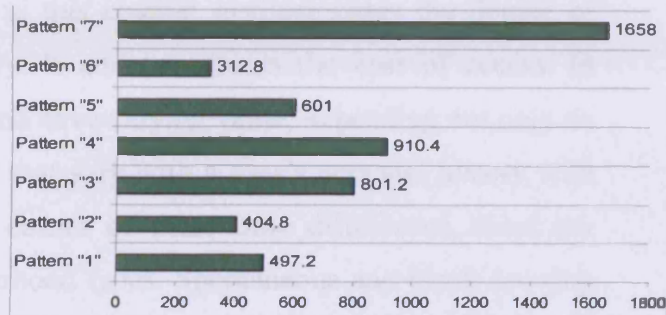


Figure (7-7), Average Distance to nearest green space distributed by neighbourhood patterns

- Time needed to reach the nearest and the usually visited green spaces

Table (7-7) shows the time to reach both the nearest and the usually visited green spaces. 15 min to reach the nearest space was the median, while 29 minutes was the median time for reaching the usually visited one.

Table (7-7) Distance covered to the nearest green space, distributed by neighbourhood pattern

	GS Time to walk to (min.)		Time difference	(extra distance)	Expenses per visit	
	Nearest Ave. Dis (m)	usually visited				
Historical ancient Cairo	497.2	15.05	28.83	14	1102	8.1
Colonial Renaissance developments	404.8	13.43	22.86	9	754	4.7
Administrative block housing	801.2	19.65	37.53	18	1430	6
Early private development 1940-1970	910.4	19.27	32.14	13	1030	7
Late private developments 1970—Now	601	12.73	28.45	16	1258	17.6
New cities and settlements	312.8	6.4	23.3	17	1352	5.2
Spontaneous & squatters settlements	1658	34.82	55.39	21	1646	11
Average	740.8	17.3	32.6	15	1224	8.5
Median	601	15.05	28.83	14	1102	6.2

It is obvious that reasons for the time differences vary between users, but when asking the interviewees about reasons for not using the nearest green spaces, the most common answers were:

- The nearer spaces are poor quality ones and better quality space is much preferred, even if it is remote.
- Nearer green spaces are privately owned and/or managed and entrance and usage is restricted. It is not for the public.

- People tend to gather with family or friends when going to green spaces, which forces them to choose an intermediate place to go to together.
- Users are emotionally attached to certain places and feel comfortable in them. The places carry memories and the extra distance is worth it.

These findings show that a simple analysis of average distance to nearest green space or the kind of buffering map reported earlier in this chapter over-estimates the degree of accessibility to green space. Or alternatively, it under-estimates the cost of access. In reality, green spaces are of variable quality and have varying value, depending not only on intrinsic qualities but on subjective qualities that vary with a user's personal history with that space. Notwithstanding the subjective causes of these time differences, there are significant differences between the neighbourhood types. Spontaneous and block housing areas have the highest time difference, indicating perhaps that the quality of 'nearest' spaces (and quality of spaces in the neighbourhood overall) are poorest. The difference in the renaissance areas is lowest indicating that people are most satisfied with the quality of spaces in this area.

- Seeing green space from home

As well as analysing access to green space, it is of interest to know whether interviewees could see green spaces from their homes. Given the scarcity of greenery already documented in this thesis, the fact that 435 of the 676 valid respondents do not see green spaces is not surprising, (64% of the sample).

Table (7-8) and figure (7-8), show the distribution of the percentages of those who can see and those who cannot see green spaces from their homes, distributed by neighbourhood pattern. Pattern six, the new cities and settlements, has the highest visibility score, with 75% of its 93 valid respondents being able to see green space from home. Then comes pattern two and five with 57% and 47% respectively. These three patterns account for 69% of the respondents who can see green space from home. The other four patterns share the remaining 31%. It can be concluded that green space view is very unequally distributed across the city and that it is delivered satisfactorily only by a planned approach to green space provision. Spontaneous development, whether poor, middle income or mixed income

and government planning that focused on housing and job provision have failed to deliver green views in this arid city.

Figure (7-8), distribution of the percentages of those who can see GS from their homes within different neighbourhood patterns

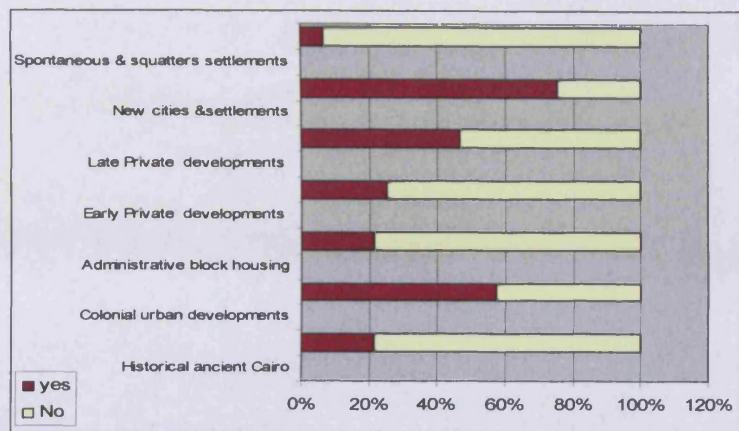


Table (7-8) Whether GS could be seen or not distributed among neighbourhood patterns

		See GS	Can Not see GS	Total
Historical ancient Cairo	Frequency	20	74	94
	Within Yes or No	8%	17%	
	Within pattern	21%	79%	
Colonial developments	Frequency	54	40	94
	Within Yes or No	22%	9%	
	Within pattern	57%	43%	
Administrative block housing	Frequency	21	77	98
	Within Yes or No	9%	18%	
	Within pattern	21%	79%	
Early Private developments 1940 – 1970	Frequency	26	78	104
	Within Yes or No	11%	18%	
	Within pattern	25%	75%	
Late Private developments 1970 – now	Frequency	43	49	92
	Within Yes or No	18%	11%	
	Within pattern	47%	53%	
New cities and settlements	Frequency	70	23	93
	Within Yes or No	29%	5%	
	Within pattern	75%	25%	
Spontaneous & squatters settlements	Frequency	7	94	101
	Within Yes or No	3%	22%	
	Within pattern	7%	93%	
Total		241	435	676

1-4 How do people value green spaces subjectively? What do they feel about them?

Only 6 did not complete this section of the questionnaire most of whom do not go to green spaces at all for various reason, the most of common being affordability and shortage of leisure time. Among the 709 responses for this set of questions, which was among the highest response rate in the questionnaire, people had wide variety of perceptions and feelings evoked.

Figure (7-9), shows the average distribution of the evoked feelings in green spaces organized in descending order, with 'calmness and peacefulness' dominating, followed by 'happiness' then 'meditation' then 'freedom'. The least frequent responses were 'adventure' and 'nostalgia'.

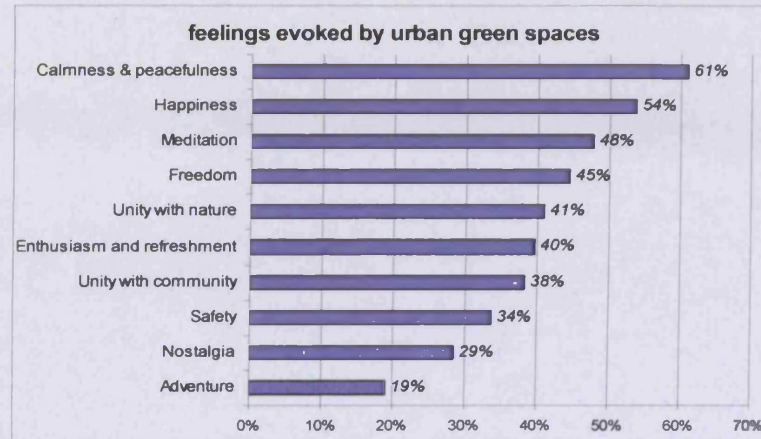


Figure (7-9), evoked feelings in GSs organized in a descending order

- Figure (7-10), shows the frequency distribution of feelings evoked, by neighbourhood pattern. While calmness and peacefulness are the top feeling in most neighbourhood patterns, it is interesting to see that some other feelings are highly evoked in some patterns, and that there is some variation. Generally, calmness and peacefulness, happiness and to some extent meditation are closely relate. These are, after all, very close concepts. It is possible that Mediation, calmness and peacefulness may be associated with neighbourhood types that have a higher average degree of education, these being more sophisticated abstract concepts. Generally speaking, however, all that can be concluded is that green spaces evoke a rich range of feelings. In pattern two, unity with nature equalled calmness feeling, possible saying something about the maturity of the vegetation with the renaissance greenery. Although many of the differences between feeling categories are probably statistically insignificant, there are some noticeable differences. For example, Pattern one (Historical Cairo) scored the highest percentage for a single feeling of 21% - calmness and peacefulness- possibly indicating something about the quality of the large green spaces found in those neighbourhoods. Similarly, nostalgia scored highly in patterns one and two, clearly reflecting the fact that these are the oldest patterns with green spaces that have historical qualities. Surprisingly, pattern five (late urban developments), which

were built during the last 3 decades, recorded the highest proportion of respondents citing nostalgia. That might be due to the nature of the residents in this pattern, who have moved from their old neighbourhoods to the new developments and still miss the old Green Cairo.

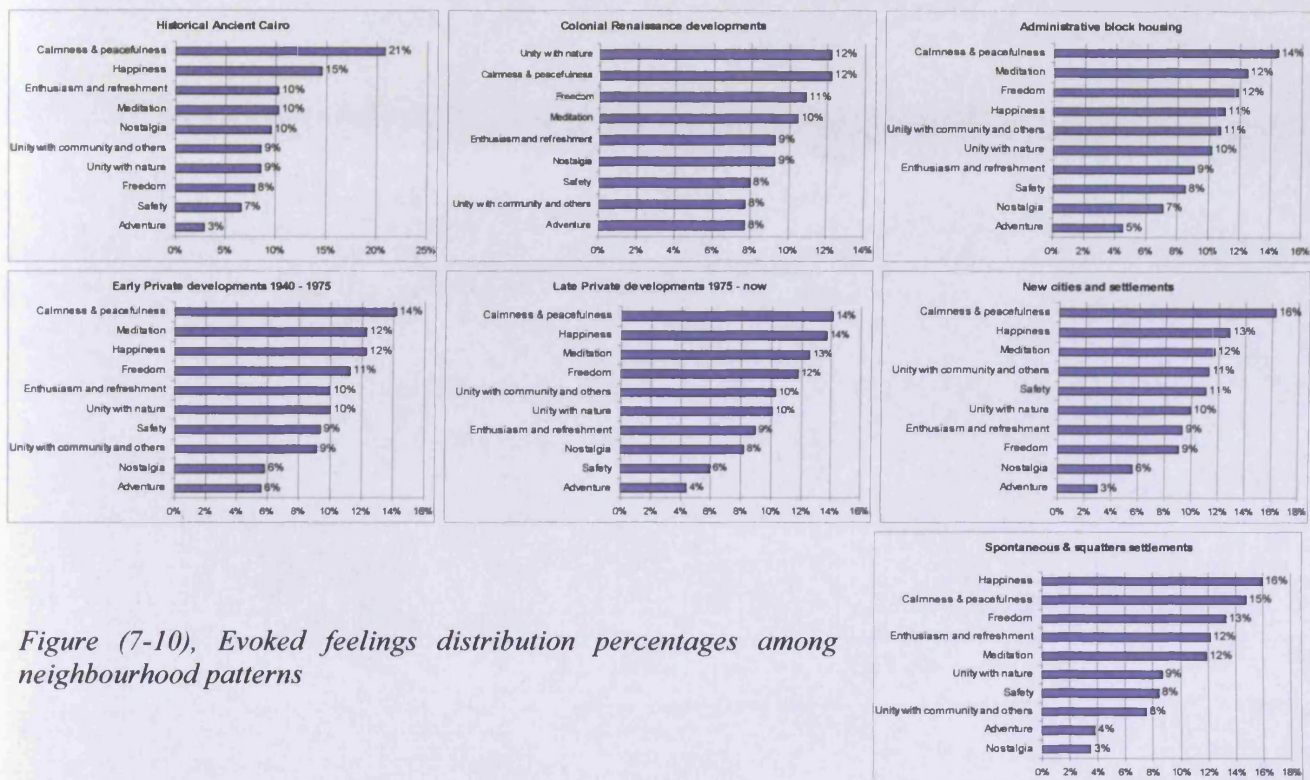


Figure (7-10), *Evoked feelings distribution percentages among neighbourhood patterns*

When correlating evoked feelings and the marital status of interviewees, safety emerges as a highly important evoked feeling for certain categories. 59% of divorced interviewees (43 frequencies), and 28% of the single interviewees (168 frequencies) considered safety as a significant feeling evoked by green space (Table 8-9).

Table (7-9), Distribution of frequencies of feelings among the different marital status of respondents

	Married & do not have children	%	Divorced	%	Single	%	Married & have children	%	Widower/ widow	%
1-Freedom	32	10%	5	7%	43	7%	229	12%	7	2%
2-Calmness & peacefulness	51	15%	4	5%	66	11%	305	17%	8	3%
3-Adventure	10	3%	1	1%	27	5%	94	5%	3	1%
4-Happiness	44	13%	5	7%	59	10%	268	15%	5	2%
5-Meditation	40	12%	3	4%	55	9%	230	13%	10	3%
6-Unity with nature	38	11%	2	3%	54	9%	188	10%	9	3%
7-Unity with community and others	35	10%	5	7%	40	7%	189	10%	3	1%
8-Safety	28	8%	43	59%	168	28%	2	0%	241	81%
9-Nostalgia	28	8%	3	4%	36	6%	127	7%	8	3%
10-Enthusiasm and refreshment	30	9%	2	3%	46	8%	202	11%	2	1%

1-5 How essential to people's daily lives are the feelings evoked by green spaces?

There is a distinction between recording an evoked feeling and the strength and significance of an evoked feeling. Thus, interviewers were asked if these feelings are important to them. It was found that 89%, of interviewees stated that the evoked feelings are essential in their daily life, while only 7% of the respondents stated that its not important. This is an explicit assurance of the interviewees' positive valuation of urban green spaces. When correlating the importance of the evoked feelings and neighbourhood patterns, some unexpected and interesting results emerge (Table 8-10 and Figure 8-11). 66% of the respondents stating that their evoked feelings are *not* important are found in only two patterns: the third (24%) and the seventh (42%). This concentration of the lack of importance of green spaces to everyday life is related to the tough nature of residents' lives in these two neighbourhood patterns as they are the poorest two patterns in the city. A repeated comment by interviewed residents in both patterns portrays the situation clearly:

“Do not ask me about sensations in green spaces because I have lost them a long time ago. My only concern is to feed my family; green spaces and sensations is a luxury, which I cannot afford even thinking of.”

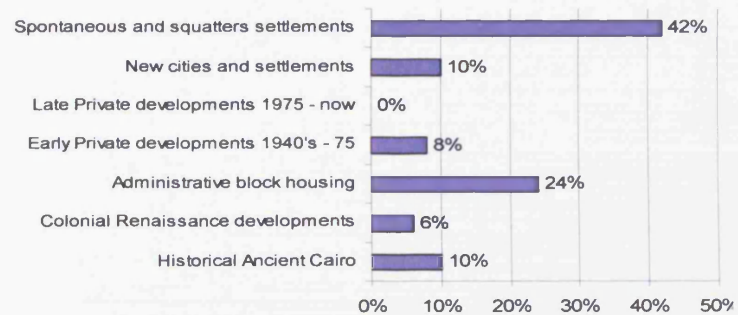
Table (7-10), *Distribution of frequencies of the importance of evoked feelings among neighbourhood patterns*

	Historical Cairo	Colonial develop.	Administrative block housing	Early development	PrivateLate development	PrivateNew cities	Spontaneous & squatters	Total
Important	91	94	87	91	98	92	70	623
% within Importance	15%	15%	14%	15%	16%	15%	11%	100%
% within Pattern	92%	94%	87%	91%	98%	92%	69%	
Neutral	3	3	1	5	2	3	10	27
% within Importance	11%	11%	4%	19%	7%	11%	37%	100%
% within Pattern	3%	3%	1%	5%	2%	3%	10%	
Not important	5	3	12	4	0	5	21	50
% within Importance	10%	6%	24%	8%	0%	10%	42%	100%
% within Pattern	5%	3%	24%	4%	0%	5%	21%	

In pattern seven, 8 different respondents from two different neighbourhoods made statements that can be generalised as:

“Questions about the feelings and their importance are irrelevant and difficult for me to answer, simply because the neighbourhood does not have any green spaces to go to, I had not the chance to experience feelings in them before”.

Figure (7-11), *Correlation of the classified feelings evoked in GS importance (not important), with the neighbourhood typology pattern*



Taken together, these two questions reveal on the one hand, the scope of values placed on green spaces and on the other, the limitation placed on the realisation of that value by income. Technically, it can be said that, from the representative survey sample, most Cairo residents have some kind of reservation or existence value for green space. The various feelings evoked give expression to the various kinds of reservation and existence value. But this does not uniformly convert into use value because of financial and time constraints.

1-6 Do Peoples' motives vary for going to GS with different neighbourhood typologies along the city?

The question of valuation could be further examined by considering the issue of motive. Figure (7-12), shows an average descending distribution of the 15 different motives mentioned in the questionnaire form, among the 715 interviewee. Nearly 63% stated that enjoying greenery was among the motives for their going to green spaces. This suggests that the majority of Cairo's residents have an intrinsic valuation of green spaces, as opposed to whatever other types of value they place on them, for example functional use for meeting people. Other motives included "to listen and observe nature", "change regular day routine", "to meet friends and family" and "to enjoy sun and air". The least mentioned motive was to walk the dog (dog ownership is not a deeply embedded cultural practice in Egypt).

Figure (7-12), Descending distribution of the different 15 motives to go to GS⁶²

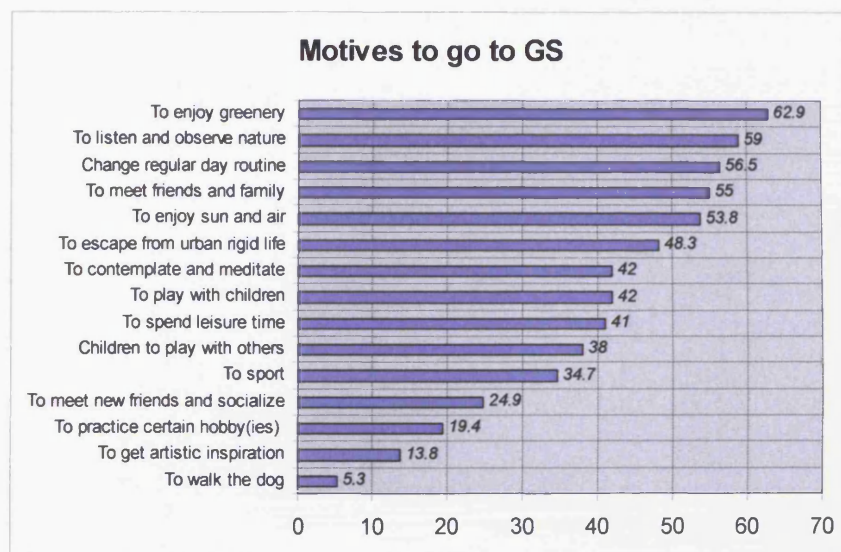


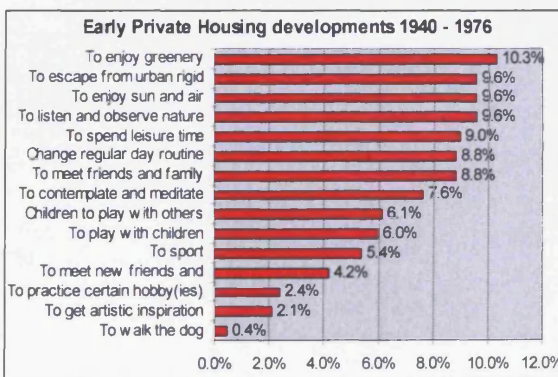
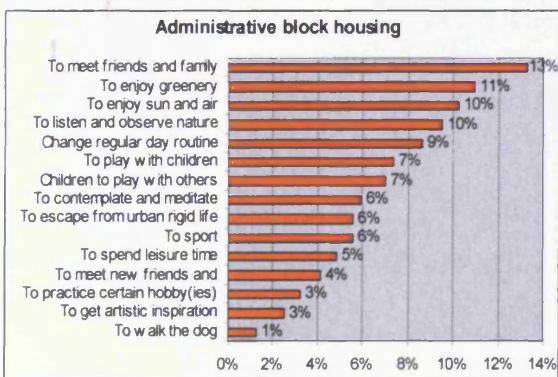
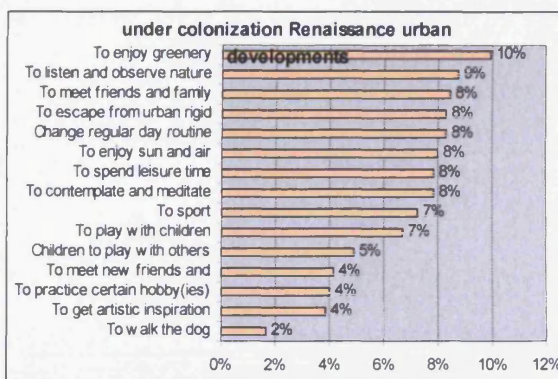
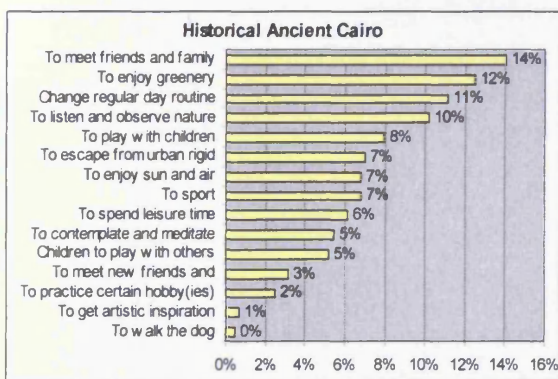
Figure (7-13), shows motives by neighbourhood patterns, while figure (7-14) shows a detailed distribution of the frequency percentages for each motive among the different neighbourhood patterns. Significant results can be summarised in the following:

⁶² The question asked was in the following statement form:

5/6 What are your motives to go to urban green spaces? (*chose all the relevant*)

(1) For sport, (2) To meet friends and family, (3) To play with children, (4) To walk the dog, (5) To listen and observe nature, (6) To contemplate and meditate, (7) To get artistic inspiration, (8) To practice certain hobby(ies), (9) Children to play with others, (10) To meet new friends and socialize, (11) Change regular day routine, (12) To enjoy greenery, (13) To spend leisure time, (14) To enjoy sun and air, (15) To escape from urban rigid life

- The most popular motives for going to green spaces are similar in all neighbourhoods.
- Patterns two and five together account for more than 50% of the respondents who ranked 'getting artistic inspiration' as a motive, reflecting the way people of different incomes and backgrounds place instrumental or use value on green space.
- 'Meeting friends' scored the top motive in patterns one and three with a percentage of 13% and 14% respectively, which highlights the important role of green spaces play in creating pleasant venues for socialization. This use-motive may be highest in these neighbourhoods because of a mix of high net densities in historic Cairo and block housing (small and crowded apartments), so that open spaces become vital substitutes for limited private space. If this were the case, it might be expected that squatter areas would place a similar use value on green spaces. However, only 6% mentioned this motive and this may be because they have less time to socialise.



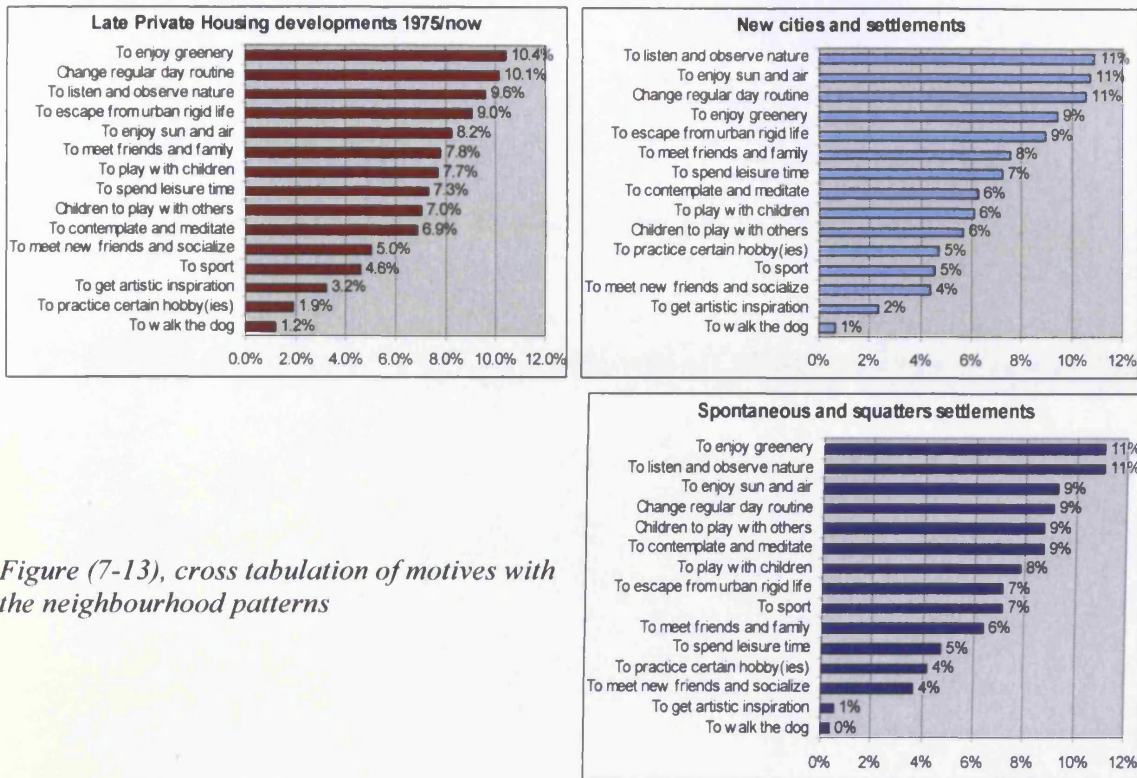


Figure (7-13), cross tabulation of motives with the neighbourhood patterns

Residents in the colonial developments dominated the other patterns in using green spacer for sporting motives (20%). This may reflect the greater degree of leisure time and money that the more wealthy residents have. The fifth pattern of late developments, dominates the other patterns with respect to use value derived associated with playing with children. This may reflect the demographic profile of people living in this kind of neighbourhood. Pattern six of new cities dominates, the use-motive “to practise certain hobbies”, (22%), followed by pattern two with 19%. This reflects the influence of a modernising population in these neighbourhoods. Patterns one, three and seven put least emphasis on “to spend leisure time” and “to escape form the urban rigidity”. The reason, as already noted, is the rareness of leisure time for the householders in these neighbourhoods, which are the poorest in the city.

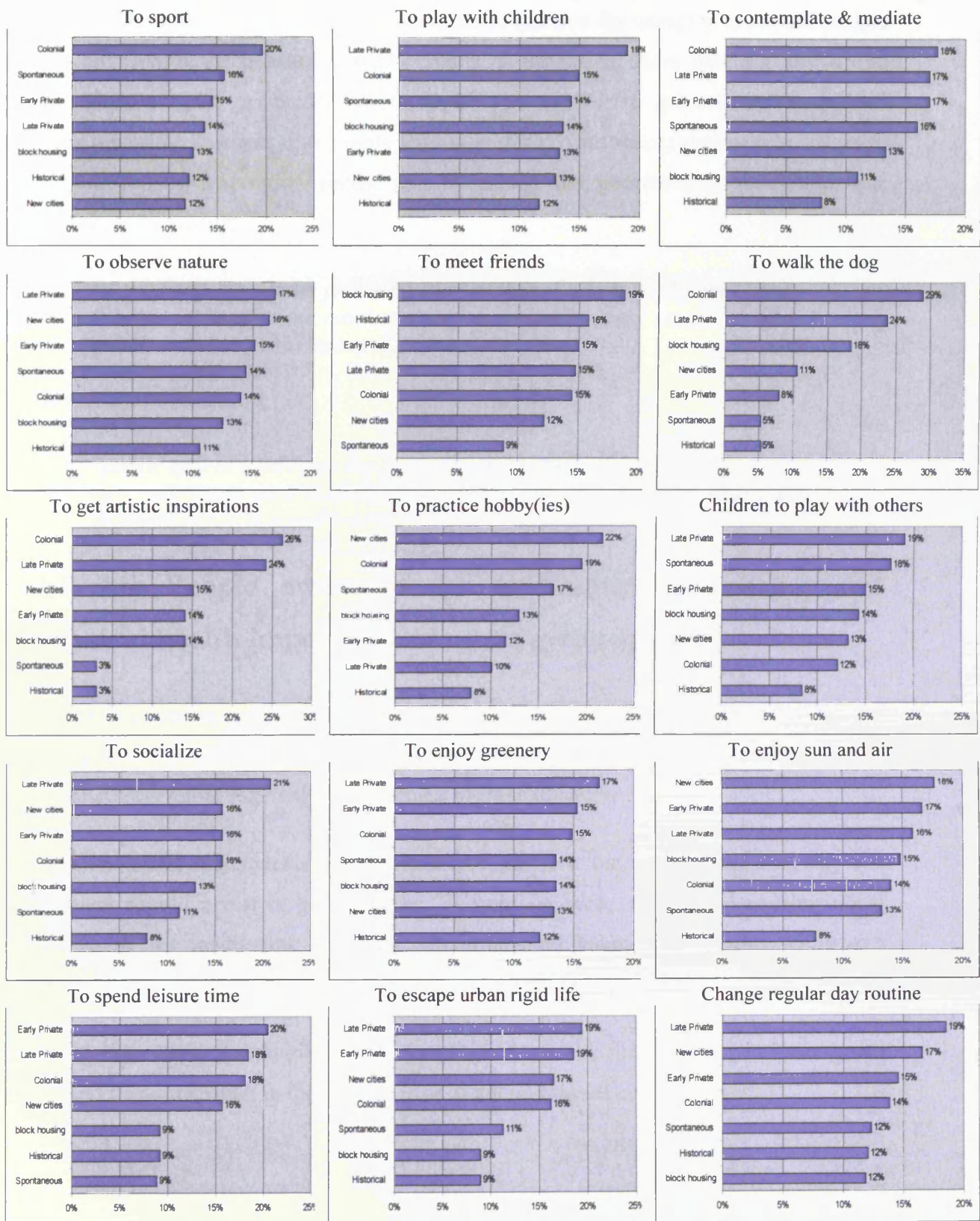


Figure (7-14), Distribution of motives' frequency percentages over neighbourhood patterns

When correlating the different type of use-value of (motive for using) green space people usually go to with the private or public status of the space, there was not any strong pattern. However, the preference for those who go to GS “to get artistic inspiration” deserves reporting. It seems that people tend to prefer private spaces than public spaces to fulfil their artistic inspiration needs, and by asking the interviewees about this, one summed it up by saying:

“Private Green spaces provide better quality of urban landscapes, thus it helps in inspiration, moreover they are gated, access restricted and not crowded as public spaces”.

While another adds;

“public spaces used to be the best place for artistic inspiration 40 years ago, , directors used to shot films in them, but now they have changed dramatically, it is a real lose”.

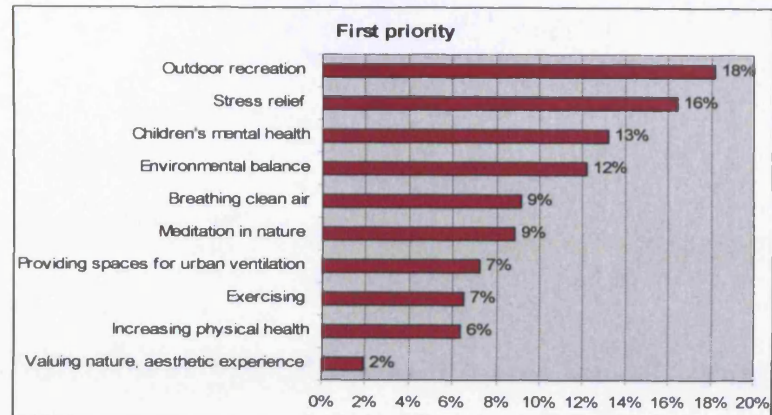
1-7 Are People aware of the environmental, mental and physical health importance of urban green spaces?

Existence, reservation and use value relating to personal, subjective wants and needs are one thing. Another is respondents’ appreciation of the objective values of green space. The questionnaire therefore asked about awareness of these objective benefits.

A question asked respondents to prioritize the top five out of ten reasons why the government should invest in green spaces. The options were, outdoor recreation; stress relief; spaces for meditation; clean air; environmental balance; aesthetics; children’s mental health; physical health; exercising; and urban ventilation.

Figure (7-15), shows the distribution of first ranked reasons for investing in more green spaces and it is noticeable, in this respect, that aesthetic reasons come last.

Figure (7-15), *Descending distribution of chosen first priority reasons to invest in GS*



Cross tabulating the first priority reasons for investing in green spaces with the neighbourhood typologies (Figure 7-16) once again indicates the variety of values placed on green space and the way in which these values are influenced by experience. For example, nearly half the respondents, who put 'out door recreation' as a priority reason, were located in two patterns only, early private developments (25%), and colonial developments (22%). By contrast, only 5% of new cities respondents cited this reason. In the case of early private development this clearly reflects the lack of recreational space. The case of colonial neighbourhoods is interesting and may indicate that while these areas are well endowed with mature greenery planted along roads and squares, there is a lack of useable recreation spaces. New city residents have an abundance of open green spaces and recreation would not be for them, therefore, an objective reason to invest in more green spaces.

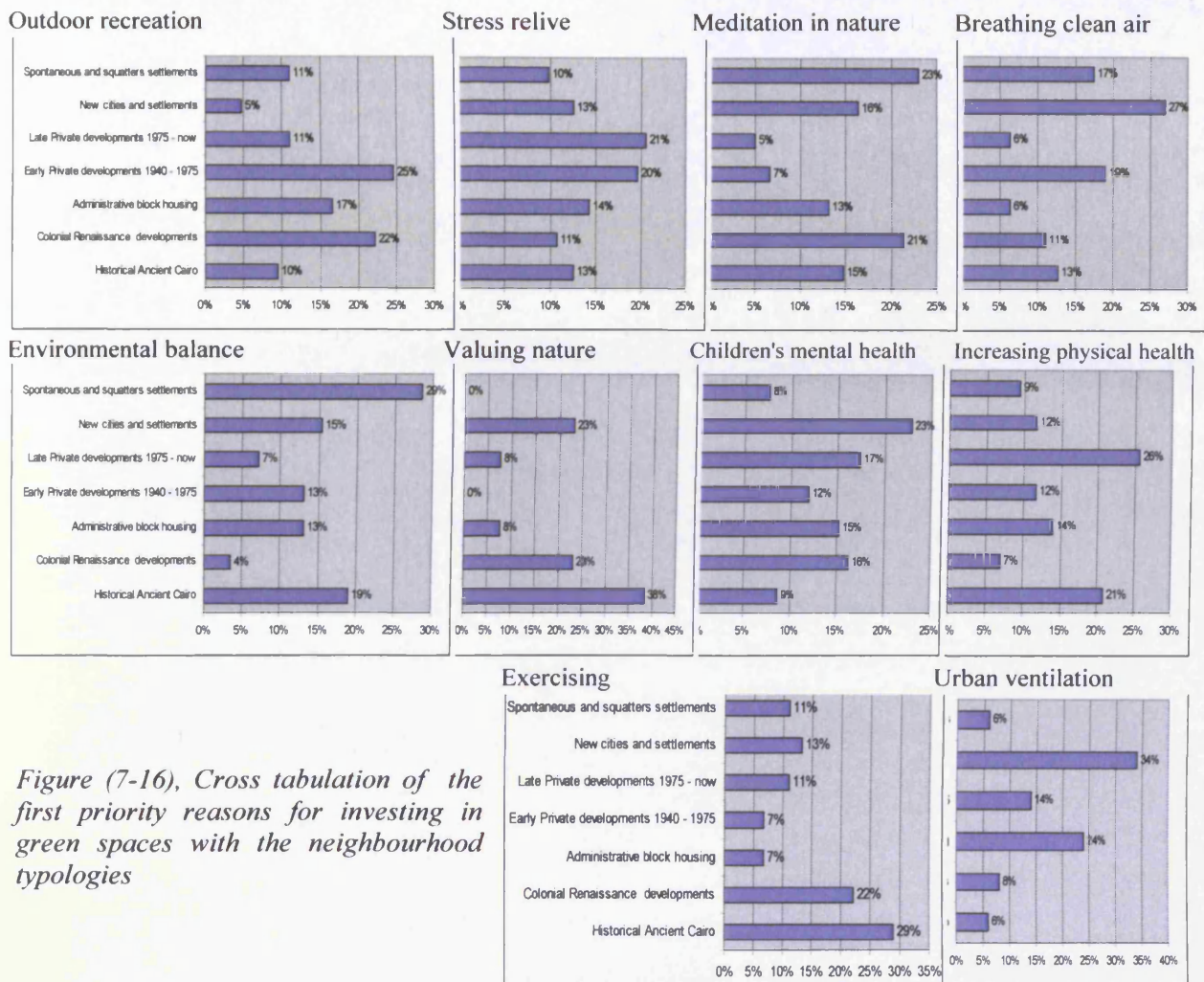


Figure (7-16), Cross tabulation of the first priority reasons for investing in green spaces with the neighbourhood typologies

A surprisingly high percentage of respondents in pattern six (27%) cited ‘breathing clean air’ as a reason to invest. This is possibly explained by the fact that this is the only pattern that does not suffer the air pollution of the rest of Cairo. The city often has a black cloud of pollutants hanging over it. Most Cairens seem to have adapted themselves to this but pattern six residents are particularly sensitive to it having escaped it.

Spontaneous and squatter residents scored the highest percentage (29%) citing ‘environmental balance’ as a reason. This on the one hand is somewhat surprising since this might be thought of as a sophisticated view. It may be explained, however, by the extreme lack of environmental balance in these crowded, unserved areas. This is all the more interesting when set against the fact no spontaneous neighbourhood residents expressed cited ‘nature and aesthetic experience’ as a reason to invest (0%). Clearly, they are sensitive principally to the practical aspects of environmental imbalance. The explanation may also lie partly in the fact that the squatter areas have no intrinsic natural or

aesthetic environmental value that needs enhancing or preserving. There is some evidence for this explanation from respondents in historic Cairo neighbourhoods, 35% of whom cited nature and aesthetic experience as a reason for investing.

Residents' awareness of the objective benefits of green spaces are particularly well captured in the following quotation, which was repeated several times by pattern six residents:

"We need more trees to act as shelters and buffer against the blowing sandy winds, which causes serious vision, and health problems, new cities are just urban expansions on the capital's desert periphery."

Here we have a hint that while the new areas are relatively well endowed with green spaces, the landscape planning has not used greenery in the most effective way. Trees here are seen as engineering artefacts: a type of valuation quite distinct from that of the residents in ancient Cairo which is protected by centuries of traditional urban design.

The most ironical result from this question was the importance of "providing spaces for the urban ventilation" as a reason to invest in block housing, and late private development neighbourhoods (24% and 34% respectively). These two patterns were strongly government planned but characterised by a violation of building and planning regulations, creating over-densified neighbourhoods in which planned open space provision has become too little for the actual population levels. It is interesting to notice that the old traditional morphology of the ancient Cairo in pattern one and the new cities in pattern six seem both to have achieved a degree of efficiency and success in regards to urban ventilation.

"Providing spaces for urban ventilation" was cited as a reason to invest by only 6% of residents.

It can be concluded from the previous analyses that, the people of Cairo do possess a well developed and thought out awareness of the objective environmental, mental and physical health importance of urban green spaces. They, of course, value these benefits according to personal qualities, but the neighbourhood analysis suggests that the value placed on investment also, naturally, reflects the residents experience as a result of the kind of neighbourhood they live in.

R.Q.2. Problems of GS

The second set of questions presented to interviewees is designed to understand the problems experienced in the use of green space in Cairo. The problems have been divided into three categories: (a) antisocial behaviour and sensational problems, which include the problems of, misbehaviour of some users, youth drug addiction and smoking, security and safety; (b) undersupply of infrastructure and ongoing investment, including lack of shaded areas, seats & site furniture, trees and greenery, essential public services, maintenance; and (c) accessibility and location problems, which include site access, distance, availability of transportation to/from, smallness and usability of green spaces, expense of entrance fees, shape problems and scarcity more generally.

2-1 How do Cairo residents as a whole perceive the problems of existing green spaces?

Respondents were asked; "generally, what are the main problems perceived by you in the surrounding urban green spaces?" The general frequencies for the whole sample show some interesting results (Figure 7-17).

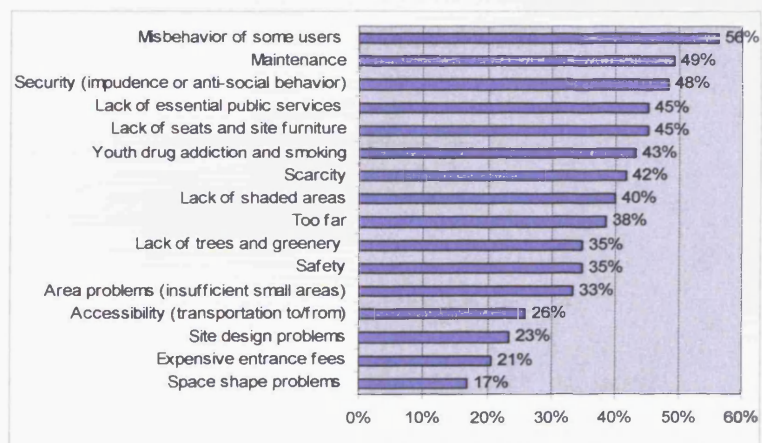


Figure (7-17), Problems perceived in urban green spaces⁶³

⁶³ The figures are the %s of respondents who ticked each problem. Respondent could chose any variables - they are not mutually exclusive.

The following section is a brief reflection on the more significant of these findings:

Social behaviour and sensational problems

Includes problems of: Misbehaviour of some users - Youth drug addiction and smoking- Security - Safety

Of the 715 respondents, 56% (402 respondent), considered the misbehaviour by certain users among the major problems which they encounter in using green spaces. This has the highest percentage among all the perceived problems. 48.3% (345 respondent), considered security (impudence or anti-social behaviour) a problems in using GS. These problems lower the use-value of green space to residents and may reduce the visiting frequencies especially for children, families and female users. Two householders stated that:

“We face a very strange problem of young security and police officers teasing our daughters and sisters, instead of protecting them”

Some green spaces in the city have clearly become a theatre for youth drug addiction and smoking, with 43.2% (309 respondents) stated that they perceive this to be a problem in using green spaces. Several interviewees stated that:

“Most of the public green spaces have no police stations or security guards which results in the lack of safety and misbehaviour of some users especially youth causing the desertion of these spaces by the residents”

More than 1/3 of the interviewees, (34%.7) stated that safety is a problem for them in using green spaces.

Users’ perception of green space features and characteristics

Nearly half the respondents (49.2%) complained about lack of maintenance of green spaces, while 45% complained about lack of both essential public services and lack of seats and site furniture. These are high figures, suggesting that nearly half the users of green spaces use inadequate quality green spaces. A typical quotation of interviewees was:

“There are no toilets in the space, how on earth can a family spend their day outdoor!”

Others complained about the garbage and debris-dumping problem, as one householder said:

“Lack of adequate systems to collect garbage caused the accumulation of debris and dump piles in green spaces, threatening us with a health catastrophe”.

In an arid hot city like Cairo, shade is much appreciated, and usually a green spaces is valued for its dense trees and shade. However, it was shocking to find that 40% of respondents complained about the lack of tree-shading. Moreover, 34.7% stated that there is a general scarcity of greenery in green spaces.

Accessibility and location problems

Unsurprisingly, scarcity was among the top perceived problems by the residents, with 41.7% of the whole sample saying that there was not enough green space. One of the respondents, for example, stated:

“...All what I dream of is to breath clean air and that my children have green spaces to play in, with cheap affordable entrance fees especially for us low income people, not all people are wealthy, you know!”

While another typical quotation describing scarcity states:

“... If I have found a green space or a children playground, I would not have hesitated in using it daily; we are really in need of such virtues”

38.3% stated that the nearest green spaces are too far for them to go to (a more detailed analysis will be covered in subsequent sections). 20.7% stated that they find the expensive entrance fees problematic. This is a significant finding, suggesting that 1/5 of Cairo's residence, which is more than 1.5 million person, may face financial problems in accessing Cairo's excludable green spaces. Seven interviewees stated the following touching comment:

“.. Is it acceptable that a child's dream is only that his father earns enough money to go to the park?”

I elaborate the analysis further by looking at the pattern of reported problems by neighbourhood type.

A correlation between the perceived problems and the neighbourhood typology shows that misbehaviour, security and youth drug addiction are the top perceived problems in most neighbourhood patterns. These problems are ubiquitous. Only very slight variations could be traced between neighbourhoods, such as the high percentage reporting maintenance problem in the new cities. This is not at all surprising given the relatively large amounts of green spaces planned into these settlements. This raises questions about the sustainability of these green spaces, at least under current institutional arrangements there is also a problem of low quality spaces, particularly associated with low-cost housing developments. A Typical quotation from pattern six interviewees - mentioned 12 times - stated that:

“There is an alarming threat to our new settlements' quality of life, which is the increasing municipality new block housing developments, these areas do not have even a single tiny green space. This has negatively affected our communities green assets; we are feeling the deterioration of green spaces' and their urgent need for maintenance.”

Among significant results revealed in Figure (7-18) are the following.

The ancient city residents appear to be satisfied with the quality of their green space (only 6% cited problems relating to features and characteristics of green space). This is probably because of the presence of the high quality and well managed public green spaces in this pattern, such as Al-Azhar park.

Pattern four scored the highest percentage of 21% in terms of the lack of trees and greenery, and that is because the very congested and densely built urban environment of the pattern. It is the most dense pattern in the city.

A relatively high percentage in patterns one and seven regarded the expensive entrance fees as a problem in using green space. This is because these two patterns have the lowest monthly income of all the patterns. By contrast, residents in the colonial neighbourhoods cited this problem least frequently (7%), this being the highest monthly income type of area.



Figure (7-18), *Perceived Problems in GS distributed over neighbourhood patterns.*

2-2 Does problems of distance, scarcity and accessibility vary between neighbourhood types?

These problems are acute in both patterns four and seven, with nearly half residents in each citing this type of problem. This is mainly due to the severe scarcity of green spaces in these patterns, which results in residents having to use more remote green spaces. The following are typical quotations from these two parts of Cairo:

“There is no place for our children to play, or for us to recreate in or communicate, we have to take about half an hour in transportation to reach the nearest green space, which have expensive entry fees”

“Congestion of green space is mainly because scarcity, in our case the only garden we have is over-used, it can not fulfil needs of all residents”

R.Q.3. Satisfaction

3-1 Are people satisfied with the quantity of GS in their neighbourhoods?

The frequencies distribution of respondents' satisfaction with the quantity of green space among the whole sample shows that nearly 42% are satisfied with quantity, while 48% are not (10% did not express a view). However, this information hides variations across the city as Table (7-11) and Figure (7-19) show. Residents in most of the districts stated that urban green space is not sufficient in quantity – five of the seven patterns. Many residents across these five patterns stated that they need more public spaces especially for their children to fulfil their childish needs.

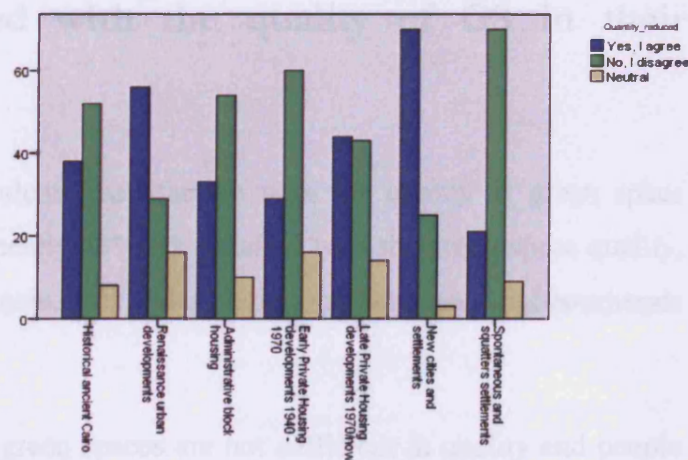


Figure (7-19), Distribution of the satisfaction with quantity over neighbourhood typologies⁶⁴

Only residents in renaissance and colonial developments and new cities stated that they have sufficient quantity of green spaces. The new cities and settlements had the highest percentage of satisfied residents (71%). One typical new city interviewees statement was; “*We have sufficient green spaces surrounding our house, and the children can play safely*”. The high percentage of dissatisfaction in spontaneous and squatter neighbourhoods (70%) stands in mirrored contrast (Table 7-11).

The relatively high percentages of the neutral responds (76 respondent in total – an average percentage of 11%), might be due to the confusion of the respondents between the publicly and privately provided spaces, meaning that in many cases, there might be a satisfactory amount of green space quantity, but most of them are privately owned, and access to them are restricted.

Table (7-11): Distribution of the quantity of green spaces satisfaction among the patterns

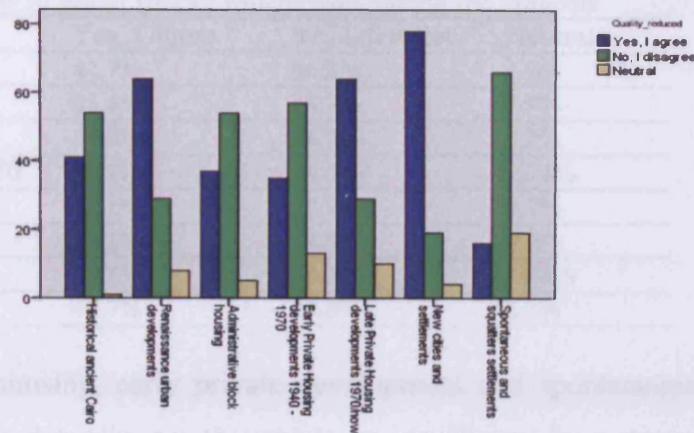
	Yes, I agree	No, I disagree	Neutral
Historical ancient Cairo	38.8%	53.1%	8.2%
Renaissance urban developments	55.4%	28.7%	15.8%
Administrative block housing	34.0%	55.7%	10.3%
Early Private developments 1940 - 1970	27.6%	57.1%	15.2%
Late Private developments 1970/now	43.6%	42.6%	13.9%
New cities and settlements	71.4%	25.5%	3.1%
Spontaneous and squatters settlements	21.0%	70.0%	9.0%
Total	41.6%	47.6%	10.9%

3-2 Are people satisfied with the quality of GS in their neighbourhoods?

The frequency distribution of respondents’ satisfaction with the quality of green space among the whole sample shows that nearly 48% are satisfied with the green space quality, while 44% are not (Figure 7-20). Again, this hides variations between neighbourhoods (Table 7-12).

Half of the districts stated that urban green spaces are not sufficient in quality and people commonly stated that they need more quality public spaces near their homes, as they need to cover great distances to reach any high quality park.

Figure (7-20), *Distribution of the satisfaction with quality over neighbourhood typologies*



Residents of renaissance and colonial developments, late developments and the new cities and settlements have a relatively high percentages satisfied with quality of green spaces.

One satisfied new city resident said:

“I adore my green neighbourhood and I am envied to have such a spectacular view from home, I consider my self lucky and hope to live in the same place until I die.”

These are the three neighbourhood patterns, in which private green space institutions have developed most. In renaissance areas there are many private recreational clubs and many wealthy residents. In the late private development areas, residents have developed their own exclusionary ‘club-like’ arrangements as discussed in the previous chapter. The new cities contain many of the city’s gated developments as well as having a relatively high public investment in green spaces (although see comments above about the degradation and under-investment in some of these spaces).

Tying the results of both quantity and quality questions together for these neighbourhoods we can say that in these areas, a mixture of government and market mechanisms have worked to satisfy a strong majority of residents. Residents in late private development neighbourhoods, however, are much more positive about quality than quantity. This lends support to the idea that although green space is undersupplied by a mixture of market failure and failure in government planning, the club-supplied spaces that have emerged through informal collective institutions have succeeded in preserving some good quality spaces, even though there are not enough of them.

Table (7-12): Distribution of the quality of green spaces satisfaction among the patterns

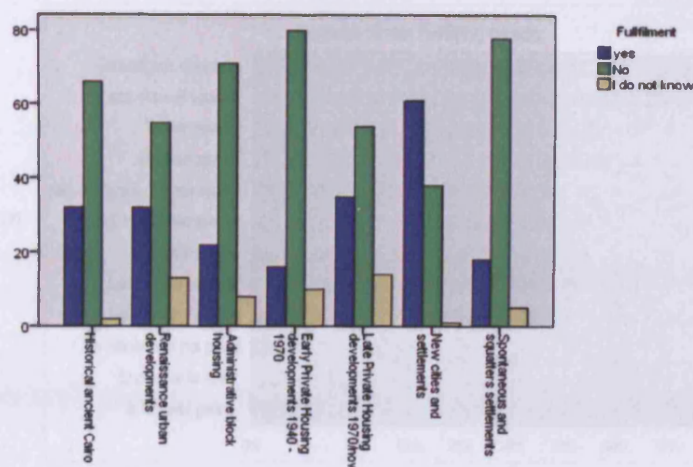
	Yes, I agree	No, I disagree	Neutral
Historical ancient Cairo	42.7%	56.2%	1.0%
Renaissance urban developments	63.4%	28.7%	7.9%
Administrative block housing	38.5%	56.2%	5.2%
Early Private developments 1940 - 1970	33.3%	54.3%	12.4%
Late Private developments 1970/now	62.1%	28.2%	9.7%
New cities and settlements	77.2%	18.8%	4.0%
Spontaneous and squatters settlements	15.8%	65.3%	18.8%
Total	47.7%	43.8%	8.5%

- In the historical city, block-housing, early private development and spontaneous squatter areas, both quantity and quality are thought to be insufficient by a strong majority of respondents. The greatest dissatisfaction about both quantity and quality comes from residents of early private development and spontaneous squatter areas. These are the neighbourhoods that have been least influenced by planning – be it public sector planning or private sector neighbourhood planning (both of which have contributed to the effective supply of green space in new settlements). Both the land market and governmental urban planning have failed to supply greenery in adequate quantity and quality in these parts of the city.

3-3 Does local GS fulfil residents' needs?

Figure (7-21) and Table (7-13), report responses to a question that asks if respondents think that the green spaces in their district meet peoples' needs in the neighbourhood in general. The question deliberately asks about the needs of the 'general public' – i.e. not the respondent's own needs. Interestingly, only in the new peripheral neighbourhoods do the majority of respondents answer positively. This suggests that those whose own needs are satisfied in renaissance and late private development areas are also aware that there are others in the neighbourhood whose needs are not being met. This is what we might expect in a city in which enclosed spaces have become so important in meeting the demand for green space. In contrast, residents in new peripheral neighbourhoods are not only satisfied in respect of their own consumption but are also satisfied that the needs of others in their neighbourhood are more generally being met. This probably reflects both the scale of provision, the relative abundance of open-access space and the homogeneity of residents.

Figure (7-21), Fulfilment of needs percentages distribution over neighbourhood typologies



An overall percentage of 62% of interviewees stated that green spaces in their neighbourhoods does not fulfil the resident's needs. In the two most congested patterns (four and seven), this reaches more than 75% of respondents.

Table (7-13): Fulfilment of green spaces to the people's need analysis

	Yes	No	I do not know
1- Historical ancient Cairo	32.0%	66.0%	2.0%
2- Renaissance urban developments	32.0%	55.0%	13.0%
3- Administrative block housing	21.8%	70.3%	7.9%
4- Early Private developments 1940 - 1970	15.1%	75.5%	9.4%
5- Late Private developments 1970/now	34.0%	52.4%	13.6%
6- New cities and settlements	61.0%	38.0%	1.0%
7- Spontaneous and squatters settlements	17.8%	77.2%	5.0%
Total	30.4%	62.2%	7.5%

3-4 Scarcity is the major reason for not fulfilling people's needs

Figure (7-22), indicates that the general problem of under-supply is the most persisting reason for not fulfilling the peoples' needs (45% or 228 respondent). A rather shocking result was that of 30% (151) of respondents stated that the reason behind not fulfilling the people's needs is the non existence of green space in their neighbourhoods. From a planning strategy perspective, it is of interest to note that 40% stated that lack of small spaces is among the reasons for not fulfilling peoples' needs. This shows that residents not only have an awareness of the problem of scarcity but of possible solutions too.

Figure (7-22), Percentages distribution for the reasons for not fulfilling needs

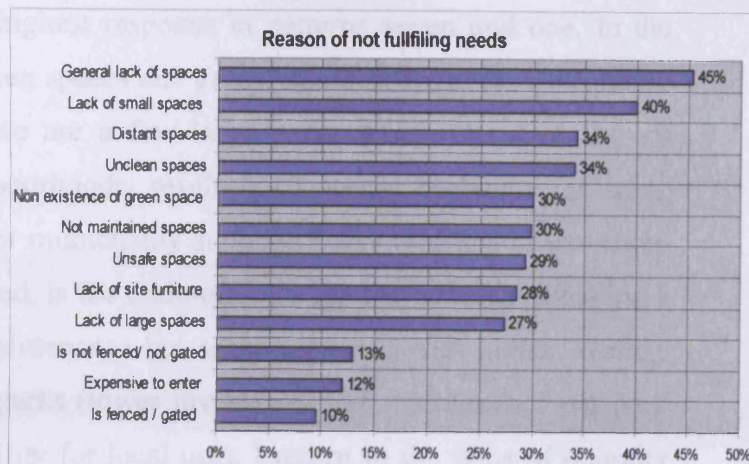


Table (7-14), shows reasons for not fulfilling people's needs by neighbourhood type. The analysis reveals some significant results.

In regards to the "general lack of spaces" as the reason for not fulfilling peoples' needs, unsurprisingly, pattern seven has the highest percentage of responses (22%). On the other hand, it is surprising that early private development residents come next with a relatively high percentage of (21%). It was anticipated that either ancient historical Cairo or the municipal block housing would be in the second place because their development was mainly based on intensification and making the most profit of land.

Table (7-14): Cross tabulation of reasons for not fulfilling people's needs and neighbourhood patterns

	Pattern							Total
	One	Two	Three	Four	Five	Six	Seven	
Lack of small spaces	24	25	23	42	31	19	37	201
	11.9%	12.4%	11.4%	20.9%	15.4%	9.5%	18.4%	
Lack of large spaces	12	19	13	34	30	8	21	137
	8.8%	13.9%	9.5%	24.8%	21.9%	5.8%	15.3%	
General lack of spaces	35	14	33	48	35	13	50	228
	15.4%	6.1%	14.5%	21.1%	15.4%	5.7%	21.9%	
Remote spaces	36	22	18	31	22	4	39	172
	20.9%	12.8%	10.5%	18.0%	12.8%	2.3%	22.7%	
Expensive to enter	5	11	11	14	3	2	14	60
	8.3%	18.3%	18.3%	23.3%	5.0%	3.3%	23.3%	
Is fenced / gated	7	13	3	9	2	5	9	48
	14.6%	27.1%	6.3%	18.8%	4.2%	10.4%	18.8%	
Is not fenced/ not gated	6	11	9	14	2	11	12	65
	9.2%	16.9%	13.8%	21.5%	3.1%	16.9%	18.5%	
Unsafe spaces	14	21	26	31	17	11	27	147
	9.5%	14.3%	17.7%	21.1%	11.6%	7.5%	18.4%	
Unclean spaces	26	18	26	30	32	10	29	171
	15.2%	10.5%	15.2%	17.5%	18.7%	5.8%	17.0%	
Not maintained spaces	18	12	29	22	33	17	19	150
	12.0%	8.0%	19.3%	14.7%	22.0%	11.3%	12.7%	
Lack of site furniture	10	14	23	20	32	22	22	143
	7.0%	9.8%	16.1%	14.0%	22.4%	15.4%	15.4%	
Non existence of GS	15	14	28	26	3	4	61	151
	9.9%	9.3%	18.5%	17.2%	2.0%	2.6%	40.4%	

“Remote spaces” was predictably the highest response in patterns seven and one. In the former, there is a general scarcity of green spaces due to the nature of spontaneous squatter developments; while in the latter, there are a few large parks which are spatially not centrally distributed within the neighbourhoods, resulting in access problems for some residents. An interesting policy issue for municipally supplied parks that this raises, taken along with other results already discussed, is the trade-off between the benefits of having a few large parks (high quality, good maintenance but securitised and with higher average travel distances) versus many smaller parks (lower investment and maintenance per park and poorer quality but greater accessibility for local use). I return to the issue of quantity and quality trade-offs in the conclusion.

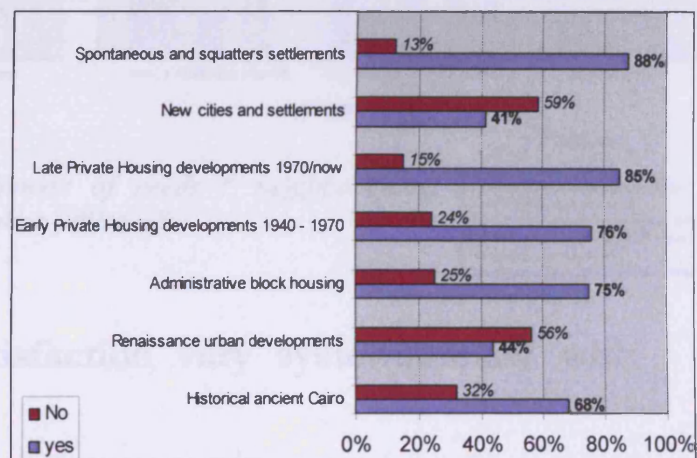
Pattern two had the highest percentage citing “Is fenced and gated” as a reason for not fulfilling the peoples’ needs. This is one of the wealthiest, and greenest types of neighbourhood in Cairo, with more than 24% of its area made up of green spaces (privately or publicly owned and managed). This response might be due to the fact that most public parks in this pattern are large in size with few entrances, and most of the time it is only one entrance that is opened to the public for security reasons. Not only will this tend to make interviewees identify problems of access and scarcity (as already noted above) but will also lead them to identify a problem of access for people in general.

It is interesting to contrast this with the interviewees who cited “Is not fenced and not gated” as a reason for not fulfilling the peoples’ needs. The highest percentage of people citing lack of gating as a cause of not fulfilling the peoples’ needs is in patterns 4 and 7. This indicates something of considerable interest. These are patterns with the lowest supply of green space in the city. The response on this question indicates an association between restricted access and needs fulfilment. This suggests that in high scarcity areas, people may be willing to trade off free access to more and better green spaces. It can be noted in this respect that overall in the city, more respondents cited absence of fences/gates as a reason for lack of needs fulfilment (65) than presence of fences/gates (48).

3-5 Do users have to pay to reach, utilize or access GSs? Does this influence their satisfaction and mode of consumption?

When asking the interviewees if they have to pay to reach, enter or utilize, it was found that 68% of the 715 respondents stated that they have to pay to reach, use or utilize their usually visited green space. The highest figure was 88% in the case of the seventh pattern respondents (indicating their greater need to use public transport to find a green space). Clearly, the majority of Cairo's residents have to pay to reach, utilize or/and enter their usually visited green spaces, and that might be accepted for the time being as a result of the overall scarcity problem that Cairo suffers from. The main issue is whether these payments are affordable and whether they hinder the fulfilment of needs.

Figure (7-23), Have to pay to reach, enter or use usually visited green space distributed over neighbourhood patterns



To answer these questions, crosstabulation of neighbourhood patterns, fulfilment of needs and having to pay or not, was undertaken. 47% of the 627 valid responses on these questions stated that green spaces does not fulfil people's essential needs and that they have to pay in order to reach, utilize or/and enter green spaces, figure (7-24).

Patterns four and seven have the highest percentage of respondents who both have to pay and state that green spaces does not fulfil people's needs. This probably reflects the travel costs faced by these residents, since I have already reported them having a favourable attitude to fencing/gating. Pattern five, on the other hand dominates the respondents who both have to pay and state that green spaces fulfil peoples' needs. This is a clear endorsement of the hypothesis that the spontaneous club institutions that have emerged in this pattern have helped secure a satisfactory supply of quality green space. Pattern six had

the highest number of respondents who both do not have to pay and state that green spaces fulfil peoples' needs. This reflects the high amount of publicly supplied spaces in these areas. Similar results were found when crosstabulating neighbourhood patterns with 'have to pay' and satisfaction with both quantity and quality of green space (and for the sake of avoiding repetition these results are therefore not reported).

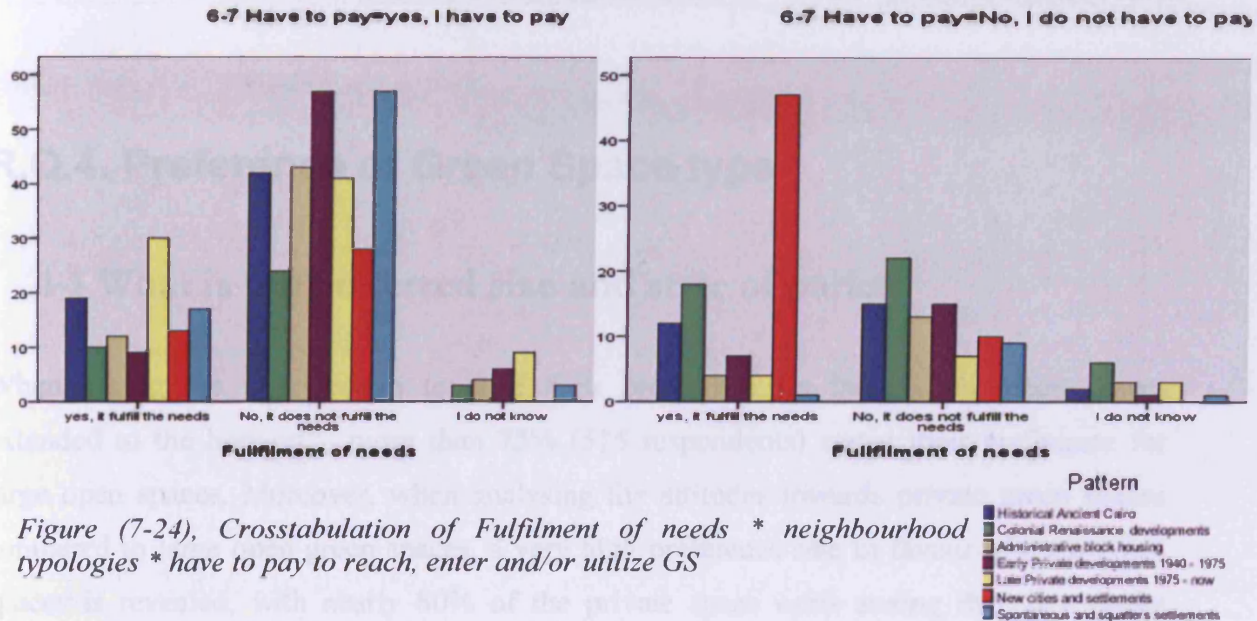


Figure (7-24), Crosstabulation of Fulfilment of needs * neighbourhood typologies * have to pay to reach, enter and/or utilize GS

3-6 Does green space satisfaction vary systematically with income level?

When cross tabulating satisfaction with quantity of green space and monthly income of the residents, (Table 8-15), the following results emerge. The relationship between income and satisfaction is a complex one. There is a clear single modal pattern in respect of satisfied residents, with middle income residents in Cairo being more satisfied than either lower or higher income residents. On the other hand, the dissatisfied respondents are bi-modally distributed to both lower and higher income residents. It is the two extremes of income that have scored the highest percentages of non satisfaction, (over 60% of both income groups were dissatisfied). This is quite plausible since the poor usually live in neighbourhoods that suffers from green spaces scarcity and poverty, while the wealthy are looking for as better quality of life, and they think that they deserve more green spaces for the high taxes they pay.

Table (7-15): Crosstabulation of the satisfaction with quantity of GS and the residents' monthly income

		Monthly income							Total	
		< 500	500 - 1000	1000 - 1500	1500 - 2000	2000 - 2500	2500 - 3000	> 3000		
Quantity sufficient	Yes, I agree	Count	24	79	41	43	25	25	27	264
		% within Quality	9.09%	29.92%	15.53%	16.29%	9.47%	9.47%	10.23%	100.00%
		% within income	36.92%	44.13%	45.56%	57.33%	59.52%	58.14%	38.57%	46.81%
	No, I disagree	Count	41	100	49	32	17	18	43	300
		% within Quality	13.67%	33.33%	16.33%	10.67%	5.67%	6.00%	14.33%	100.00%
		% within income	63.08%	55.87%	54.44%	42.67%	40.48%	41.86%	61.43%	53.19%

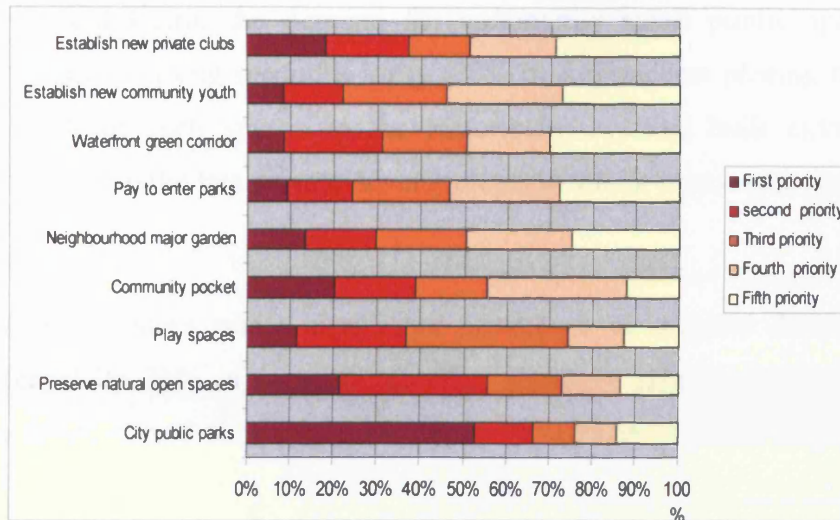
R.Q.4. Preference of Green Space type

4-1 What is the preferred size and style of parks?

When asking the interviewees to state their preference for large open green spaces extended to the horizon⁶⁵, more than 75% (515 respondents) stated their preference for large open spaces. Moreover, when analysing the attitudes towards private green spaces compared to large open green spaces, a very high preference rate in favour of open green spaces is revealed, with nearly 80% of the private space users stating that they prefer having large open green spaces⁶⁶. This reflects that, in spite of their usage of private green spaces they still want large open parks, which cannot easily be supplied privately.

When cross tabulating the preferring of open green spaces with the neighbourhood patterns, there was strong agreement in favour of large parks across the city, with the highest disagreement being in colonial developments. 22 respondents there, did not prefer open green spaces. This is likely to be simply due to the saturation of this pattern with greenery, as greenery in this pattern is nearly 24% of its area. It also possess the largest percentage of public open green spaces among all the neighbourhood typologies.

Pursuing a similar line of enquiry, interviewees were asked another question about prioritizing their preference if the government had funds for developing urban green space⁶⁷ (Figure 8-25). The top choice among the nine different proposed types of green space was the city's public parks, which came first by a huge margin, being ranked first by 40% of respondents.



	Priority					Total
	1 st	2 nd	3 rd	4 th	5 th	
City public parks	270	69	50	49	73	511
Preserve natural open spaces	102	161	82	64	63	472
Play spaces	52	113	169	59	57	450
Community pocket	85	79	70	137	51	422
Neighbourhood major garden	62	74	96	113	115	460
Pay-to-enter parks	17	28	42	48	52	187
Waterfront green corridor	21	57	49	49	76	252
Establish new community youth	24	39	67	77	78	285
Establish new private clubs	43	45	33	48	69	238
Total	676	665	658	644	634	

Figure (7-25), distribution of priority choices over different GS types

Other patterns to emerge when correlating interviewees' preferences for the investment of government green space funds with neighbourhood type, (Figure 7-26).

While city parks was the most strongly demanded investment in all but one type of neighbourhoods, pattern four was the top demanding type of neighbourhood.. This is logical, as this pattern is among the most crowded and congested type of area suffering from the high green space scarcity. The fact that all but one neighbourhoods have a high demand for more large city parks indicates their superior value. This may partly be because of intrinsic benefits of large parks, such as relative lack of crowding, but may also relate to the fact that most of Cairo's existing large parks are well managed spaces with a high quality environment. The irony is that this has been achieved through fencing and charging – a style of park that may not be not favoured, but have proven its efficiency in a GS scarce context like Cairo. This suggests that many interviewees have not made the connection between enclosure and quality preservation.

Within historical ancient Cairo, the demand for community small public spaces was significant where it came a strong second priority (20% of respondents placing it second). This reflects the lack of such spaces in the historically evolved built environment, compared for example, with the late private developments in which many such places were planned.

Preserving natural open spaces was a significant preference in colonial developments, where it was preferred by 21% of respondents. This probably reflects the high rate of education of these residents and their awareness of the importance of preserving the city's green assets.

When analysing the preferences for pay-to-enter parks as an investment by the government there was an unexpected finding, with patterns two, six and seven being highly in favour of this investment (24% of respondents in each). On the other hand, pattern one respondents, intriguingly, totally disagreed with this investment choice (0%). The explanation for the latter may partly be that all the municipal parks in the area are pay-to-enter, which exclude many of the residents from using their neighbourhood's green spaces. They may have been expressing a view that there are sufficient pay-to-enter parks and what they would really want are more open access large parks (i.e. a demand for subsidised entry to large parks, given their experience of expensive access), beside they have already 2 of the largest parks in the city and they feel that its sufficient for them, they need other types of GSs. The explanation for the positive demand for pay on entry parks in squatter areas may reflect a distrust in the government's ability to provide public goods. After all, these areas developed without any help from the government. It may also reflect a desperation of demand: paying for green space would at least ensure the provision of some greenery for recreation, even if it came at a cost. Better paid for than non-existent.

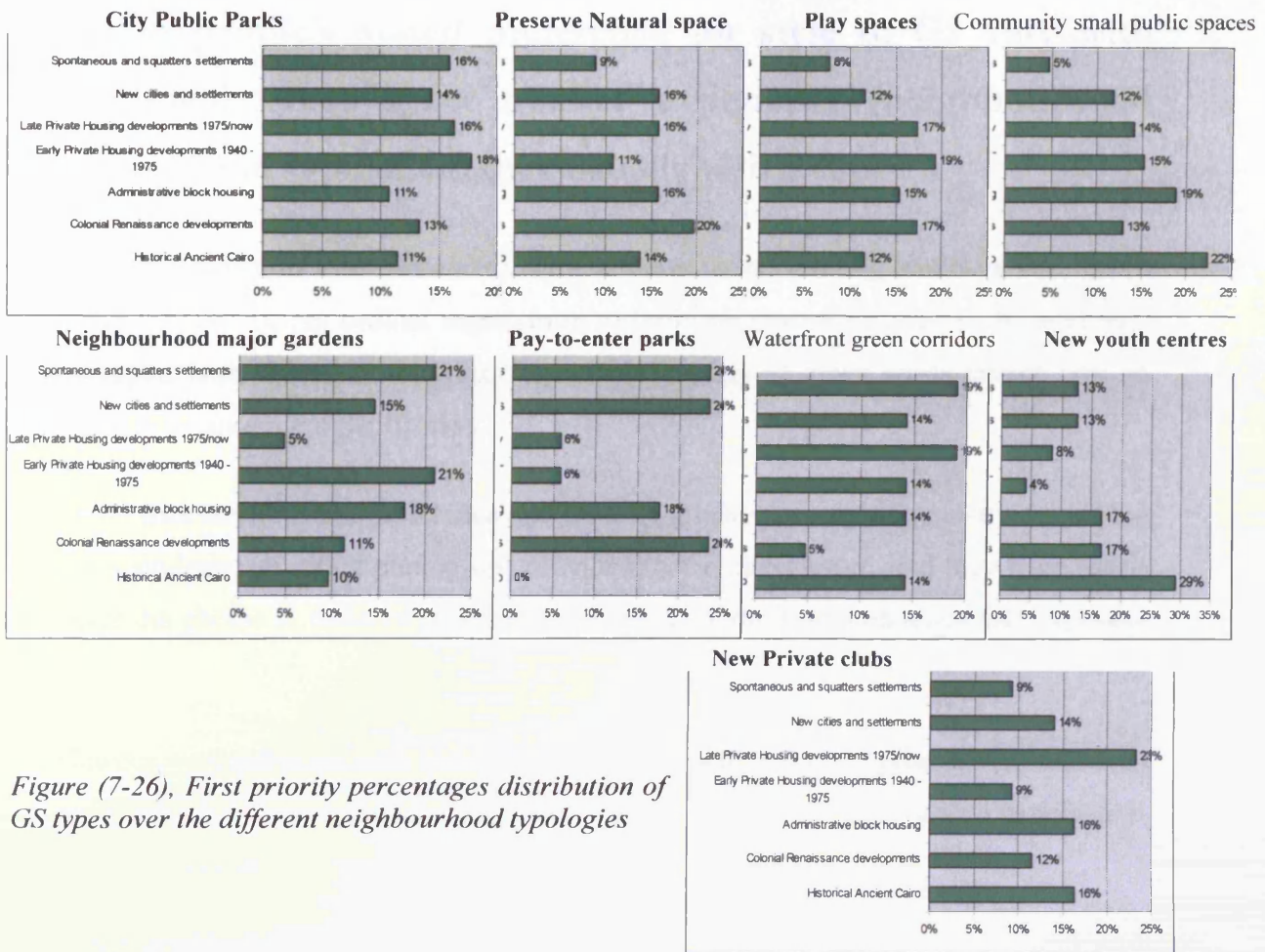


Figure (7-26), First priority percentages distribution of GS types over the different neighbourhood typologies

Pattern one had 29% voting for investing in new youth community centres, knowing that youth in this high density, unplanned area, are suffering from the scarcity of both green spaces and playing areas. Unsurprisingly, pattern five had 23% voting for investing in new private sports and recreational clubs, as this pattern's neighbourhoods are the most intensive users of private clubs, and their judgement is based on their successful experience with private spaces which they can afford paying for. So this suggests a learning experience different to the learning experience of pattern one. The difference is that most pattern five residents can afford to consume green spaces supplied by the private or self-organised club market. Pattern one residents have no experience of self-organised local club-organised green spaces because there are no spaces suitable for this type of institution.

4-2 Do people's stated preference for style of GS vary with their local 'green space market' experience (neighbourhood typology and type of GS they usually visit)?

Although this question was structured with a view to conducting multi-variate stated preference analysis (using ordinal regression), to limit the size of the thesis I have chosen only to report here bi-variate analysis. Regression models of green space choice will be developed in a subsequent publication.

In order to measure the area preference and level of green space service mostly demanded by the respondents, six titled photos was provided to the interviewee, and they were asked to arrange the photos in order of preference, where (1) is the first preference and (6) is the least.

Interviewees were provided with clear coloured photos with the same picture size shown in Figure (7- 27). The legend shows a schematic visualization of the hierarchical distribution of these green spaces.



(1-) City public huge parks



(2-) Pay-to-enter fenced gardens



(3-) Neighbourhood gardens



(4-) Community Pocket space



(5-) Waterfront Green corridors



(6-) Children Play spaces

Figure (7-27), Photos provided to interviewees for the different GS types

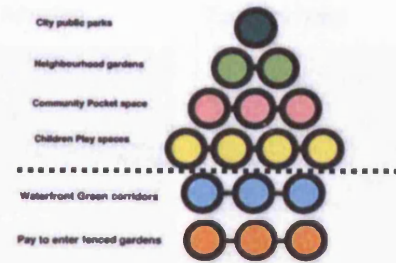


Table (7-16), shows the Residents' responses. City public parks, once again were the top preference (30% of the responses), verifying the results of the verbal question already discussed, followed by community pocket space (20%).

Table (7-16): Residents' responds to the preference of green space

	First	%	Second	%	Third	%	Fourth	%	Fifth	%	Sixth	%
City public parks	208	30%	72	10%	95	14%	101	15%	97	14%	125	18%
Pay-to-enter fenced gardens	94	13%	100	14%	101	15%	110	16%	141	20%	147	21%
Neighbourhood gardens	114	16%	200	29%	123	18%	117	17%	94	14%	41	6%
Community Pocket space	138	20%	140	20%	116	17%	97	14%	114	16%	89	13%
Waterfront Green corridors	89	13%	101	14%	142	20%	127	18%	114	16%	126	18%
Children Play spaces	57	8%	85	12%	119	17%	140	20%	132	19%	163	24%
Total	700	100%	698	100%	696	100%	692	100%	692	100%	691	100%

Figure (7-28), shows the correlation of the stated preferences with the neighbourhood type. Significant results include the following.

While city public parks were the first choice for most neighbourhoods types, the top preference for administrative block housing interviewees was community pocket space, (32% of the respondents within the pattern). This reflects the very poor community environment between blocks.

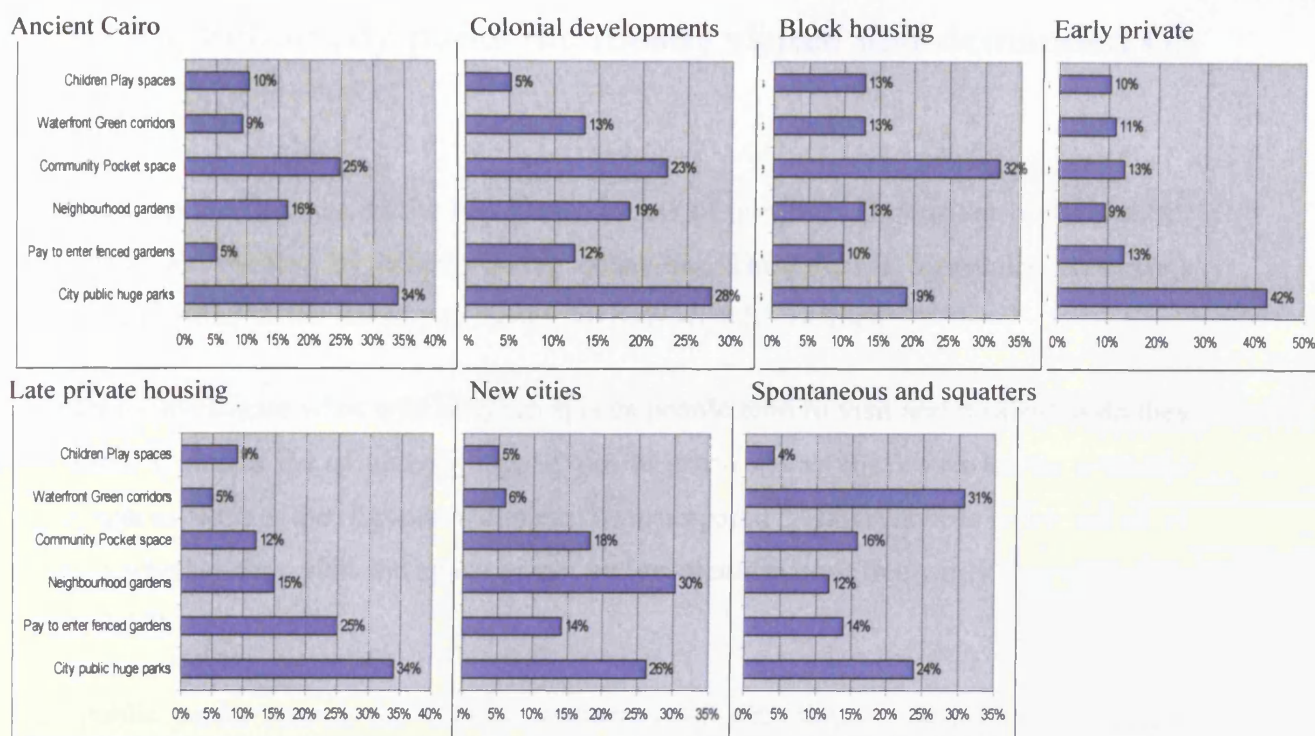


Figure (7-28), Correlation of the stated preferences of the green space types and the neighbourhood patterns

Pattern Five of late private developments responses were dominated by “pay-to-enter fenced gardens” (27%), while only 5% of historic Cairo residents selected this. That, again, confirms the preferences from the previous question.

The strongest squatter preference, surprisingly, was “waterfront green corridors” (35%). No doubt, this is because these waterfronts green areas are free to enter, and are among the very few places in Cairo that are purely “public”. Set against squatters relatively high preference for pay on entry parks in the previous question this makes an interesting finding. The residents of these poor areas with such little local green space would be willing to travel to free open green space or would be willing to pay for a greater amount of local enclosed green space. Either way, they are expressing a demand for greenery and a willingness to pay.

Rather surprisingly, children's' play spaces were the least preferred, in spite of the fact that Cairo suffers a severe scarcity of children's' play areas. The finding is all the more remarkable in that preference is lowest in the most needy pattern of squatters and spontaneous settlements. This may be accounted for (shockingly) by the absence of leisure time residents have for playing with their children.

4-3 Are Public city parks the mostly visited and demanded GS in the city?

Following up the findings of the two previous sets of questions, I consider preference for large parks as revealed by actual visiting behaviour. This, then is a revealed preference analysis compared to the stated preference analysis already conducted.

In order to investigate what type of green spaces people tend to visit and how often do they visit these spaces, a list of nine different types of green spaces that cover all the available green spaces within the Egyptian context was prepared⁶⁸. Interviewees were asked to mention whether they visit the space or not and to mention how frequently they visited it, (Table 7-17).

City public parks scored the highest frequency of 405 times, confirming the stated preference analysis. This was followed by private clubs with annual membership, whilst the least was privately owned gardens.

Table (7-17): Number of interviewees who visit each kind of Green space

Green space type		Green space type	
City public parks (e.g. Azhar park, Zoo, ...etc)	405	Waterfront Green corridors (Andalus, ...etc)	154
Neighbourhood major gardens (e.g. Fosata, ...etc)	257	Private clubs with annual membership (Alahly, ..etc)	260
Community Pocket small public spaces	247	Youth community centres (elJazera, Rod elFarag, ..etc)	96
Play spaces (playgrounds, children play yards, ...etc)	241	Private owned gardens	85
Natural open spaces (fields – countryside)	181		

A very significant result comes from examining the pattern of visiting these spaces. All green spaces except private clubs and children play spaces, were visited only 2 times a year or less. The pattern of visiting changes to more than 13 times per year with both private spaces and children play spaces. This clearly differentiates between at least two kinds of green spaces: those that have infrequently realised use value (but, as the previous analysis shows, high existence and reservation value); and those that are valued much more for their use value. Children have to fulfil their essential needs of outdoor exercising and recreation; and within the private spaces, people have paid in advance to utilize these spaces and feel a sense of ownership and belongingness, to the extent that some users go to these spaces on a daily basis.

Table (7-18), shows the different tendencies of visiting frequencies for the nine green space types among the seven neighbourhood types.

Table (7-18), Visiting frequencies for the 9 GS different types among neighbourhood patterns

	Times of visit per year				Total
	Twice or less	From 3 to 6	From 7 to 12	More than 13	
City public parks	284	67	29	28	408
Neighbourhood major gardens	169	42	36	10	257
Community Pocket small public spaces	93	53	33	68	247
Play spaces	102	56	26	57	241
Natural open spaces	110	38	19	14	181
Waterfront Green corridors	112	18	14	10	154
Private clubs with annual membership	56	43	35	126	260
Youth community centres	49	20	11	16	96
Private owned gardens	43	21	7	14	85
	1018	358	210	343	

A general tendency of visiting the green space twice or less per year can be seen with the city public parks, neighbourhood major gardens, natural open spaces, waterfront green corridors and youth community centres. This is due to reasons such as lack of time for recreation and leisure; relatively remote access of some of these spaces; congestion of these popular spaces due to scarcity; and the high total cost of the visit for most householders (including travel and entry costs).

Community 'pocket' spaces are used more than once a month by a significant number of residents in the new cities and settlements and administrative block housing. This is intriguing since the latter areas have few such spaces while the former have many. It may be that block housing resident, with so little green space, travel to other types of areas to use their community spaces. However it needs further investigation, which might be accomplished in future research.

Pattern two dominates the demand for private owned green spaces and that might be due to the nature of development in this pattern, the wealthy nature of residents, and the existence of a number of private sport and recreation clubs.

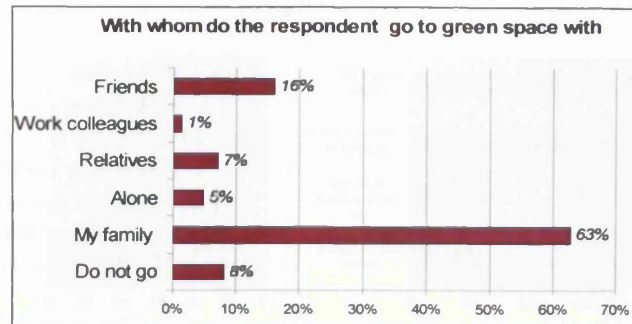
4-4 Does monthly income affect the type of GS usually visited, and the mode of consumption?

When crosstabulating the gender and type of green space usually visited it was found that 45% of females goes to private spaces, compared to only 29% of males. This is another very significant finding, indicating the influence of security and safety on the consumption of green space. A correlation is also found between monthly income and the type of green space usually visited: Higher monthly income residents make higher use of private spaces. However it was interesting to find that the medium income category also have the same tendency, which must mean that going to private spaces makes a burden on their monthly budget. The number of medium monthly income married respondents with children that go to private spaces was found to be 61 (46%), which equals the number of those who go to public spaces, 63 respondent (47%)⁶⁹. This is strong evidence to support the idea that privately supplied GS is efficient in fulfilling people's needs, and is positively contributing in filling the gap of GS scarcity.

The high monthly income married respondents with children usually visiting private spaces, formed 72% of that category, nearly triple those who go to public spaces. The same tendency towards private spaces can be found when cross tabulating green space type, age and monthly income. It was found that respondents aged 51 and above with medium or high monthly income tend to go to private green spaces. This is likely to be due to the calmness, feeling of possession and enclosure they experience in the private spaces.

When cross tabulating the three variables of green spaces type, monthly income and whom does the interviewee go to the space with, the following results emerged. The prevailing majority stated that they go with their families (children, parents), (Figure 7-29), consisting 63% of the whole sample.

Figure (7-29), Percentages distribution for who do the respondents go to GS with



The 8% that do not go to green spaces at all is rather astonishing. 57% of these are low income respondents, while 22% are medium income, and 21% are high income respondents. Reasons for not going to green spaces must clearly differ between these groups, but the majority state that they do not have enough time and are very busy earning their sustenance.

In spite of the fact that only 7% stated that they go to green spaces with their relatives, there were some significant differences. 83% of low-income people go to public green spaces with their relatives while 100% of high income residents go to private green spaces with their relatives. This paints a stark picture of the dual green space market.

Figure (7-30), shows some interesting results from cross-tabulating neighbourhood patterns with who the interviewee goes to green spaces with. The highest percentage for those who do not go to green spaces was recorded for squatters (28%). While the least was in pattern six of the new cities and settlements (2%). This verifies the findings of the supply side analysis in previous chapters, which reported that pattern seven, possess the least green spaces, while pattern six is the richest patterns in public green spaces.

Interestingly, early private development neighbourhoods (pattern four) scored the highest percentage for interviewees going to green spaces with their relatives. This might be due to the nature of these developments, where the extended family house was the fundamental characteristic, where buildings with several stories were built by a member of the family, usually the household head or the grandfather for his sons, daughters and relatives. By contrast, pattern two, scored the lowest, since residents have typically moved to these prestigious neighbourhoods from other origins and have few relatives living nearby.

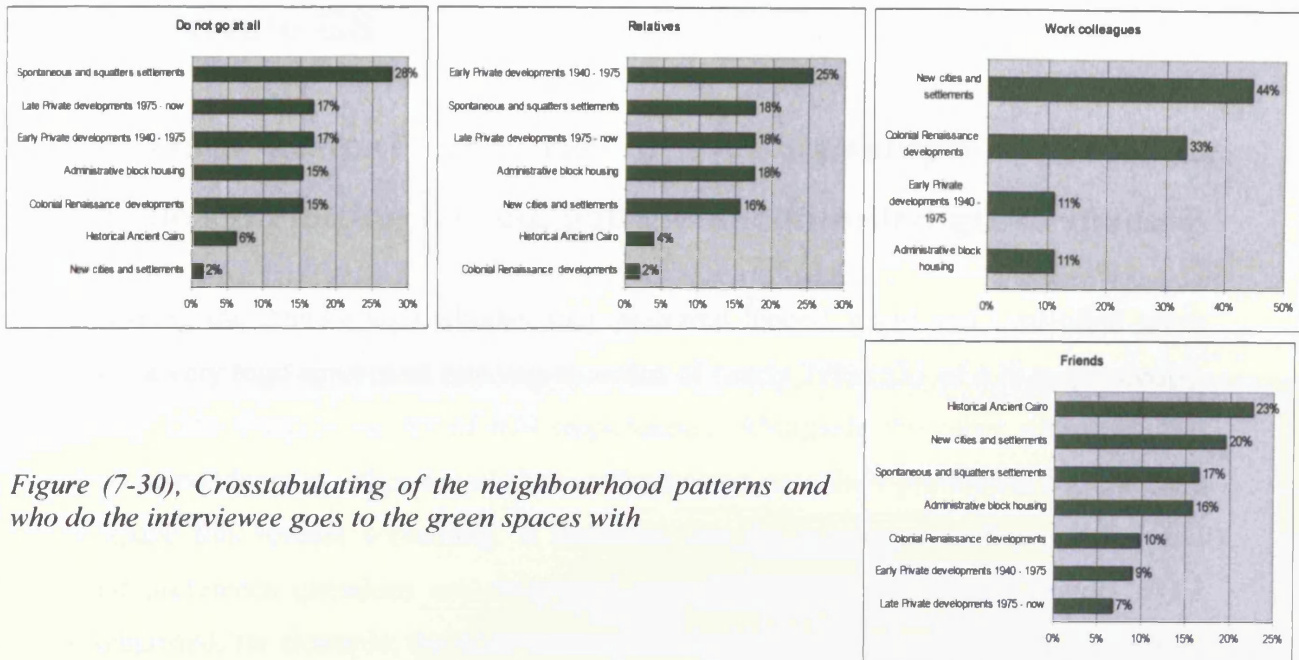


Figure (7-30), *Crosstabulating of the neighbourhood patterns and who do the interviewee goes to the green spaces with*

Pattern six scored the highest percentage for interviewees going to green spaces with their work colleagues (44%). This is due to the flourishing of private businesses with many offices and companies being opened in these areas. With consideration for the relative remoteness of these places, people tend to build strong relationships with their work colleagues and usually go for lunch together in the many GSs found in this pattern. No respondents in patterns one, five and seven went to green space with their work colleagues.

Pattern one scored the highest percentage for interviewees going to green spaces with their friends (23%), followed by pattern six (20%). This is likely to be due to the homogenous social structure in these neighbourhoods. The least percentage of green space use with friends is in pattern five, where people tend not to know their neighbours well, and social bonds and relationships are apparently weak.

R.Q.5. Private GS

5-1 Does scarcity and fear of over-consumption result in people's preferring fenced, gated and controlled green spaces?

When asking the interviewees whether they preferred fenced, gated and controlled green spaces⁷⁰, a very high agreement rate was recorded of nearly 79% (533 of 679 respondents), with only 13% disagreeing (87 of 679 respondents). Alongside the other responses that required respondents to either reveal their preference or state their preference for enclosed green space this reveals something. It indicates that the responses to those stated and revealed preference questions are moderated by various other influencing factors. As I have suggested, for example, the poor residents of the informal settlements may be willing to pay for more local open space, whereas, when faced with a choice between paid for local parks and free waterside parks, they state a preference for the latter. The other distinction that the analysis in this chapter has clearly shown, is the one between frequently used spaces and occasionally used. The latter also are likely to have more symbolic existence value than the former. The fact that 79% are in some way in favour of enclosure suggests that a large majority see that this is a way of preserving value. For some, as I have already suggested, this view may have been learnt from experience.

Only 21% of those who do not go to green spaces disagreed about fencing and gating, and their reason was that it would be unaffordable for them to pay for the expensive entry fees. This shows the other side of the picture: while enclosure may preserve the value of green spaces, there will always be some for whom this means total exclusion. Of the 21% who do not go to green spaces and disagree with charging, 41% live in the squatter areas. This is a serious policy challenge for the government.

5-2 Are entrepreneurially supplied private club green spaces, an effective institution for providing more & better GS?

The role that entrepreneurially supplied private green spaces plays can be tracked by examining the numbers and distribution of those who go to private green spaces and the percentages compared to the public spaces users, knowing that most private space users

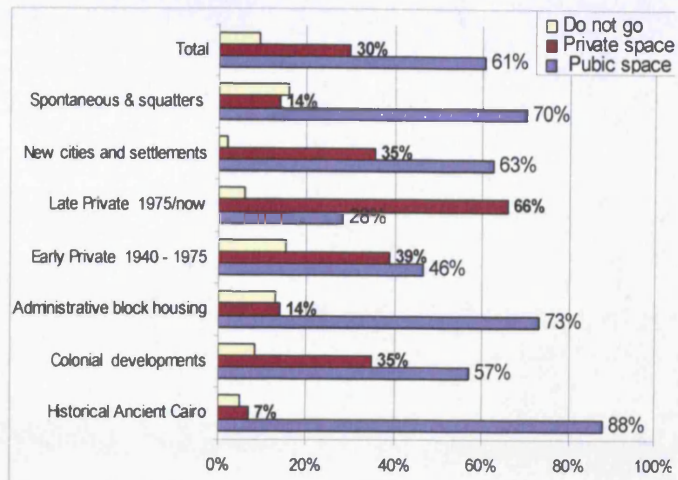
visit municipal public parks as well. Of the 715 respondents, 30% go to private green spaces⁷¹, 10% do not go to green spaces at all, and 60% go to public spaces, it is clear that one third of the green spaces' users prefer private supplied green spaces.

The vital role of Cairo's private green spaces lies in their partial filling of the undersupply gap of green spaces in the city's different neighbourhoods. Figure (7-31), shows the distribution of the percentages of the public and private space users within the different neighbourhood patterns. Among the significant results are the following. In all patterns except pattern five, people tend to go to public green spaces, pattern one has the largest percentage of people going to public spaces, 88%, while patterns three and seven had more than 70% of their respondents going to public spaces.

Patterns three, four and seven score the highest reported percentages of those who do not go to green spaces, with 15%, 16% and 13%, respectively. These are high figures, and can be assumed to be because of the scarcity of green spaces in these patterns on one hand (high time and money cost of access), and the relative poverty in these patterns, with households working all day just to meet essential life expenses.

Pattern five has the highest percentage (66%) of interviewees going to private green spaces, and that is in spite of the well designed hierarchy of green spaces in these municipally planned neighbourhoods. Bringing the supply side analysis of Chapter Six alongside this finding, it is clear that this type of neighbourhood has an undersupply of green areas because they have been developed at densities much higher than planned for. Also, most of the gardens are fenced, and residents do not have open access to them. In addition, and interestingly, some residents stated that they do not feel it is safe for their children to play in the open local green spaces, and they prefer fenced, gated and controlled private spaces, which they view as safer. The residents are wealthy enough to pay for these services, stating that their family's safety and comfort deserves these extra expenditures.

Figure (7-31), *Distribution of the percentages of the public and private space users within the different neighbourhood patterns*⁷²



Pattern four is interesting. It has the highest percentage of respondents that do not go to green spaces because they cannot afford, and at the same time, has 46% going to public spaces and 39% going to private green spaces. This is a result of the neighbourhood's unique socio economic structure, with a mixture of low, medium and high monthly income residents.

Figure (7-32), shows the distribution of private green spaces in the city (defined in chapter six). By comparing this map with the public green space map (7-1) and the public/private GS distribution among Cairo's 7 neighbourhoods typology (6-11) in p.195, we find that private green spaces have arisen in many of the areas that do not have public green spaces. This is clear prima facie evidence of the hypothesis that private parks emerge to fill under-supply gap. The interpreted satellite image presented in Chapter Five revealed that 67% of the spaces in Cairo are private spaces and only 33% are public. The questionnaire results show that 60% of the sample goes to public spaces, while 30% goes to Private. That means that 30% of the residences use 67% of the GS asset in the city, while 60% of the residences can use 33% of the GS asset.

This is a significant finding of the thesis. The statistics should be accepted with caution, however, because of definitional issues. On the demand side, there is scope for interviewees to interpret these categories individually, however clear the questionnaire was. Having said this, the idea that 30% of Cairo's population use 67% of its green space assets is a startling headline, and although the exact value of the numbers may be debatable, the detailed analysis of this chapter provides a lot of evidence to support the general conclusion of inequality that is associated with the enclosure of green space.

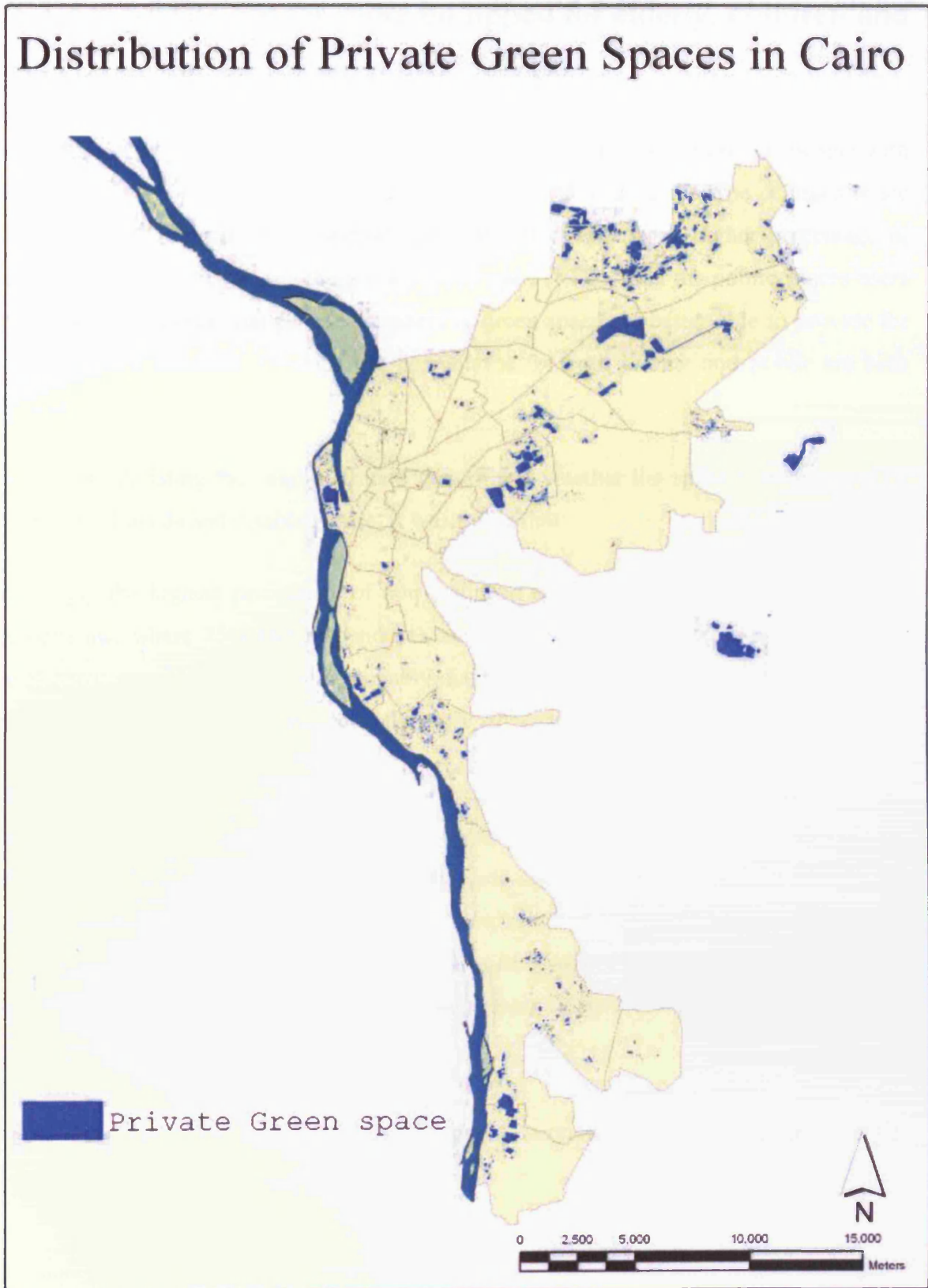


Figure (7-32), *Distribution of the private GS in Cairo.*

5-3 Are private spaces more equipped for elderly, children and special needs users than public spaces?

When asking interviewees whether the spaces they usually go to functions for people with special needs, 64% stated that they do not. When cross tabulating the type of green space with whether it is equipped for special needs, it was found that a higher percentage of agreement was recorded among the private space users (47%), than the public spaces users (31%). This is evidence that private suppliers of green space are better able to provide for the needs of the disabled, although the percentages for both private and public are both sadly low.

When cross tabulating the neighbourhood pattern and whether the space was equipped or not for special needs and disabled users, it was found that:

Surprisingly the highest percentage of non equipped spaces was recorded in the colonial developments, where 75% (44 respondent), stated that their spaces are not equipped for special needs and disabled. This is probably due to the age of these green spaces, most of them being designed and constructed in the early 20th century.

Pattern one scored the highest agreements on equipped spaces (32 respondents or 46%), and this is due to the existence of Cairo's largest and newest two parks in this pattern. These two parks had external international funds and were designed according to the highest international standards, thus justice, equality of opportunities were taken in consideration in both designing and implementing the parks. In spite that both parks are on hilly terrain, they are well equipped for disabled users. They are charged for on entry and were funded as private-public partnerships.

5-4 Do private spaces have more activities occurring within the space than public spaces?

Green spaces support various activities, and that gives these places their magic and unique characteristics. 76% of interviewees stated that there are many activities occurring in the spaces they usually visit, however, 91% (174 respondent of 192) of private spaces users agreed that there is a variety of activities in their spaces, compared to 78% (282 respondent

of 362) within the public spaces users. This shows the superior ability of private spaces to cater for a diverse mix of users. They tend to have a variety of playgrounds for different sports and recreation uses. Private green space owners have a financial incentive to maximise their profit by trying to use every inch for a useful purpose. This result therefore shows the importance of financial incentive in making the best use of green spaces. By contrast, the government has no such incentive to optimise their green space investments. They respond to much blunter information: voting, lobbying, complaints and the advice of their professional advisors.

R.Q.6. Willingness to participate in enhancing local GS.

6-1 Are People willing to pay for good quality shared green space inspite of their poorness? Are they willing to contribute and participate in any development to enhance their built environment quality?

The chapter finishes with a question that is complementary to but broader than the issue of private-public green space supply: are people willing to participate in helping to increase the supply of green space in Cairo?

Interviewees were asked a multiple choice question:, "*To enhance your local green space, would you wish to:*", with six multiple choices answers provided. These were; pay money; donate plants & site furniture; give time & effort; provide advice and consultancy; donate a plot of land; and do not want to participate. Interviewees were advised to choose more than one choice if they felt it was more convenient for them. Among the 697 valid responds to the willingness to pay question, 519 (74%) stated their willingness to positively participate, while only 178 (26%) stated that they do not want to participate. This reflects a resounding positive attitude and valuation of the people towards green spaces. It endorses the other finding in this chapter, showing interviewees' awareness of the value of green spaces in their life.

Figure (7-33), shows that many interviewees selected more than one choice, further illustrating their enthusiastic response to this question. The most frequent response was for providing advice and consultancy (289 or 29%). Paying money was chosen by 239 (25%). Amazingly, 18 respondents stated a willingness to donate a plot of land to be converted into public green space to enhance the green infrastructure in their local community. This is really a significant set of findings that together with the many other indications of the high value placed on green space presented in this chapter, suggest that the problem of green space scarcity in the city is not due to a lack of demand but a problem in organising that demand in a way that stimulates a greater supply. I return to this in the conclusion.

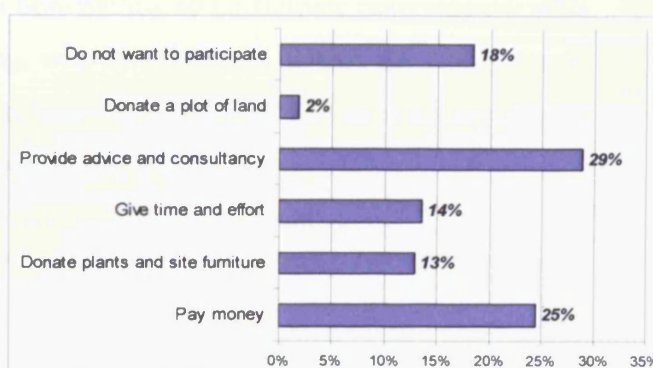


Figure (7-33), Percentages of the willingness to contribute variables

Table (7-19), shows the distribution of the responses to the contributions question across neighbourhood types.

Table (7-19): The distribution of the responds on the different neighbourhoods typologies

	Pay money		Donate plants & site furniture		Give time & effort		Provide advice & consultancy		Donate a plot of land		Do not want to participate	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Historical Ancient Cairo	30	13%	9	7%	7	5%	44	16%	4	22%	25	14%
Colonial Renaissance developments	42	18%	21	17%	21	16%	34	12%	4	22%	16	9%
Administrative block housing	24	10%	11	9%	19	14%	36	13%	1	6%	35	20%
Early Private developments 1940 - 1975	42	18%	29	23%	25	19%	42	15%	1	6%	22	12%
Late Private developments 1975 - now	58	24%	29	23%	22	17%	38	14%	4	22%	15	8%
New cities and settlements	29	12%	15	12%	21	16%	59	21%	2	11%	18	10%
Spontaneous & squatters settlements	14	6%	12	10%	17	13%	28	10%	2	11%	48	27%
Total	239	100%	126	100%	132	100%	281	100%	18	100%	179	100%

The 18 interviewees who indicated that they would donate land to the public use as a garden was really unexpected, as land prices in Cairo are very high,. Surprisingly, the 18 people come from all neighbourhood types, even the poor ones, table (7-20). The idea of a family in the squatter settlements donating land is interesting. It suggests, perhaps, a

gesture by an early squatter, with some underused land, perhaps residual, oddly shaped land, on which it would be difficult to build, offering it to help enhance a neighbourhood which they are proud of helping develop. Moreover, residents in these squatter areas have suffered so long from being deprived from GS, and such a donation is like proposing a solution for the neighbourhoods' children and residents.

Table (7-20): The distribution of the responds of plot of land donation on neighbourhoods typologies

	Pattern							Total
	One	Two	Three	Four	Five	Six	Seven	
Frequency	4	4	1	1	4	2	2	18

Contrast to this, however, the 47% of the total non-willing to participate respondents, who lived in squatter settlements and block housing, who clearly have neither time nor money to spend and who consider open spaces and enhancing quality of life as a luxury which they can not effort. One interviewee in pattern seven put it this way:

"Instead of caring for useless green space, we need proper humane houses to live in"

While another in pattern three says:

"Do not ask me about sensations or feelings in green spaces because I have lost them a long time ago. I am just working myself flat and struggling very hard to feed my family, going to green spaces is a luxury that I can not afford even thinking of."

Other 'non-participants' expressed the view that they do not need to participate as the green spaces enhancement task is the municipality's responsibility:

"Do not ask me about sensations or feelings in green spaces, instead ask the policy makers and municipality responsible people about their feelings watching us struggling even to feed our children, it is totally a governmental responsibility, its not ours. Where does the collected tax go?"

Other 'non-participants' supported the above mentioned statement by raising the following question: *"....When will the government and municipalities do their jobs? Where are their efforts and plans? We cannot see anything except neglect!"*

A third interviewee expressed his willingness to pay to enhance the local green spaces, but feels sorry that he cannot afford to pay and expressed regret about his lack of ability to provide for the open space needs of his children.

"... Of course, I want to contribute in enhancing my local community's spaces, however, I cannot afford either paying money or spending time or giving effort, all my time is dedicated to feed my family. It is very cruel to feel disabled to fulfil your children's essential childish needs of going to open green spaces, just because you cannot afford the expenses, it is the worst feeling ever!"

Table (7-21), shows the high valuation and willingness to enhance local green spaces among the majority of residents, Even those who do not go to green spaces were keen to express their positive attitude (70%) towards local green spaces enhancement. This supports findings reported earlier in the chapter which identified a significant level of existence and reservation value among respondents. For those who do not go to green spaces it was surprising to find these positive responses (57 out of 77 responses), crowned by the willingness of one of the low income interviewees to donate a plot of land for the public use.

*Table (7-21): Willingness to enhance GS * GS type * Income Crosstabulation*

Willingness to contribute	Income per month	GS type			Total
		Pubic space	Private space	Do not go	
Pay money	Low, less than 1500 EGP	55	26	9	90
	Medium, from 1500 to 2500 EGP	27	32	0	59
	High, more than 2500 EGP	31	38	6	75
Donate plants & site furniture	Low, less than 1500 EGP	31	16	5	52
	Medium, from 1500 to 2500 EGP	15	15	4	34
	High, more than 2500 EGP	11	19	1	31
Give time & effort	Low, less than 1500 EGP	46	18	9	73
	Medium, from 1500 to 2500 EGP	10	13	2	25
	High, more than 2500 EGP	6	17	1	24
Provide advice & consultancy	Low, less than 1500 EGP	112	28	11	151
	Medium, from 1500 to 2500 EGP	25	29	6	60
	High, more than 2500 EGP	15	28	2	45
Donate a plot of land	Low, less than 1500 EGP	7	1	1	9
	Medium, from 1500 to 2500 EGP	1	1	0	2
	High, more than 2500 EGP	2	4	0	6
Do not want to participate	Low, less than 1500 EGP	90	7	17	114
	Medium, from 1500 to 2500 EGP	13	7	1	21
	High, more than 2500 EGP	4	5	2	11
Total		501	304	77	

Among the other findings of note in Figure (7-34) are the following: private space users are much less likely to say they will not contribute; and a remarkable willingness to contribute by paying money among all types of respondent, but especially among private space users, with 31% of them stating that they are willing to pay for enhancements.

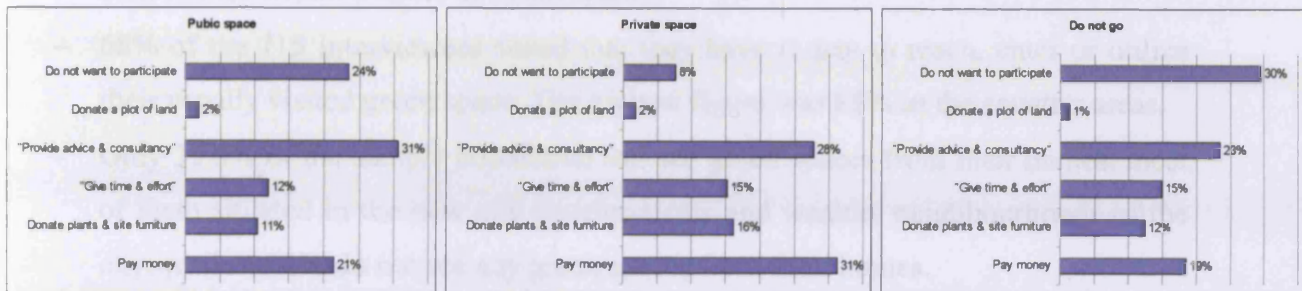


Figure (7-34), Correlating the kind of usually visited space with the willingness to contribute variables

Conclusions and comments

The more significant results from this descriptive analysis can be summed as follows.

Research Question 1: Demand and perception

- Cairo city suffers from an uneven distribution of GS, due to reasons that include the different levels of planning during the development eras in which these neighbourhoods appeared; the weakness of legislations and regulations; and the different morphologies, some of which are more suited to the creation of various forms of private and public spaces than others.
- 38.3% of the respondents have to cover a distance of more than 900m to reach the nearest green space – an impossible distance for children and elderly.
- The median distance varied across the patterns from 20m in the new cities and settlements, to 1350m in spontaneous and squatter areas.
- The average distance to reach the nearest GS in pattern seven was 1658m - more than a mile – and in patterns three and four it was also high (801m and 910m respectively).

- A distance of 600m was reported as a median distance to the nearest GS, which is double the international norm of urban open green spaces of 300m.
- More than 31% of respondents do not have any green space within a walking distance of 10 minutes; in other words, they do not have any green spaces around their homes within a circle of 500m radius.
- 68% of the 715 interviewees stated that they have to pay to reach, enter or utilize their usually visited green space. The highest figure was 88% in the squatter areas.
- Only 35.6% of the sample population can see green spaces from their homes, most of them situated in the new city developments and wealthy neighbourhoods of the city, while 64.4% do not see any green spaces from their homes.
- 53% of the female respondents agreed that green spaces are safe places for them to go to.
- 15 minutes duration was reported as the median journey duration to the nearest green spaces, while 29 minutes journey duration was reported for the usually visited GS.
- Among the 15 listed motives to go to GS, nearly 63% of the whole sample, stated that enjoying greenery was their motive for going to green spaces.

Research Question 2: Problem of Green spaces

- 56% (402 respondent), considered that the misbehaviour of some users was among the major problem which they face when using green spaces. While 48.3% (345 respondent), considered the security (impudence or anti-social behaviour) among the more serious problems of GS use.
- Nearly half the respondents (49.2%) complained about green spaces lack of maintenance, while 45% complained about lack of both essential public services and lack of seats and site furniture.
- Unsurprisingly, general scarcity was among the top perceived problems by residents, with 41.7% of the whole sample citing this problem.

Research Question 3: Satisfaction

- Only 30.4% stated that existing green spaces fulfilled their various needs for open space, while 62.1% stated that the existing green spaces do not fulfil their essential needs.
- Most of the districts stated that GSs are not sufficient in quantity – five of the seven patterns - and the people stated that they need more public spaces especially for their children to fulfil their childish needs.
- Only the renaissance and colonial developments and the new cities stated that they have sufficient quantity of green spaces.
- 45% (228 respondent) stated that general scarcity meant that peoples' needs in the city were not fulfilled, with 30% (151) of respondents stating that the reason for the people's needs not being fulfilled is the non existence of green space in their neighbourhoods.
- There is a relationship between satisfaction with quality and income. Low and high income residents are more likely to be unsatisfied while middle income residents are more likely to be satisfied.

Research Question 4: Preference of different types of GS

- City parks are the top demanded investment, while pattern four was the top demanding pattern.
- High monthly income married respondents with children, tended to go to private space, - nearly triple those who go to public spaces.

Research Question 5: Private GS

- Interviewees generally preferred fenced, gated and controlled green spaces, with 79% (533 of 679 respondents) stating their agreement and only 13% disagreeing (87 of 679 respondents).
- Supply analysis in chapter five results have shown that, 67% of the green space in Cairo is “private space”, and only 33% is public. Questionnaire results have shown that 60% of the sample goes to public spaces, while 30% goes to private. Which

means that 30% of the residences use 67% of the city's green space, while 60% use 33%.

- Private space users are much more likely to be satisfied with the maintenance of their usually visited green space (76%) than public space users (51%).

Research Question 6: Willingness to participate in enhancing local GS

- Among the 697 valid responds to the willingness to pay question, 519 (74%) stated their willingness to positively participate, while only 178 (26%) stated that they would not want to participate. This reflects widespread positive attitude and valuation of the people towards GS.
- 18 interviewees said they would be willing to donate a plot of land to the public use, as a garden was unexpected and these came from all neighbourhood types, including the very poorest.
- Despite their poverty, low-income interviewees show a remarkable willingness to contribute in enhancing their local green spaces.

Various theoretical issues have been brought out in the Chapter's discussion where appropriate. Broadly, several main theoretical (but also practically relevant) interrelated points have been established with evidence from the survey data. These include the following.

- (a) Demand for green space is not homogeneous.
- (b) Demand varies by person type (such as income level), neighbourhood type and type of green space.
- (c) The value people place on green space can be broken down into use-value, existence value and reservation value. Cairo residents clearly place a high level of existence/ reservation value on their green spaces as well as use value.
- (d) Both use value and non-use value is highly differentiated and individuals in all neighbourhood types have very sophisticated views about greenery in their city.
- (e) Private spaces have clearly emerged to fill the gap in supply left by government planning and the principle of enclosure and payment seems broadly accepted.
- (f) There is some evidence of learning from experience in this respect, with peoples' views

being shaped by the experience in their particular type of living area. (g) There is a tension among poorer people between a clear preference for large open green spaces and a desire to have free or cheap access. The existing large open spaces are expensive to enter, with the exception of the riverbank areas, which is technically difficult to enclose. (h) There is plenty of evidence that enclosure of spaces increases supply and raises quality for a wide range of socio-economic types (ie not just the very rich). (i) There is also evidence of the inevitable consequence of enclosure for the poorest: some of the interviewees could not afford to use GS. This is one of the main themes addressed in the concluding chapter of this thesis.

To conclude, this chapter has evidenced the general scarcity of GS in Cairo in great detail, and explored the many dimensions of this scarcity. It is a seriously demanding problem. The emergence of institutions that supply green spaces through private entrepreneurs, voluntary resident action and government-managed commercial parks (pay on entry) has clearly improved the problem. Private/ enclosed greens space is provided efficiently in the sense of meeting needs at a price consumers and suppliers are willing to pay/ accept. Cairo's green space enclosures might be accused of being exclusionary but they have created venues where a large part of the population can fulfil their essential needs.

Private spaces have attracted a huge population of users (30% of Cairo's residents if the survey is taken as broadly representative), relieving public green spaces from some burden by reducing the number of users of those spaces. This leaves the municipality with relatively smaller problem to solve.

Having said this, this chapter underlines the fact that rates of green space deprivation are high in the city. The fine level of analysis of green space demand presented in this chapter will hopefully provide the most detailed picture yet produced of the challenge faced by public and private sector agencies as they seek to organise collective action in supplying an asset that is in very short supply but clearly in very high demand.

Chapter Eight

Third Empirical study: Measuring the demand, usage & valuation of GS (Regression models reporting)

Introduction

The previous chapter presented a selected set of descriptive statistics to portray the pattern of green space demand and valuation in Cairo. The current chapter extends this with a more probing set of regression analyses that explore the mutual relationships between different variables that contribute in supply, valuation and use of green spaces. Regression models are used to predict one variable from one or more other variables. Regression

models provide researchers with a powerful tool, allowing predictions about past, present, or future events. Moreover the descriptive analysis has uncovered some interesting relationships, thus a more in depth analysis is achieved by measuring the relationship between the dependent and independent variables while holding the other variables in the equation constant. This allows more accurate and precise statements to be made about the green space use and valuation.

Three types of models are used: Continuous, ordinal and binary. Continuous regression models are used when dependent (criterion) variables derived from questionnaire questions which the interviewee has the freedom to write any number as a response, for example number of visits to a GS. With this category of variables a step wise linear regression has been chosen, in order to minimize the huge number of independent (predictor) variables entered in the equation. Three models were run:

- Time to usually visited GS
- Distance to nearest GS
- Number of GS within a walking distance of 10 minutes

Ordinal regression models were run for variables relating to questions in which respondents had to choose from a number of stated answers. The format used in the questionnaire for measuring was mainly the format of a typical five-level Likert item. This usually consists of a statement and five entities, from which the interviewee has to choose one. Entity items were as following:

- | | | |
|-------------------|----------------------|-------------------------------|
| 1- Strongly agree | 2- Agree | 3- Neither agree nor disagree |
| 4- Disagree | 5- Strongly disagree | |

Ordinal models include:

- People's satisfaction with quantity of GS
- People's satisfaction with quality of GS
- People's fulfilment of needs

Binary models are run for variable derived from questions in which the respondents had to choose one from only two choices. Models include:

- Seeing GS from home
- Type of green space usually visited
- Perceived problems in the green space, which was categorized into three different groups, where the first is the Social behaviour and sensational problems, the second is problems in users' perception of GS, its components, features and characteristics and Third is the accessibility and location problems.
- Willingness to participate in enhancing local GS.

Models are shown in summary form, giving only the significant variables in this chapter.

A- Continuous Regression models:

In this set of models, independent (predictor) variables are grouped into four categories. The first category is demographic information, covering gender, age, marital status of interviewee, No. of children, monthly income of the household and the neighbourhood typology, in which the interviewee lives. The second category relates to motives and feelings about GS, which include feelings evoked in GS, the importance of these evoked feelings in interviewee's daily life, motives for visiting GS and the perceived problems in GS. The third category is interviewees stated preferences for GS, covering the preference for small-enclosed spaces, large open parks and gated-fenced spaces. These relate to questions in the questionnaire structured as Likert scales. The fourth category is about the use of the most frequently visited GS, including the type of GS, whom does the interviewee go to GS with, length of visit and means of reaching the space. The full set of variables with the associated questions that generated the data are listed in appendix [Appendix 3].

All models contain dummy variable terms so there is a need to suppress certain categories on these variables as the reference group against which any significant dummy variable regression coefficients are compared. The reference group (for models 1 to 3) is respondents living in pattern one (historic Cairo), aged between 35 and 50 years old,

married with children, with a university degree and earning an average monthly income of less than 500 EGP.

Selected variables in the models are discussed according to the theoretical significance. Where the relationship revealed does not seem of great interest or has been addressed in a previous model, it is not discussed.

Model 1- Time to usually visited GS

Table (8-1), shows the results of a linear regression model in which **'time taken to the usually visited GS'** is the dependent (criterion) variable. The purpose is to examine how the time to the usually visited GS is affected by various predictors.

The significant variables included in the model are as follows. The *'total number of children'* is negatively associated with the time to usually visited GS. This is likely to be partly due to large families tending to use local GS, even if it is poor quality. For reasons of difficulty, expense and safety, large families prefer to stay local, a compromise that they have to accept.

Interestingly, the upper intermediate class of *'monthly income - from 2000 to 2500 EGP -'* spend an extra 15 minutes to reach their usually visited space compared to the reference group. This may reflect the fact that these people are more widely distributed across the city than the highest income groups (who are fewer and more concentrated). Besides the respondents of this category tend to use their private cars to travel to quality spaces, including private green clubs.

Respondents *'who do not see GS'* from their homes had to travel an extra distance of 12 minutes, which is due to their relative remoteness from GS. Those respondents who stated that *'the non existence of GS'* is a problem had to spend 14 minutes extra in travelling. Respondents who stated that *'distance to GS'* is a problem had to spend an extra 21 minutes to reach their usually visited GS compared to the reference group. This suggests both that there is a general scarcity problem and that there are households who would prefer more localised GS and travel greater distances more out of necessity than choice.

Those who perceived '*safety*' as a problem had to spend an extra 13 minutes travelling, indicating that local GS is sometimes not used because it is, or is thought to be, insecure. Those who perceived '*expensive entrance fees*' as a problem had to spend an extra 11 minutes travelling. This suggests that there are households who would prefer more free or cheap entrance fee local GS, as they have to travel greater distances and spend more time travelling.

All of these relationships can be explained by general scarcity of GS in the city and its uneven distribution, (as evidenced in the previous chapters). They also show that people place different values on the green spaces mapped in Chapter Five. Those who perceived '*lack of essential public services*' as a problem had to travel 13 minutes further than the reference group, which might be due to the poor quality of local GS, which forces users to travel extra distances for better quality GS.

Of the stated preference variables, it was found that '*preference for large extended spaces*' is negatively associated with time to 'usually visited green space'. This might be due to the abundance of large parks in the reference group compared to other patterns. Besides, it suggest that people travel in order to get to quality small spaces. People make a valuation of green space available and make choices accordingly.

Time travelled varied by respondents' motives for going to GS. Those who stated that their motive is '*to enjoy sun and air*', had to spend an extra 15 minutes travelling, which is likely to be due to the poor quality of local urban green spaces in their neighbourhoods. While those who stated that their motive is '*children to play with others*' had a negative associations, which might be due to the tendency of staying local, as children prefer to play with neighbouring and well-known local friends.

Interestingly, there was a direct association between the dependent variable and those who stated that they are '*willing to provide advice and consultancy*', in spite of the fact they had to spent an extra 26 minutes travelling, which implies a very positive attitude of the respondents towards enhancing their local neighbourhoods. On the other hand, those who stated that they '*do not want to participate*' in enhancing their local neighbourhoods, had to spent 16 minutes travelling to their usually visited GS. There is perhaps a hint here of desperation driving action.

Table (8-1) Model 1, Linear regression model of Time to usually visited GS summary of significant attributes

Model Summary^u								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate				
20	.696 ^t	.485	.427	27.873				
t. Predictors: (Constant), 4-3-5 Too far, 2-9-12 Non existence of GS, 6-19-4 Provide advice and consultancy, 2-9-8 Unsafe spaces, 5-2 Large extended space preference, 2-9-4 Distant spaces, 1-9-4 monthly income 1500 - 2000, 1-9-5 monthly income 2000 - 2500, 4-1-3-Adventure, 4-3-12 Site design problems, 1-5 Total no. of children, 6-19-6 Do not want to participate, 5-6-14 To enjoy sun and air, 2-10 Seeing GS, 4-3-2 Safety, 4-3-6 Accessibility (transportation to/from), 2-9-9 Unclean spaces, 4-3-14 Lack of essential public services, 5-6-9 Children to play with others, 4-3-8 Expensive entrance fees u. Dependent Variable: 2-6-2 Time to usually								
Coefficients^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
20	(Constant)	8.963	10.799		.830	.408		
	1-5 Total no. of children	-3.704-	1.253	-.173-	-2.957-	0.004	0.846	1.183
	1-9-4 monthly income 1500 - 2000	-17.858-	5.409	-1.333-	-3.301-	0.001	0.018	56.634
	1-9-5 monthly income 2000 - 2500	14.995	5.405	1.122	2.774	0.006	0.018	56.81
	2-10 Seeing GS	12.142	5.386	0.137	2.254	0.025	0.78	1.281
	2-9-12 Non existence of GS	14.555	5.463	0.17	2.664	0.008	0.704	1.421
	2-9-4 Distant spaces	-15.433-	4.53	-.203-	-3.407-	0.001	0.808	1.238
	2-9-8 Unsafe spaces	22.994	4.755	0.284	4.836	0	0.835	1.198
	2-9-9 Unclean spaces	-13.648-	4.948	-.173-	-2.758-	0.006	0.735	1.36
	4-1-3-Adventure	22.234	5.784	0.227	3.844	0	0.823	1.215
	4-3-12 Site design problems	-13.127-	5.231	-.149-	-2.509-	0.013	0.814	1.228
	4-3-14 Lack essential public services	13.277	5.035	0.177	2.637	0.009	0.636	1.573
	4-3-2 Safety	-13.788-	4.929	-.181-	-2.797-	0.006	0.686	1.458
	4-3-5 Too far	17.639	4.71	0.24	3.745	0	0.701	1.426
	4-3-6 Accessibility (transportation to/from)	-15.370-	5.532	-.175-	-2.778-	0.006	0.728	1.374
	4-3-8 Expensive entrance fees	11.389	5.169	0.132	2.203	0.029	0.797	1.254
	5-2 Large extended space preference	-4.967-	2.019	-.150-	-2.460-	0.015	0.771	1.298
5-6-14 To enjoy sun and air	15.745	4.484	0.212	3.512	0.001	0.788	1.269	
5-6-9 Children to play with others	-11.166-	4.728	-.149-	-2.362-	0.019	0.724	1.381	
6-19-4 Provide advice and consultancy	26.418	5.271	0.35	5.012	0	0.591	1.693	
6-19-6 Do not want to participate	15.813	5.673	0.19	2.787	0.006	0.62	1.614	
a. Dependent Variable: 2-6-2 Time to usually								

Model 2- Distance to nearest GS

Table (8-2), shows the results of a linear regression model, where '**distance to the nearest GS**' is the dependent variable.

Respondents who '*cannot read or write (illiterate)*', had to cover an additional distance of 741m compared to the reference group. This is likely to be due to, the nature of neighbourhoods that these people tend to live in, which are usually the squatter areas, city slums and the illegal expansions on Greenfields. All these areas are characterised by the acute scarcity of green spaces because of the unplanned nature of development.

The extra 867m, covered by '*divorced*' respondents was unexpected. This is likely to be due to the cultural customs that tend to discard the divorced –especially women- and to look down on them as failures. Thus, divorced people tend to go far away from their own neighbourhoods to places where they will not be known.

Of the motives and feelings variables, it was found that those who feel '*nostalgia*' have to cover an additional distance of 300m, to reach their nearest GS. This might simply show that those more deprived of local green space have stronger sentimental feelings about greenery – the opposite to "familiarity breeds contempt": scarcity breeds preciousness.

Respondents who stated that the '*non-existence of GS*' is a problem, had to cover an extra 463m to reach the nearest GS. Moreover, the figure increases for those stating that '*lack of large spaces*' is a problem (an extra 477m). Those stating that the '*scarcity*' of GS is a problem had to cover an extra 360m. Those who considered the '*lack of seats and site furniture*' as a problem had to cover an extra 312m, while those who perceived '*site design*' a problem had to cover 301m. All these show various dimensions of the variable valuation of green space. The overall association is between those expressing some kind of dissatisfaction with access to GS and the distance they have to travel to the nearest GS. This is as expected. It may be of some interest to note that the lack of large space complaint and the more general scarcity complaints appear as independent terms in the model, suggesting that these are different dimensions of demand. Perhaps this is saying that the farther away respondents are from any green spaces, the more they appreciate large GS. This is an intriguing hypothesis that has policy relevance.

Responses stating that the problems of GS are '*uncleanliness*' and '*lack of shaded areas*', are negatively associated with distance to the nearest green space. Either respondents are forced to use the near spaces inspite of their non-satisfaction with both cleanness and shade, or they do not tend to go to the nearest GS and prefer travel for a farther space to fulfil their needs of shade and cleanness. Thus they have to travel an extra 424m for more clean spaces, and 570m for more shaded areas, compared to the reference group.

Those who prefer '*gated or fenced green spaces*' had to cover an additional distance of 137m to the nearest GS. That might indicate that lack of nearby GS is one of the drivers for people's willingness to pay for gated GS. Respondents who '*go to GS with their families*' travel 402 m less to reach their nearest spaces. This is intriguing and may suggest that the presence of local green space induces more family visits to GS. This is a potentially very important finding for GS planners.

The 'time to nearest GS' coefficient indicates that for every additional minute travelled, the '*distance*' increase by 10m. This suggests an average speed of 0.6KM/hour in travelling to GS. This is very slow and indicates, that there are obstacles that hinder the residents and slow them down. Among these obstacles is the very crowded heavy traffic in most of Cairo's road network, in which crossing a road is a very risky challenge. This challenge is of course magnified if children are travelling. Another example of obstacles is the extremely bad condition of pavements, as there is no regular maintenance to them. In addition, they are usually occupied by either commercial activities on the ground floor, or by parking cars, which again contributes to the challenges facing pedestrians.

Table (8-2) Model 2, Linear regression model of Distance to nearest GS summary of significant attributes

Model Summary ^a							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
18	.741 ^a	.549	.501	654.257			

r. Predictors: (Constant), 2-9-12 Non existence of GS, 2-9-4 Distant spaces, 2-6-2 Time to usually, 6-1-2 My family (children, parents.), 2-9-2 Lack of large spaces, 1-3-1 Cannot Read& Write, 5-6-10 To meet new friends and socialize, 4-3-4 Scarcity, 2-9-9 Unclean spaces, 4-3-10 Lack of shaded areas, 6-1-1 Do not go at all, 2-6-1 Time to nearest, 4-3-11 Lack of seats and site furniture, 1-4 MS Divorced, 5-3 Gated or fenced space preference, 4-1-9-Nostalgia, 4-3-12 Site design problems, 6-19-4 Provide advice and consultancy
 s. Dependent Variable: 2-5 Distance to nearest GS

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
18	(Constant)	-69.204-	183.244		-.378-	.706		
	1-3-1 Amount of education (illiterate)	741.972	252.115	0.163	2.943	0.004	0.879	1.137
	1-4 Marital status (Divorced)	866.771	345.52	0.136	2.509	0.013	0.916	1.092
	2-6-1 Time taken to nearest GS	10.31	2.962	0.193	3.481	0.001	0.872	1.147
	2-6-2 Time taken to usually GS	3.895	1.446	0.152	2.694	0.008	0.842	1.188
	2-9-12 Problem of Non existence of GS	463.334	120.191	0.218	3.855	0	0.842	1.187
	2-9-2 Problem of Lack of large spaces	476.866	114.461	0.228	4.166	0	0.892	1.121
	2-9-4 Problem of Distant spaces	306.541	107.585	0.161	2.849	0.005	0.835	1.197
	2-9-9 Problem of Unclean spaces	-424.078-	112.743	-.213-	-3.761-	0	0.834	1.199
	4-1-9-feeling in GS (Nostalgia)	299.548	113.249	0.15	2.645	0.009	0.834	1.199
	4-3-10 Lack of shaded areas Problem	-570.499-	119.398	-.291-	-4.778-	0	0.725	1.38
	4-3-11 Lack of seats and site furniture	311.568	112.545	0.165	2.768	0.006	0.756	1.323
	4-3-12 Site design problems	301.107	136.002	0.132	2.214	0.028	0.75	1.334
	4-3- 4 Scarcity Problem	359.465	106.326	0.192	3.381	0.001	0.833	1.201
	5-3 Gated or fenced space preference	136.599	49.503	0.162	2.759	0.006	0.777	1.288
	5-6-10 To meet new friends & socialize	-433.379-	112.389	-.211-	-3.856-	0	0.892	1.121
	6-1-1 Do not go at all	-821.404-	351.607	-.129-	-2.336-	0.021	0.885	1.131
	6-1-2 Go to GS with (children, parents.)	-401.921-	112.032	-.199-	-3.588-	0	0.869	1.15
6-19-4 Provide advice and consultancy	234.337	107.974	0.123	2.17	0.031	0.834	1.2	

a. Dependent Variable: 2-5 Distance to nearest GS

Model 3- Number of GS within a walking distance of 10 minutes

Table (8-3), shows the results of a linear regression model, with ‘**number of GS within a walking distance of 10 minutes**’ as the dependent variable.

As expected, the larger the number of green spaces, the more satisfied the respondents are with ‘*the quantity*’, and the more their ‘*needs are fulfilled*’, and vice versa: the less the number of green spaces the less the satisfaction with the GS quantity and the less the fulfilment of their needs. A positive association was found between ‘the number of GS’ and ‘*the number of visits to private clubs*’ with annual membership (for example the large Al-Ahly and Al-Shams clubs). This might be due to the fact that in some neighbourhood patterns these private clubs are abundant, occupying large areas with several gates (which

might be interpreted by some respondents as constituting separate green spaces). These private spaces have a great polarity and attraction, and members tend to live as near as possible to these places to guarantee a safe and clean place for their family's recreation.

A positive association was found between 'number of GSs' and '*preference for large extended parks*'. This might show how demand develops by stages. Many people have adapted themselves to the small surrounding green spaces and gardens, by using the available spaces such as street medians and creating small shared spaces by self-effort. Having established that need, what they lack is municipal parks, which cannot be based on self-funding or self-effort. Demand for large parks is not so high for those who have fewer spaces within 10 minutes because their immediate demand is for such spaces.

Interestingly, and as expected, the larger the 'number of green spaces', the more the mature is the respondents motives to go to GS, such '*to enjoy greenery*', '*to contemplate and meditate*' and '*to practice certain hobby(ies)*'. The more the number of local GS the more ones motives develops and the more dependant the user becomes on them, and the more the vital role that these spaces plays in the users' lives.

Interestingly, the more 'the number of GS' the higher '*the willingness to participate in enhancing local GS*'. This includes a willingness to pay money, donate plants and site furniture and to provide advice and consultancy. This confirms the generality of the findings reported earlier that Cairo's citizens are apparently willing to invest in green spaces. I noted the ubiquitous willingness to pay for use as demonstrated by the entry-tolled public parks, self-organised communal green spaces and captured spaces. Here we see that people express a willingness to contribute by paying money, donating plants and advice and we see, interestingly, that the more the number of GS within 10 minutes, the more strongly people express their willingness to contribute by paying and donating of plants. This clearly reflects an important dynamic in the GS economy: there is a higher willingness to pay for investment where people have neighbourhood GS that they can (presumably) take a sense of ownership of.

Table (8-3) Model 3, linear regression model of Number of GS within a walking distance of 10 minutes summary of significant attributes

Model Summary^o								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate				
14	.684 ⁿ	.468	.434	118.368				
n. Predictors: (Constant), 3-2-7 Private clubs with annual membership (Alahly, ..etc), 6-19-1 Pay money, 2-8 Fulfillment of needs, 3-2-4 Play spaces (playgrounds, children play yards, ...etc), 2-2 Quant. sufficient long, 5-2 Large extended space preference, 6-19-4 Provide advice and consultancy, 5-8-8 To contemplate and meditate, 5-8-12 To enjoy greenery, 2-9-12 Non existence of GS, 6-19-2 Donate plants and site furniture, 5-8-8 To practice certain hobby(ies)								
o. Dependent Variable: 2-4 No. of GS								
Coefficients^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
14	(Constant)	184.416	67.322		2.739	.007		
	2-2 Quant. sufficient long	-37.066	8.457	-.273	-4.383	0	0.747	1.34
	2-8 Fulfillment of needs	-73.295	33.235	-.130	-2.205	0.029	0.831	1.204
	2-9-12 Non existence of GS	58.468	22.319	0.161	2.62	0.01	0.764	1.309
	3-2-4 Play spaces (playgrounds and play yards)	-1.212	0.507	-.140	-2.391	0.018	0.845	1.183
	3-2-7 Private clubs with annual membership	2.747	0.296	0.601	9.284	0	0.689	1.452
	5-2 Large extended space preference	32.907	8.289	0.233	3.97	0	0.836	1.196
	5-8-12 To enjoy greenery	46.397	19.19	0.143	2.418	0.017	0.824	1.214
	5-8-8 To contemplate and meditate	-73.346	19.59	-.230	-3.744	0	0.765	1.306
	5-8-8 To practice certain hobby(ies)	50.688	23.881	0.122	2.123	0.035	0.873	1.145
	6-19-1 Pay money	-37.830	19.63	-.113	-1.927	0.055	0.835	1.198
	6-19-2 Donate plants & site furniture	-75.237	28.189	-.160	-2.669	0.008	0.808	1.238
	6-19-4 Provide advice & consultancy	52.104	18.579	0.161	2.805	0.006	0.874	1.144
	a. Dependent Variable: 2-4 No. of GS							

B- Ordinal Regression models:

The groups of independent variables from which the models are selected are the same as for the continuous regression models, for further details, see appendix [3].

Model 4- People's satisfaction with quantity of GS

Table (8-4), shows the results of an ordinal regression model, with '**people's satisfaction with quantity of GS**', as the dependent variable. The reference group for this dummy variable regression model is automatically decided by the SPSS process as the last attribute in each independent variable, which is respondents living in 'pattern seven', with a 'post graduate university degree', earning an average 'monthly income over 3000 EGP', having

'more than 7 children', perceiving 'GS as unsafe place' especially for females and 'not satisfied with the quality of local GS'. Having a reference group which includes higher degree holders living in squatter neighbourhoods is not inappropriate since as a result of immobility there are many such individuals (including children of first and second generation squatters and people who have chosen low rent accommodation) living in these areas.

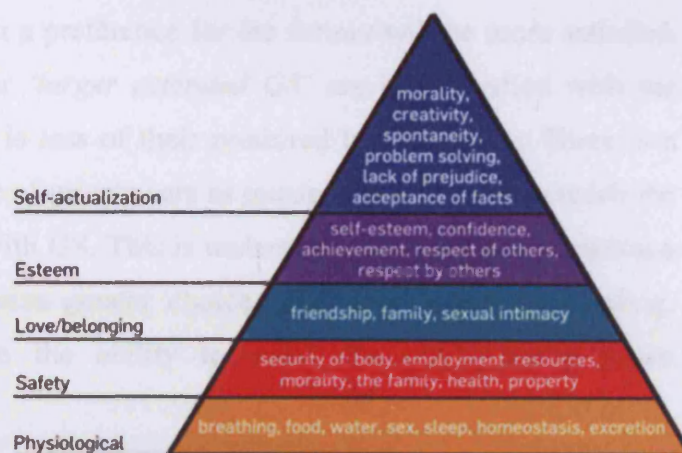
Interestingly there is a significant non-satisfaction among '*university degree*' holders with the GS quantity (compared to higher degree holders). This may be due to higher degree holders, usually having better employment opportunities, which help in enhancing their quality of life more rapidly than their university degree holders counterparts.

Another significant association is '*the total number of children*' in the household's family. It was found that the more the number of children, the greater the satisfaction. This may be due to relative ease of smaller families to go to GS more than large families who are hindered by the large number of children, high living expenses and less time. Large families therefore have different priorities in their lives other than recreation or visiting green space and this may explain their relative greater satisfaction.

'*Monthly income*' is also significant. It was found that the intermediate class who earns between 1500 and 2500 EGP are not satisfied with the quantity of GS. This group of people's income covers all the mandatory life expenses, and fulfils their basic human needs; it allows them to live good life. Thus they begin aiming higher and upgrading. In Maslow's hierarchy of needs pyramid, they are ascending from the esteem stage, to the self-actualization, where they have confidence and respect of others, and feel that they are obliged to care for others' needs as well, (Figure 8-1). Beside they pay higher taxes and they think that the service of green spaces supply is not satisfactory. They care about their families especially children and identify problems that constrain their ambitions.

Figure (8-1), Maslow's pyramid of hierarchical needs

Source: http://en.wikipedia.org/wiki/Maslow's_hierarchy_of_needs



As for feelings about GS, it was found that '*Safety of females*' in GS is negatively associated with peoples' satisfaction with 'GS quantity'. The more satisfied respondents are with quantity the less the happiness about female safety. This interesting finding might be due to the fact that where GS is particularly scarce, safety issues are of marginal importance. This may have a relationship to crowding. As there are many people using the scarce space, females feel safe in the crowd (of families and children). Thus it is much safer for females to be within these busy spaces than quieter or abandoned and deserted spaces. This is potentially of great significance to GS planners. Moreover, rareness of space concentrates the management and security efforts, thus more discipline might be provided in these locations.

A similar negative association is found between the satisfaction with '*GS quality*' and 'quantity', and this is likely to be due to the ability to keep and enhance the quality of the few insufficient available GS, while in the case of plentiful spaces, maintenance and security effort will be dispersed, and the quality will thus be less. This implies a trade-off between quantity and quality. For any quantity, there will be a relationship between number of users and quality (see the discussion in Chapter Three). Quality increases as the number of people using the GS increases because of companionship and safety. After a certain point, the quality falls. To achieve improved quality for the larger number of people, there need to be more investment in (security, facilities and extra space). The findings here therefore support the club theory analysis of green space economy.

Preference for '*small-enclosed spaces*' is associated with greater satisfaction with the 'quantity of green space'. This is understandable since there are simply more smaller green

spaces than larger ones. So people with a preference for the former will be more satisfied. On the other hand, people who prefer 'larger extended GS' are less satisfied with the quantity of green space because there is less of their preferred type of space. There is a significant relationship between the use of private cars as transportation means to reach the GS on one hand, and the satisfaction with GS. This is understandable since people using a car to visit GS are believed to exercise greater choice. This is a significant finding, showing the impact of mobility on the ability to enjoy the city's scarce green infrastructure.

Table (8-4) Model 4, Ordinal regression model of People's satisfaction with quantity of GS summary of significant attributes

	Estimate	Sig.		Estimate	Sig.
[Amount of education=4]	1.281	.015	[Distance to nearest= less than 150m]	-1.527-	.001
[Total no of children= No children]	-15.990-	.000	[Fulfilment of needs=Yes]	-1.144-	.027
[Total no of children=1 or 2]	-16.702-	.000	[Local problem - lack general]	-.621-	.048
[Total no of children= 3 or 4]	-16.304-	.000	[Local problem - not maintained]	.749	.033
[Monthly income= 1500-2000 EGP]	-1.389-	.008	[Local problem - no GS]	-1.195-	.005
[Monthly income= 2000–2500 EGP]	-1.343-	.030	[Prefer small spaces=Yes, totally agree]	-1.952-	.004
[Safety females= Yes, totally agree]	-2.392-	.000	[Prefer small spaces=Yes, agree]	-1.534-	.012
[Safety females= Yes, agree]	-1.887-	.001	[Prefer small spaces=No, disagree]	-1.358-	.022
[Safety females= Neutral]	-2.965-	.000	[Prefer extended GS= Yes, totally agree]	3.629	.000
[Safety females= No, disagree]	-1.466-	.008	[Prefer extended GS= Yes, agree]	3.686	.000
[Quality sufficient= Yes, totally agree]	-8.791-	.000	[Prefer extended GS=Neutral]	3.078	.005
[Quality sufficient= Yes, agree]	-6.078-	.000	[Prefer extended GS= No, disagree]	2.937	.006
[Quality sufficient= Neutral]	-5.760-	.000	[Kind of GS=Public]	1.950	.006
[Quality sufficient= No, disagree]	-4.024-	.000	[Means to reach space=Private car]	2.323	.036
[No GS 10 min=no GS]	1.532	.032			

Model 5- People's satisfaction with quality of GS

Table (8-5), shows the results of an ordinal regression model in which 'people's satisfaction with quality of GS' in their districts is the dependent variable. The reference group for this dummy variable regression model, automatically decided by the SPSS process as the last attribute in each independent variable, is respondents living in 'pattern seven', earning an average 'monthly income over 3000 EGP', having 'more than 7 children', perceiving 'green spaces as unsafe places for females', and are 'not being satisfied with the quantity of local GS'.

Neighbourhood '*pattern four*' (early private housing) residents have a significantly greater dissatisfaction with quality compared with the reference group (squatter neighbourhood dwellers). This is of particular interest since both neighbourhood types have acute scarcity through free market land development and lack of green space planning. The difference suggests either that the GSs that do exist in pattern four are worse than those in pattern seven (it is difficult to think why this should be the case) or that squatter residents are more tolerant of poorer quality. The latter may be more plausible because, by and large, they have a harder life than any other of the city's residents.

Another significant association with 'quality satisfaction' is '*the total number of children*' in the household's family. The less the number of children, the more the dissatisfaction with quality. This may be due to large families accepting existing conditions because of lower expectations, as mentioned earlier in this chapter. It is difficult for large families with many children to travel to farther spaces and they accept this limitation of choice and with it the quality of whatever space is available. Poor quality space is better than none. Families better able to travel to GS, on the other hand, are more inclined to compare poor quality local GS with better GS elsewhere.

'*Monthly income*' is also significant in the model. Those who earn between 1000 to 1500 EGP are less satisfied with the quality of GS than the reference category (over 3000 EGP). This may simply show that more wealthy people have access to better GS – via clubs and pay on entry public spaces.

It was found that '*GS quantity*' is negatively associated with the 'people's satisfaction with GS quality', which might be due to, the more GS quantity the less their quality will be. That is due to the tendency and ability to care for and develop the few spaces in order to face its rareness. On the contrary, when there is abundance of spaces, efforts to maintain and care for the spaces will be dispersed. Moreover, the same could be said about the association between the number of green spaces and their quality.

While those who stated that '*GS is a safe place for females*' to go to tend to be not satisfied with the quality of these green spaces.

A positive association was found between the problem of '*GS being expensive*' and dissatisfaction with the quality of the space. This shows again, that quality is associated

with cost so that those finding cost of access a problem are faced with lower quality. A similar positive association was found between the problem of 'general lack of services' and the quality of GS. This is a tautological finding but it does confirm the validity of the data and gives an insight into the meaning of quality. People clearly see services as part of the quality issue and this is due to the deep-rooted problem of lack of services like toilets, as most designs lack this essential, even the high quality spaces.

A negative association between perception of 'cleanness' and 'youth drug addiction' problems with GS and quality of green space was found. People who ticked 'lack of cleanliness' as a problem were more likely to be satisfied with quality. This is puzzling but may show that people are making a distinction between design and other qualities of a space and the degree to which it is maintained. It may also show that a greater degree of satisfaction with quality comes with a higher standard of expectation about cleanliness.

Respondents that prefer 'small-enclosed green space' are more likely to be satisfied with quality. This is interesting and may be because small-enclosed spaces, are easier to maintain, cleaner and usually well designed, all contributing to enhancing the quality of a space.

Table (8-5) Model 5, Ordinal regression model of People's satisfaction with quality of GS

	Estimate	Sig.		Estimate	Sig.
[Pattern=4]	1.181	.025	[Quantity sufficient= No, disagree]	-3.323-	.000
[Total no of children= no children]	-16.575-	.000	[No GS 10 min= No spaces]	1.824	.009
[Total no of children=1 or 2 children]	-16.364-	.000	[No GS 10 min=from 3 to 5 spaces]	2.423	.039
[Total no of children=3 or 4 children]	-16.562-	.000	[Distance to nearest=301 to 600m]	1.283	.007
[Monthly income=1000-1500 EGP]	-1.188-	.030	[Local problem - expensive]	.938	.026
[Safety females=Yes, Totally agree]	-2.150-	.001	[Local problem - unclean]	-.837-	.011
[Safety females= Yes, agree]	-1.370-	.013	[Prefer small spaces= No, disagree]	1.104	.032
[Quantity sufficient= Yes, Totally agree]	-7.722-	.000	[problems Lack public service]	.932	.005
[Quantity sufficient= Yes, agree]	-6.210-	.000	[problems Youth drug addiction]	-.741-	.025
[Quantity sufficient=Neutral]	-4.794-	.000			

Model 6- People's fulfilment of needs

Table (8-6), shows the results of an ordinal regression model with '**people's fulfilment of needs**' as the dependent variable. The reference group is similar to the last 2 models.

'*Young and middle-aged*' respondents show a negative association with the fulfilment of needs compared to older people. The first three age variable categories (respondents under the age of 50 years old) state clearly that GS does not fulfil people's needs. This is likely to be due to the fact that this group of people are more mobile and active than the elderly and have needs that cannot be fulfilled by greenery alone. The older respondents in the non-satisfied group are mostly married householders and have families and young children who needs GS spaces to go to.

'Fulfilment of peoples' needs' is positively associated with '*interviewees' feelings of freedom in GS*'. People who appreciate the feeling of freedom from GS are more likely to think that GS satisfies peoples' needs. This may well be a value statement as much as an evaluation of the success of green spaces. Living in the congested capital is not such an easy thing: it is full of stresses, constraints and obligations. People who value freedom as an attribute of GS are likely to also take the view that greenery in general meets an important need of their fellow citizens.

A positive association was found between interviewees' stated problems of '*security and safety*', and the fulfilment of needs. Those who considered security and safety a problem are likely to feel that green spaces do not meet peoples' needs. This emphasises the fact that green spaces can easily fail to live up to their promise. Providing space is not sufficient alone. It has to be governed well. The misuse or colonisation of some users tends to degrade spaces for others. Some people tend to be aggressive in the way they derive fulfilment from green space, and this can offend others.

A negative association was found between 'needs fulfilment' and statements that '*remoteness and lack of maintenance*' are a problem. Those stating that maintenance and accessibility are a problem are more likely to think that peoples' needs are fulfilled by GS. This is strange but may show the effect of interviewees travelling to more remote spaces

with better quality and taking a positive view of overall needs fulfilment inspite of acknowledging problems of accessibility.

Table (8-6) Model 6, Ordinal regression model of People's fulfilment of needs summary of significant attributes

	Estimate	Sig.		Estimate	Sig.
[Age= under 20]	-14.705-	.000	[problems - Security]	1.570	.032
[Age= from 21 to 35]	-15.456-	.000	[problems - Safety]	2.192	.005
[Age= from 36 to 50]	-15.687-	.000	[problems - Maintenance]	-1.532-	.042
[Local problems - far]	-2.609-	.012	[problems - Accessibility]	-1.947-	.048
[Feelings evoked]	1.742	.033			

C- Binary Regression models:

Model 7- Seeing GS from home

Table (8-7), shows the results of a binary regression model in which '**seeing green space from home**', is the dependent variable. The reference group for this dummy variable regression model is the same as the previous model.

Unsurprisingly, '*pattern two*' (colonial developments) and '*pattern six*' (new settlements) respondents can see more GS from home compared with the reference group (squatter residents). It is of interest that none of the other neighbourhood patterns were significantly different from squatter areas once other variables are held constant. The implication is that although some of the other patterns (notably five – late private development) are better provided with GS than squatter areas, their residents are no less likely to see GS from their home. This is because all neighbourhoods with the exception of 2 and 6 are very high density with limited lines of sight between buildings.

A significant association was found as expected, between '*respondents who have GS within 300m from their homes*' and seeing GS from home. This tautological finding helps verify the data. Another significant association is between '*satisfaction with GS quantity/quality*' and seeing GS from home. It appears that those who do not see GS from home are more likely to be unsatisfied with the quality/quantity, which is logical. This model therefore isolates one particular benefit of GS – visual benefits and shows that,

holding other factors constant (including the amount of local GS and problems with GS), seeing GS from home increases satisfaction with quantity and quality. In other words, seeing GS from your home can partially make up for both lack of quantity and quality. This is an important policy finding, suggesting that where possible, lines of sight to GS should be maximised in urban design.

Table (8-7) Model 7, Binary regression model of Seeing GS from home summary of significant attributes

	B	Sig.		B	Sig.
Pattern		.001	Quantity sufficient(No, I disagree)	-3.200-	.009
Pattern(2)	-1.319-	.043	Quantity sufficient(Yes, I totally agree)	-2.124-	.068
Pattern(6)	-1.929-	.004	Distance to nearest		.002
Quantity sufficient(Yes, I totally agree)	-3.282-	.011	Distance to nearest(Less than 150m)	-1.620-	.000
Quantity sufficient(Yes, I agree)	-3.685-	.003	Distance to nearest(from 151 to 300m)	-1.129-	.011
Quantity sufficient(Neutral)	-3.798-	.002			

Model 8- Type of green space usually visited

Table (8-8), shows the results of a binary regression model in which the ‘**type of usually visited GS**’, (public or private) is the dependent variable. As discussed in Chapter Three, the definition of private used here is spaces with access restricted by private or shared property rights (other than rights over daily access gained by the payment of daily tolls), while public GS means those spaces that users have no restrictions that excludes them from using the spaces other than the requirement of a daily fee, and includes tolled spaces for access, which are usually run by the municipality. The reference group is the same as the previous model.

‘*Pattern five*’ (late private developments) and ‘*pattern six*’ (new settlements) respondents, are more likely to be private GS visitors, compared with the reference group. This is likely to be due to the relatively high monthly income in the former and the abundance of private spaces in the later.

There is also a significant association between the ‘*respondents who have GS within 300 to 600m from their homes*’ and the kind of green space (they tend to use private GS). This may be due to the fact that they have to travel to GS anyway and might as well travel to

better quality spaces, to make the trip more worthwhile. Put another way, travelling imposes a cost of access and having paid that cost, people will expect benefits to match.

Interestingly, the opposite patterns was found with another variable: there is a positive association between 'the number of GS within 10 minutes walking distance' and type of GS usually visited. It appears that those who have 3 to 10 green spaces within 10 minutes walking distance from their homes, tend to go to public green spaces. The availability of cheaper and nearer green space means that there is no reason for travelling extra distances to private spaces. The existing spaces fulfil the residents' needs even if they are not as good quality as more distant private spaces. This shows again, the trade-off between distance and quality and indicates that people weigh the benefits against the costs: lower quality may be acceptable at lower (travel and entry) costs.

Table (8-8) Model 8, Binary regression model of Type of GS usually visited summary of significant attributes

	B	Sig.		B	Sig.
Pattern(5)	1.745	.046	No GS 10 min(either 1 or 2)	-2.232-	.058
Pattern(6)	3.564	.002	No GS 10 min(from 3 to 5)	-3.478-	.009
Monthly income(<500 EGP)	-3.834-	.001	Distance to nearest(from 301 to 600m)	1.494	.035
Monthly income(500-1000 EGP)	-2.943-	.000	Local problem Lack Small	1.323	.003
Monthly income(1500-2000 EGP)	-2.744-	.001	Local problem expensive	1.891	.010
Monthly income(2500-3000 EGP)	-2.303-	.010			

Model 9- Perceived problems in the green space

Table (8-9), shows binary models run for 16 different responses to the question asking respondents about their 'perceived problems in GS'. These attributes can be classified into three different groups: (i) Social behaviour and sensational problems, which include misbehaving, drug addiction and smoking, security and safety; (ii) problems with GS components, features and characteristics, including lack of shade, lack of seats and site furniture, lack of trees and greenery, lack of essential public services, and maintenance problems; (iii) accessibility and location problems, includes problems of site design, remoteness (far away), transport problems, problems of size and shape, expense of entrance fees and general scarcity. Interviewees had the choice to select as many problems as they wanted.

Binary regression models were run for each of these sixteen attributes. All are selectively reported below. For reasons of clarity and simplification, only the most important significant associations will be reported.

Each problem is regressed against all attributes. The purpose is to examine how these predictors affect the different perceived problems. The reference group for this dummy variable regression model was automatically decided by the SPSS process as the last attribute in each independent variable, which is 'females' aged 'over 65 years old', living in 'pattern seven'. 'Post graduate educated', 'married' with 'more than 7 children', earning an average 'monthly income over 3000 EGP', perceive 'GS as unsafe place for females' and neither satisfied with the 'quantity' nor the 'quality of local GS'.

Social behaviour and sensational problems

*Includes problems of: misbehaviour of some users, youth drug addiction and smoking, Security and Safety*⁷³

From model (9-1), it can be seen that residents in '*patterns one*', '*four*' and '*six*' are less likely to perceive these problems as important. This might indicate that GS in these patterns tends to be better managed. A positive association was found with the other problems such as problems of '*safety, lack of trees, lack of public services, youth drug addiction*'. That suggests that all these problems are linked together as managerial problems, meaning that, if the GS management is good enough complaints about safety, security, lack of services and youth behaviour will not be forthcoming.

A negative association was found, however, between **security problems** and the problems of '*lack of small spaces*' and '*absence of fencing*'. This suggests that this is a different kind of problem and does not necessarily correlate with the other substantial problems. People who see GS security as problematic tend not to see the lack of fenced small spaces as a problem. In other words, they do not necessarily see the provision of small fenced spaces as a solution to the security problems.

Model (9-2), looks at the correlates of perceived '**safety problem**'. It was found that '*patterns two*' and '*four*' have a positive association with safety problems: residents in these types of neighbourhood are more likely to regard safety as a problem. This may be

explained by the negative influence of outsiders in pattern two, where many people from outside the pattern visits the pattern's green spaces, with common issues arising about neighbourhood safety. In pattern four, on the other hand, the rareness of GS results in over-consumption and crowding. Use patterns are determined by the survival of the fittest and in case of the more vulnerable residents they are often dominated by young people who aggressively capture the rights to the spaces

Model (9-7) looks at the correlates of '**misbehaviour problems**'. '*Pattern five*' has a positive association with the misbehaviour problem in GS. This is likely to be explained by the abundance of workers (domestic, builders, gardener etc) coming to work in these wealthy neighbourhoods. The workers serve the residents of the pattern, but cause many problems in the public spaces within the pattern. Alternatively, the youth of these neighbourhoods are wealthier than other reference groups and are more likely to abuse their and others' freedom, especially by smoking and drug addiction.

Another significant association is between '*marital status*' and the probability of mentioning misbehaviour problems. Compared to the reference group (married with >7 children), all the other categories of marital status view misbehaviour as a critical threat to the benefits of GS (whether married or not, or with children or without). All classes within the community perceive it as a critical problem. In the descriptive statistics, it scored the top problem with 56% of the respondents mentioning it.

Looking at the regression model of '**drug addiction problem**' (model 9-8), it was found that '*gender*' has a positive association with the probability of mentioning drug addiction as a problem in GS. Females clearly tended to perceive this as a problem more than males – due either to their greater vulnerability or to a greater concern for their children. Interestingly, a positive association between the problems of maintenance, security and misbehaviour was also found. This is likely due to the fact that neglected and unsecured places tend to encourage drug addicts and misbehaving youths, see table (8-9).

Table (8-9) Social behaviour & sensational perceived problems in GS binary regression models

Model 9-1- Security			Model 9-2- Safety		
	B	Sig.		B	Sig.
Pattern(1)	-2.958-	.009	Pattern(2)	4.080	.009
Pattern(4)	-3.065-	.004	Pattern(4)	2.597	.035
Pattern(6)	-3.878-	.005	Age	-1.361-	.011
Gender(Male)	1.619	.008	Monthly-income(Less than 500 EGP)	-3.340-	.037
AE(finished primary education)	3.075	.026	Monthly-income(1500-2000 EGP)	-3.541-	.003
AE(finished secondary education)	2.936	.005	Safety-females		.004
AE(university degree)	1.912	.045	Safety-females(Yes, I totally agree)	-4.720-	.008
Marital-status(Married and do not have children)	4.742	.010	Safety-females(Yes, I agree)	-3.623-	.008
Marital-status(Divorced)	6.545	.004	Safety-females(Neutral)	-6.834-	.000
Marital-status(Single)	3.681	.036	Safety-females(No I disagree)	-3.830-	.005
Marital-status(Married and have children)	3.728	.034	Quality-sufficient(Neutral)	4.689	.037
Monthly-income(500-1000 EGP)	2.305	.031	Fulfilment-of-needs(Yes)	9.000	.000
No-GS-10-min(No Near spaces)	-3.326-	.019	LP -lack-general	-2.360-	.003
No-GS-10-min(either 1 or 2 spaces)	-4.161-	.005	LP -not-maintained	3.088	.001
No-GS-10-min(from 3 to 5 spaces)	-3.059-	.046	LP -lack-site-furniture	1.885	.009
Distance-to-nearest(from 301 to 600 m)	-1.632-	.044	PP-Security	2.203	.002
LP-not-fenced	-2.391-	.002	PP-Maintenance	-1.849-	.009
LP-unsafe	1.735	.006	PP-Accessibility	2.685	.005
LP-no-GS	-1.622-	.014	PP-Expensive	3.681	.000
PP-Safety	2.352	.000	PP-Space-shape	2.066	.032
PP-Lack-trees	1.247	.024	PP-Lack-trees	2.619	.005
PP- Lack-public-service	1.291	.040	PP-Misbehaviour	3.146	.000
PP -drug addiction	2.949	.000	With-Whom- Do not go	4.747	.004
With-Whom- Do not go	-3.105-	.048	With-Whom- My family	2.254	.023
Means to reach space(Private car)	4.238	.012	With-Whom- Alone	5.544	.000
Model 9-7- Misbehaviour			With-Whom-Friends	3.600	.001
	B	Sig.	Kind-of-GS	1.923	.021
Pattern(5)	4.061	.030	Have-to-pay	2.026	.028
AE(finished primary education)	-6.704-	.007	Model 9-8- Drug addiction		
Marital-status(Divorced)	7.510	.018		B	Sig.
Marital-status(Married and have children)	5.485	.028	Gender(Male)	-1.933-	.011
Total-no-of-children	-1.613-	.032	AE(finished primary education)	-4.684-	.008
Monthly-income(Less than 500 EGP)	3.629	.044	Marital-status(Married and do not have children)	-4.600-	.026
Monthly-income(500-1000 EGP)	3.349	.029	Marital-status(Divorced)	-6.352-	.018
Monthly-income(1000-1500 EGP)	3.504	.025	Marital-status(Single)	-6.288-	.004
Safety-females		.023	Safety-females(Neutral)	-3.041-	.013
Safety-females(Yes, I agree)	3.725	.009	Safety-females(No I disagree)	-2.991-	.012
Safety-females(Neutral)	3.269	.012	Quantity-sufficient(Yes, I agree)	3.366	.026
Safety-females(No I disagree)	4.140	.003	Quantity-sufficient(No, I disagree)	2.936	.010
Quantity-sufficient		.005	Quality-sufficient(Yes, I agree)	-3.352-	.013
Quantity-sufficient(Neutral)	-8.921-	.000	Quality-sufficient(Neutral)	-3.329-	.042
No-GS-10-min(from 6 to 10 spaces)	-6.668-	.044	LP-expensive	-2.179-	.042
LP-unsafe	-2.124-	.043	LP-not-maintained	2.191	.005
LP-unclean	2.787	.002	PP-Security	1.971	.001
LP-lack-site-furniture	-2.917-	.005	PP-Lack-Shade	-2.284-	.006
PP-Safety	4.025	.001	PP-Lack-trees	-1.766-	.014
PP-Maintenance	2.211	.005	PP-Lack-public-service	2.717	.000
PP-Area-problem	-2.831-	.002	PP-Misbehaviour	2.186	.001
PP-Expensive	-2.491-	.011	Means to reach space(Walking)	3.913	.035
PP-Site-design	-3.583-	.002	Means to reach space(cycling)	3.843	.022
PP-Lack-trees	2.839	.002	Means to reach space(under ground)	4.070	.019
PP-Lack-public-service	3.132	.001			
PP -drug-addiction	3.058	.000	Abbreviations used in this table: AE stands for <i>Amount of Education</i> LP stands for <i>Local problem</i> PP stands for <i>Perceived Problems (general)</i>		
Means to reach space(Walking)	-4.410-	.029			
Means to reach space(cycling)	-6.119-	.005			
Means to reach space(Private car)	-5.599-	.029			
Means to reach space(under ground)	-5.457-	.010			

Users' perception of GS, its components, features and characteristics

Includes problems of: Lack of shaded areas - Lack of seats and site furniture- Lack of trees and greenery- Lack of essential public services - Maintenance problems.

Model (9-3) looks at the correlates of '**maintenance problem**'. '*Total number of children*' has a positive association with the acknowledgement of a maintenance problem in GS. This could be explained by the tendency of large families to go to nearby GS, as it is difficult for them to go to better quality, well-maintained spaces. They are more at the mercy of local conditions and therefore more likely to raise this as a problem. The identification of maintenance as a problem is also positively associated with the identification of the problems of scarcity, lack of seats, site design and misbehaviour. Poor maintenance goes along with poor design and capture by disruptive groups. Maintained spaces are well used, but left over and badly maintained spaces invite vandalism.

A significant association could be tracked between '*public green spaces users*' and the problem of maintenance. People who tend to use public green spaces as their usually visited space are more likely to identify maintenance as a GS problem. This is clear evidence that private (including club) ownership is an institution that can improve GS quality via better maintenance as well as design and investment.

Model (9-6), regresses '**lack of services**' against various correlates. Not surprisingly, '*satisfaction with GS quality*' positively correlated with lack of services. People who scored highly on the quality Likert question (strongly dissatisfied) tended to raise 'lack of services' as a problem. This clearly identifies quality with service "enhancements" of GS and this give a guide to those wanting to improve quality. Facilities like toilets and seats are complements to land in delivering green space quality – the one enhances the other. Interestingly, a positive association is also found between the number of green spaces within 10 minutes walking and 'lack of services'. This suggests that those areas in which green spaces abound do not necessarily enjoy well serviced spaces. This may be because GS in areas where it is scarce is easier to service precisely because there is less of it. So once again, this shows the trade off between quality and quantity, which poses a difficult to choice to GS planners: should we go for more with less quality or less with higher quality?.

Another positive relationship is found between the dependent variable 'lack of services' and the independent variables 'lack of small spaces', 'lack of furniture', 'non existence of GS', 'lack of shade', 'lack of trees', 'misbehaviour' and 'youth drug addiction'. What this points to is the existence of average size green spaces that are of poor quality, lacking in services, abandoned and deserted and thus vulnerable to misuse. It might also be hypothesised that when these places collapse on one item, they tend to collapse on the other items as well, as result of neglecting and non-maintenance in a viscous downward cycle, see table (8-10).

Table (8-10) Binary regression models of users' perception of GS, its components, features and characteristics perceived problems in GS

Model 9-3- Maintenance	B	Sig.	Model 9-6- Lack of services	B	Sig.
Pattern(1)	2.067	.039	Age	-1.229-	.015
Age	-.937-	.011	Monthly-income(500-1000 EGP)	-2.613-	.036
AE(finished primary education)	-3.177-	.017	Safety-females(Yes, I agree)	-2.704-	.035
AE(finished secondary education)	-1.970-	.041	Quality-sufficient(Yes, I agree)	5.771	.001
Total-no-of-children	1.240	.007	Quality-sufficient(Neutral)	5.122	.002
Monthly-income(1500-2000 EGP)	-2.772-	.002	Quality-sufficient(No, I disagree)	2.724	.032
Safety-females(Yes, I totally agree)	-2.713-	.011	No-GS-10-min(either 1 or 2 spaces)	4.046	.016
Safety-females(Yes, I agree)	-2.364-	.012	No-GS-10-min(from 3 to 5 spaces)	4.217	.025
Safety-females(Neutral)	-3.211-	.001	No-GS-10-min(from 6 to 10 spaces)	10.254	.001
Safety-females(No I disagree)	-2.334-	.007	Distance-to-nearest(less than 150 m)	-2.384-	.018
Quantity-sufficient(Yes, I agree)	2.708	.027	Fulfilment-of-needs(Yes)	2.861	.029
No-GS-10-min(from 6 to 10 spaces)	-4.103-	.035	LP-Lack-Small	1.388	.042
Distance-to-nearest(from 601 to 900m)	3.181	.036	LP-lack-site-furniture	1.616	.022
LP-unclean	-1.289-	.019	PP-Security	1.595	.025
LP-not-maintained	2.710	.000	PP-Lack-seat	1.405	.043
PP-Safety	-1.736-	.001	PP-Lack-trees	1.742	.012
PP-Scarcity	1.816	.001	PP-Misbehaviour	2.604	.001
PP-Lack-seat	1.376	.006	PP- drug-addiction	3.044	.000
PP-Site-design	1.643	.005	Means to reach space(Walking)	7.217	.024
PP-Misbehaviour	1.858	.001	Means to reach space(cycling)	6.829	.028
With-Whom- Alone	3.289	.003	Means to reach space(under ground)	6.215	.039
Kind-of-GS	-1.159-	.041	Have-to-pay	-1.890-	.020
Means to reach space(Private car)	3.591	.033			

Abbreviations used in this table:
AE stands for *Amount of Education* - **LP** stands for *Local problem* - **PP** stands for *Perceived Problems (general)*

Accessibility and location problems

Includes problems of: Site design problems - Remoteness - Accessibility (transportation to/from) - Area problems insufficient small areas - Expensive entrance fees - Space shape problems - Scarcity

Model (9-4) regresses 'scarcity' as an expressed problem against independent variables. 'Patterns one' and 'five' dummy variables have negative coefficients, implying that these 2 patterns have enough GS. This is interesting since each of these patterns performs well in a different kind of green space supply. Pattern five neighbourhoods are planned with a hierarchal green space system, with many small spaces, as I have noted in Chapter Six,

being self organised by local residents. Patter 1 is not well served by planned neighbourhood spaces, on the other hand, but it does possess two of Cairo's largest parks which obviously play the major role in fulfilling the residents' needs. Apparently, a general sense of being well served with GS can be achieved either by many small spaces or a few large spaces. The analysis of quality satisfaction shows how this trade-off is affected by attributes other than size, particularly the ability to maintain and secure.

A positive association was found with other stated problems, including *'lack of large green spaces'*, *'uncleanliness'*, problems of *'maintenance'*, *'remoteness'*, *'accessibility'*, *'expense'* and *'lack of shaded places'*. That can be explained by the negative influence of scarcity on the few spaces that do exist, where problems of over-consumption begin to appear. Expense is correlated with scarcity as a problem because the pressure to impose high entry fees where there is more congestion. A similar finding is implied by the coefficient on the 'type of GS' variable: those who state 'scarcity' as a problem are more likely to go to private spaces.

The model for '**expensive entry fees**', (model 9-5), has positive coefficients for patterns *'three and five'* dummy variables. This is due to different reasons in each pattern. In the third pattern, several of Cairo's finest municipal public parks are located near to these neighbourhoods although the neighbourhoods themselves have poor green space supply. However, the residents of these neighbourhoods have limited monthly incomes, and cannot afford the transportation expenses added to the high entry fees of these high quality parks. In pattern five, on the other hand, many of the middle and upper-middle income households go to private GS, and private spaces are the highest spaces in terms of entry fees.

A negative relationship between the *'total number of children'* in the family and the identification of expensive entry fees as a problem was detected, and this obviously is due to the higher per family cost of use as well as relatively lower free spending power of large families. Another interesting association was found between the expense problem and problems of 'non-existence of GS' and 'scarcity'. Some people are clearly blaming private spaces and expensive entry public spaces for increasing the scarcity problem of GS. While private supply and tolled public spaces might increase the overall supply of GS in the city, they do not increase GS for all people equally.

A negative association was found between 'expense' and the problems of 'fenced spaces', 'not maintained', 'lack of site furniture', 'security', 'accessibility' and 'misbehaviour'. This implies that expensive to enter GS are offering better quality spaces. They are also more likely to be fenced. Fencing, notwithstanding its association with expensive entry is a tool to preserve the already scarce GS amenities, moreover these high quality spaces provide a securer place with less users misbehaving and this quality is appreciated by respondents, see table (8-11).

Table (8-11) Accessibility and location perceived problems in GS binary regression models

Model 9-4- Scarcity	B	Sig.	Model 9-5- Expensive	B	Sig.
Pattern(1)	-4.631-	.007	Pattern(3)	3.963	.040
Pattern(5)	-4.122-	.026	Pattern(5)	4.808	.029
AE(finished secondary education)	-3.314-	.023	Age	1.523	.042
Quantity-sufficient(Yes, I agree)	-4.275-	.021	AE(neither read nor write)	19.098	.001
Quality-sufficient(No, I disagree)	-2.864-	.035	AE(finished primary education)	8.213	.010
Distance-to-nearest(less than 150 m)	-2.911-	.024	AE(finished secondary education)	9.385	.005
LP-lack-large	2.728	.007	AE(university degree)	7.145	.012
LP -not-fenced	-2.410-	.035	Total-no-of-children	-3.772-	.005
LP -unsafe	-2.728-	.006	Quantity-sufficient(neutral)	-6.960-	.026
LP -unclean	3.180	.001	Distance-to-nearest(from 301 to 600 m)	-3.657-	.030
LP -no-GS	-3.232-	.014	LP -Lack-Small	-2.547-	.018
PP-Maintenance	3.880	.000	LP -expensive	6.505	.003
PP-Too-far	2.094	.009	LP -fenced	-3.959-	.021
PP-Accessibility	2.288	.006	LP -unclean	3.135	.014
PP-Area-problem	3.158	.000	LP -not-maintained	-5.824-	.001
PP-Expensive	2.368	.012	LP -lack-site-furniture	-2.437-	.043
PP-Lack-Shade	2.710	.002	LP -no-GS	4.190	.008
With-Whom- My family	-2.745-	.039	PP-Security	-2.476-	.039
Kind-of-GS	2.697	.011	PP-Safety	4.346	.003
Means to reach space(Walking)	7.519	.013	PP-Scarcity	4.038	.017
Means to reach space(under ground)	7.421	.010	PP-Accessibility	-2.777-	.040
Abbreviations used in this table: AE stands for <i>Amount of Education</i> LP stands for <i>Local problem</i> PP stands for <i>Perceived Problems (general)</i>			PP-Space-shape	3.015	.016
			PP-Lack-seat	3.016	.002
			PP-Misbehaviour	-5.244-	.003
			PP -drug-addiction	3.334	.008
			With-Whom-Do not go	-7.029-	.036
			With-Whom-work colleagues	13.045	.005
			Kind-of-GS	-2.739-	.014

Model 10- Willingness to participate in enhancing local GS

Tables (8-12) to (8-15), show binary models run for five different responses to the question asking respondents about their 'willingness to participate' in different ways in enhancing local green spaces. The choices were: 'pay money', 'donate plants & site furniture', 'provide advice & consultancy', 'give time & effort', and 'do not want to participate'. They could select any one or more options. A model could not be run for a sixth response 'donate a plot of land', because of the low number of responses, - only 18 frequencies from

715 respondents. It should be noted, however, that it is very positive finding to record 18 expressions of willingness to donate land. The explanatory variables and the reference group are the same as for the other binary regression models reported above.

Pay money

The first model, model (10-1), '**willingness to pay money to enhance local GS**', which is the dependent variable. Neighbourhood '*patterns one*', '*five*' and '*six*' have a positive association with willingness to pay money to enhance local GS. This is likely to be for different reasons in each pattern. For '*pattern one*', residents are more familiar with the idea of paying for quality: the more frequently use the high quality GS in their communities, such as Al-Azhar park, which also has a positive influence on the surrounding ancient neighbourhoods in Cairo. It should be noted that this finding is irrespective of income (income did not figure significantly in the model) and is interesting evidence therefore of the learning effect that comes from demonstrating the positive effects of green space enclosure. In '*pattern five*', most of the respondents earn high monthly incomes that enable them to participate in enhancing GS. They also have the experience of paying to use the informal self-organised 'club' local spaces that they govern amongst themselves. In '*pattern six*', however, the higher willingness to pay compared to the reference group is likely to be due to respondents wanting to maintain the high quality of their planned neighbourhoods, perceiving the maintenance of their scarce GS as a major problem, (see chapter seven). The willingness to pay is a measure of the value people place on GS.

Alternatively, a negative association was found between willingness to pay money to enhance GS and '*respondents' satisfaction with GS quality*'. Where respondents feel that local GS does not need enhancing, they are unwilling to pay money. This validates the previous finding that people in areas with greater GS scarcity are willing to pay money. On the other hand, it seems to conflict with the interpretation that residents in '*pattern 6*' are willing to pay money to maintain the good quantity and quality of space in their neighbourhoods. It could be that pattern six residents sense a particular need to protect their GS benefits, since they are in some respects the most favoured neighbourhoods in the city in this respect. The relationship between quality and willingness to pay money in this model is in respect to the reference group – neighbourhood 7.

A positive association was found between willingness to pay money and problems of 'remoteness', 'lack of maintenance' and 'misbehaviour'. Some willingness to pay money is apparently associated with a desire to have nearer spaces, for example, by converting derelict land. Others are willing to pay money to guarantee maintenance, which as mentioned before, is perceived as a major threat in pattern six. Others will apparently pay money to address misbehaviour problem, which is the most frequently recorded problem within the whole sample.

A negative correlation between willingness to pay money and the recognition of 'uncleanness' as significant GS problem suggests that people believe that paying money will not solve the cleanness problem; it is the user's behaviour and the managerial approach that needs changing. A positive association was found between the respondents who usually go to GS with their relatives and willingness to pay money to enhance local GS. This is likely to be due to, the willingness of such people to secure a better quality space to socialize in, through, for example, developing activities for children and shaded places for family and relative gatherings, see table (8-12).

Table (8-12) Model 10-1, Pay money binary regression model of Willingness to participate in enhancing local GS

Pay money					
	B	Sig.		B	Sig.
Pattern(1)	3.450	.028	With Whom (relatives)	3.009	.050
Pattern(2)	3.252	.055	Means to reach space		.032
Pattern(6)	4.960	.008	Means to reach space(Cycling)	6.481	.024
Local problem - far	1.550	.047	Means to reach space(Private car)	7.567	.030
Local problem - unclean	-2.227-	.016	Participation (Provide advice & consultancy)	-1.971-	.035
Main problems Maintenance	1.740	.042	Participation (Give time & effort)	-3.022-	.000
Main problems Misbehaviour	2.179	.024	Participation (Donate a plot of land)	-5.497-	.003

Donate plants & site furniture

An alternative model was run to examine the determinant of respondent's '**willingness to contribute** in non-monetary ways: **by donating plants and site furniture to enhance local GS**', model (10-2).

'*Unmarried respondents*' have a negative association with the willingness to donate plants & site furniture variable. These respondents probably feel that they will not benefit from such a donation, as they do not have the diverse needs that respondents with families do have. These single respondents also tend to be young, and so have not yet built a mature relationship with the community, and still see the community needs from a young person's

point of view. This view is less focused on the local community and is more likely to view more remote quality spaces as exciting places to go rather than as places that are too accessible.

A negative association was also found for '*respondents earning less than 500 EGP in monthly income*'. The appearance of this variable in the donation model but not in the monetary payment model may indicate that respondents see donation in kind as a more costly option. A negative association between '*satisfaction of respondents with GS quantity/quality*' and their willingness to donate plants & site furniture to enhance local GS is understandable: those that are satisfied with quality/quantity clearly feel that local GS needs neither any payment nor any plant donations to enhance it, as the spaces are already fine and satisfactory. Alternatively, respondents may perceive planting and site furniture as a municipal task, and think it is improper to interfere.

On the other hand, a positive association between the '*not fenced*', '*not maintained*', '*unsafe*' and '*lack public services*' problem variables with respondents' willingness to donate plants & site furniture shows peoples' willingness to help solve some of the ubiquitous problems in GS. This kind of positive contribution reflects the high valuation and enthusiasm of people towards the enhancement of their GS and their built environments more generally.

Interestingly, there was another subset of problems that people obviously do not think it worth contributing to solve. Willingness to donate plants was negatively associated with the identification of '*remoteness of GS*', '*expense*', '*youth drug addiction*' and '*uncleanness*'. There is little incentive to donate to remote spaces since visiting them is hindered by their remoteness and the sense of ownership is lower compared to more local spaces. People also tend to want to care for their donated plants and to see and use their donated site furniture – enhancing the feeling of belongingness and space identification. As for the negative correlation with '*expense*', it might be that where respondents already pay high fees to enter and/or use GS, they believe that they have paid their share, which is enough, and are not interested in donating any plants or site furniture, see table (8-13).

Table (8-13) Model 10-2, Donate plants & site furniture binary regression model

Donate plants & site furniture					
	B	Sig.		B	Sig.
Marital status(Single)	-7.079-	.047	Local Problem- not fenced	6.511	.003
Monthly income(<500 EGP)	-6.394-	.031	Local Problem- unclean	-5.027-	.032
Quantity sufficient(Neutral)	-9.726-	.008	Local Problem- not maintained	5.417	.016
Quantity sufficient(No, I disagree)	-4.444-	.031	Main problems Safety	4.238	.021
Quality sufficient(Yes, I agree)	-5.816-	.036	Main problems Expensive	-3.379-	.053
Quality sufficient(neutral)	-8.191-	.031	Main problems Lack public service	4.572	.007
Local Problem-far	-5.056-	.008	Main problems Youth drug addiction	-3.321-	.020

Provide advice & consultancy

A third contribution model has '**willingness to provide advice & consultancy**' (to enhance local GS), as the dependent variable. Interestingly, patterns one and two have a negative association with the '*willingness to provide advice and consultancy to enhance local GS*'. This is likely to be due to the fact that most of the residents in pattern one are artisans and workers, with no agricultural background, while in pattern two, most are employees and businessmen, who also have little relevant knowledge and skills. On the contrary, '*pattern six*' residents have a positive association with providing advice and consultancy, no doubt because many of them are rural migrants with a strong background in agriculture and planting.

'*Amount of education*' also had a significant relationship, where those who can neither read nor write and those who only finished primary schools had a direct positive association with an expression of willingness to providing advice and consultancy. This may be explained by the fact that farmers and cultivators are the least educated category of workers in Egypt (illiteracy levels are still high among them), but they are nevertheless the most experienced in caring for plants and farming. Thus this category of respondents found providing their knowledge as the best way to participate in enhancing local GS through. The finding that there are different kinds of contribution on offer in different parts of the community is a very significant one for policy makers looking at new models for the provision of sustainable green spaces.

A positive association was found between problems of '*remoteness*', '*lack of small spaces*', '*fenced*', '*lack of site furniture*' and '*lack of shade*' with respondents' willingness to provide advice & consultancy to enhance local GS. This indicates the range of motivation driving respondents to offer their knowledge: it suggests that they can see ways in which they can advise on developing green areas nearer their homes (on vacant and

residual land for example), improving the designs of small spaces, using site furniture more effectively and using plants and other features to provide more shade. Again, this would be important information in a programme of community involvement in bottom-up green planning.

A final fascinating insight from this model comes from the positive association between 'respondents who go to GS alone' and willingness to provide advice and consultation to enhance local GS. It could well be that these users know a space more than others, as they tend to contemplate there alone. They observe others and perceive what others are doing and suffering from and are a rich source of advice. While consultation with families might give GS planners ideas about how to provide better facilities for children, consulting these lone visitors might give a deeper range of localise knowledge about problems and enhancement opportunities, see table (8-14).

Table (8-14) Model 10-3, Provide advice & consultancy binary regression model

Provide advice & consultancy				
	B	Sig.		
Pattern		.016	Quality sufficient(Yes, I agree)	9.581 .001
Pattern(1)	-10.194-	.005	Quality sufficient(neutral)	12.770 .000
Pattern(2)	-4.642-	.043	Quality sufficient(No, I disagree)	3.829 .029
Pattern(6)	4.428	.026	No GS 10 min	.012
Amount of education		.039	No GS 10 min(either 1 or 2 spaces)	6.280 .026
Amount of education(neither read nor write)	8.282	.014	Local Problem - Lack Small	3.062 .003
Amount of education(Finished primary education)	5.357	.046	Local Problem - far	3.955 .008
Marital status(Married and do not have children)	-8.253-	.006	Local Problem - not maintained	-3.959- .002
Marital status(Single)	-5.719-	.026	Local Problem - lack site furniture	4.388 .000
Total no of children	-1.948-	.026	Main problems Area problem	-3.926- .002
Quantity sufficient(Yes, I agree)	-4.605-	.022	Main problems Lack Shade	2.282 .023
Quantity sufficient(No, I disagree)	-3.387-	.033	Main problems Lack seat	-2.963- .006
Quality sufficient		.008	Marital status(Alone)	4.726 .020
Quality sufficient(Yes, I totally agree)	7.679	.007	Means to reach space	.050
Give time & effort				
	B	Sig.		
Pattern	.049	.049	Quantity sufficient(No, I disagree)	-1.492- .034
Pattern(1)	2.112	.008	Quality sufficient	.002
Pattern(3)	1.477	.035	Quality sufficient(Yes, I totally agree)	2.104 .070
Pattern(6)	2.851	.002	Quality sufficient(No, I disagree)	2.100 .007
Amount of education(neither read nor write)	4.495	.007	Local Problem - far	-1.081- .015
Amount of education(Finished primary education)	2.583	.040	Local Problem - not fenced	1.224 .029
Amount of education (finished secondary education)	2.519	.027	Main problems Accessibility	1.089 .019
Amount of education(University degree)	2.910	.009	Means to reach space(Walking)	3.393 .029
Quantity sufficient(Yes, I totally agree)	-4.203-	.011	Means to reach space(Underground)	3.562 .018

Do not want to participate

Finally, a model regressing ‘do not want to participate’ on the set of independent variables showed many of the same relationships (in the inverse) to those already discussed. Thus, this response is related in expected ways to satisfaction with quality and quantity of GS, perceived problems and income, for example. Compared with the reference group (highest income), all lower income groups are less likely to want to participate (which is not to say that people in those groups are not willing to participate in various ways but that whatever particular type of contribution any person is willing to make, in general, s/he is less likely to offer that contribution the less income s/he has, see table (8-15).

Table (8-15) Model 10-4, Do not want to participate binary regression model

Do not want to participate					
	B	Sig.		B	Sig.
Pattern(4)	-2.216-	.018	Quality sufficient(No, I disagree)	-2.470-	.020
Gender(Male)	-1.715-	.005	Fulfilment of needs(yes)	2.241	.038
Amount of education (finished secondary education)	2.395	.049	LOCAL PROBLEM - expensive	-1.584-	.045
Monthly income		.015	LOCAL PROBLEM - not fenced	-2.459-	.008
Monthly income(<500 EGP)	5.268	.000	LOCAL PROBLEM - unsafe	1.406	.025
Monthly income(500-1000 EGP)	3.612	.010	Main problems Safety	-1.286-	.033
Monthly income(1000-1500 EGP)	3.239	.023	Main problems Maintenance	-1.342-	.016
Monthly income(1500-2000 EGP)	3.428	.009	Main problems Accessibility	1.639	.014
Quantity sufficient		.046	Main problems Lack trees	-1.339-	.044
Quantity sufficient(Yes, I totally agree)	5.988	.003	With Whom (Work colleagues)	-18.771-	.999
Quantity sufficient(No, I disagree)	2.177	.039	Means to reach space		.041
Quality sufficient		.034	Means to reach space(Walking)	-3.633-	.009
Quality sufficient(Yes, I totally agree)	-4.046-	.013	Means to reach space(Cycling)	-3.188-	.014
Quality sufficient(Yes, I agree)	-2.755-	.019	Means to reach space(Underground)	-3.648-	.004

Conclusions and Comments

As human behaviour is rather variable and therefore difficult to predict, therefore it is not possible to produce totally accurate predictions, however the regression models demonstrated in this chapter, allows the identification of a set of independent predictor variables which together provide a useful estimate of the interviewees likely choices and scores on some dependent criterion variables. It gave us a more in depth understanding of the relations among various variables, and helped in shaping a more comprehensive perception of the GS supply/demand in Cairo, which consequently will enhance directing planners and policy-makers to the core issues in their adoptions of plans, policies or/and

recommendations for improving the built environment. What these models have achieved can be summarised in:

(a) Investigating in very fine detail the different kinds of values that the resident of Cairo place on GS.

(b) Reducing and highlighting the most significant explanatory independent predictors affecting the dependent variable, in all the models run, which minimises the variables needed in future research and studies aiming to improve GS supply and/or draw affective policies to enhance the city's GS supply.

(c) Revealing some of the unpredicted and unobserved relationships between the dependent and explanatory independent variables, this enables establishing deeper understanding of hidden relations and causalities influencing the dependent variables, which consequently will help -if taken in consideration- planning and policy making. Moreover, its vital in predicting future unobserved responses.

(d) Analysing the detailed models provided try and find relationships between various predictor variables and various kinds of supply data, preference, satisfaction and problem identification.

(e) Using this analysis to generate detailed information for use by GS planners in improving the quantity and quality. To improve the GS supply and supply system in Cairo, it is necessary to understand what the demand is and the degree to which residents are willing to contribute to meeting as well as shaping that demand.

Although, the models give only partial explanation as the continuous regression models have relatively low R square values and the binary and ordinal regression models are significant but not strong, this study is considered to be the most detailed study ever of demand for GS in Cairo and in any arid city in the middle east, as far as the author knows. The patterns of demand analysis, have unveiled some interesting findings, which gives a clearer perception and understanding of the Cairien context in terms of urban green space demand and valuation. Policy makers and municipal bodies should put these findings in consideration, as they are reflecting the actual needs, feelings and perceptions of residents, the following is a brief list of some of the most significant findings such as:

- ‘Divorced’ respondents cover an extra 867m, due to the cultural customs that tend to discard the divorced –especially women- and to look down on them as failures.
- Respondents who ‘cannot read or write (illiterate)’, had to cover an additional distance of 741m. This is likely to be due to, the nature of neighbourhoods that these people tend to live in, which are usually the squatter areas, city slums and the illegal expansions on Greenfields.
- Most of the relationships can be explained by general scarcity of GS in the city and its uneven distribution. Respondents who stated that the ‘non-existence of GS’ is a problem, had to cover an extra 463m to reach the nearest GS.
- The presence of local green space induces more family visits to GS.
- The larger the number of green spaces, the more their ‘needs are fulfilled’ and obviously the more satisfied the respondents are with ‘the quantity’.
- Local GS sometimes is not used because it is, or is thought to be, insecure. Those who perceived ‘safety’ as a problem had to spend an extra 13 minutes travelling.
- Females feel safe in the crowd (of families and children), than within quieter or abandoned and deserted spaces.
- The more ‘the number of GS’ the higher ‘the willingness to participate in enhancing local GS’. This includes a willingness to pay money, donate plants & site furniture and to provide advice and consultancy.
- There are households who would prefer more free or cheap entrance fee local GS, even if they have to travel greater distances and spend more time travelling.
- The disproving of two prevailing perceptions, the first is that green spaces are not a safe place for females, and the second is that females are particularly un-safe in the new settlements, is A significant finding for GS planning in Cairo.
- Neighbourhood ‘pattern four’ (early private housing) residents have a significantly greater dissatisfaction with quality compared with other neighbourhood patterns, even seventh pattern of the squatter neighbourhoods, which was the reference group in the model run in Chapter Eight.
- The higher per family cost of GS use as well as relatively lower free spending power of large families have made them more accepting to existing conditions. While the less the number of children in the family, the more the dissatisfaction with quality they are.

- The lower the monthly income the less satisfied people are with the quality of GS, as the more wealthy people, have access to better GS – via clubs and pay on entry public spaces.
- Respondents that prefer ‘small-enclosed green space’ are more likely to be satisfied with quality.
- ‘Young and middle-aged’ respondents show a negative association with the fulfilment of needs compared to older people
- The significant association between ‘satisfaction with GS quantity/quality’ and seeing GS from home, implies that seeing GS from your home can partially make up for both lack of quantity and quality.
- ‘Pattern five’ (late private developments) and ‘pattern six’ (new settlements) respondents, are more likely to be private GS visitors.
- The 18 expressions of willingness to donate land is an interesting positive finding.

Chapter 9

Conclusion, recommendations and further research

9-1- Introduction

In preparing this research, it was assumed that its most crucial finding would be that people do not place a high value on green spaces. This view came from casual observation about peoples' behaviour in the city and a surface-level analysis of the low levels of provision. By analysing the questionnaire, however, it was discovered that people in Cairo value green space highly and that the green space demand varies distinctly between different

groups. To meet a variety of needs, there is a strong expressed demand that green spaces are enhanced and increased in both quantity and quality.

Again, the research started out with the view that green spaces are important for environmental balance and equilibrium regardless of demand. If that were the case, green space could be viewed as a so called 'merit good' - a good for which the social (collective) benefit is greater than the individual benefit. To supply such goods, governments have to coerce or induce people to consume more by regulation (as in the case of schooling via minimum school leaving age for example) or other means (tax incentives for example). But the research has shown that green space is not so much a merit good but a public good that people place a high value on and wish to consume more of. The problem is that the individual citizens who have the demand for more GS are not the ones in a position to supply it (generally – although I have talked in the thesis about community-organised green spaces). Land owners, developers, entrepreneurs, investors, governments and to some extent community groups all have the power to supply green space. The problem of its shortage in Cairo is an historical supply problem and more generally, a collective action problem. There appears to be the demand but the mechanisms for organising supply are less developed than they need to be (for example expressing a communities willingness to pay into a price so that an entrepreneur can supply more space or into political pressure so that government can organise supply). This research provides information that helps articulate this unmet demand and will hopefully play its part in triggering action by agencies in a position to do something about it.

The chapter continues with a brief demonstration of the main conclusions of the thesis, with commentary on how they answer the research questions in Chapter One. Then it summarises some general recommendations and propose some practical solutions to address the city's urban green space supply shortage. The chapter ends with a brief list of future research points.

9-2- Conclusions

Urban greening is crucial in arid contexts generally and in the Egyptian context specifically. In addressing the challenge of greening, it is important to correlate peoples' needs with other environmental and governmental agendas. The various dimensions of the greening problem should be seen not in isolation but as a complex issue that demands integrated solutions that bring benefits across the board. To do this a deep understanding of the multiple benefits of greenery is needed (Chapter Four). The contemporary situation of Cairo's urban green spaces supply (Chapter Five and Six) was analysed against the background of the literature of urban green space concepts, definitions and norms (Chapter Three) and its function and role (Chapter Four). Then an analysis of the patterns of demand (Chapter Seven and Eight) explored how people in the city used and valued green space and viewed its deficiency. It measures satisfaction and dissatisfaction with quality and quantity and probed which dimensions of the multiple benefits of greenery are more important to Cairo's residents. The analysis of demand and supply in Chapters; Five to Eight, gives a novel, innovative and important commentary on this issue. The supply analysis was based on a unique study that used satellite imagery and is therefore superior to any study based solely on government records. The demand study is based on a random sample of households taken using a spatial sampling frame of the whole of Cairo. Its findings can therefore be taken as generally representative of the city's population.

Some of the significant findings of this research are:

- All analyses and measurements, prove with no doubt that there is a real problem of green space scarcity in Cairo which is magnified by the rapid urban expansions into green areas.
- The apparent absence of the adoption of any strategies in the city, the lack of policies and ignorance of the importance of landscape to built environments contribute to the under supply situation that the city is suffering from. It appears that even the limited spaces created have not generally followed any systematic distributional policy, either in attempting to provide a common standard of access across the city or in respect to size distribution. The institutions governing the supply of green space have varied over time, resulting in an uneven distribution of GS, that have deprived many

neighbourhoods of adequate amount of GS, and the poorer the neighbourhood the more deprived its residents will be.

- The first empirical study showed that there is evidently inefficiency and inadequacy in municipal agencies' management of green spaces. For example, a) Municipal data on GSs are primitive paper-based and unreliable for monitoring the supply problem. b) There is a tendency to exaggeration of the amount of green space, especially in formal reports or the media. c) Official statistics clearly count some of the so-called GS that have not actually yet been developed, planted or used. d) Public figures on GS over-estimate the amount supplied by government and fail to record the considerable amount of GSs supplied privately. However the extensive detailed analysis undertaken for this research showed several districts of the city with acute shortage of green spaces particularly
- The second empirical study analysed the supply of green space in Cairo's various types of neighbourhoods, has resulted in its classification of the city into seven patterns, distinguished by GS morphology and the institutions that created and shaped them.
- Government and private individuals have, over the years, had various successes in providing the city with greenery, which can be seen in Patterns One (historical city), Two (colonial developments) and Six (new cities and settlements). On the other hand, both government and markets have failed at various times to create sufficient green space, which can be seen in Patterns Three (governmental block housing), Four (early private developments) and Seven (squatters and spontaneous developments). While Pattern Five evidences cases of the government failure and the private individuals and/or entrepreneurs' success, in the shape of collective action developments as one example and the abundance of private spaces as another. Supply analysis results (Chapter Five) have shown that, 67% of the green space in Cairo is "private space", and only 33% is "public".
- The third empirical study analysed the questionnaire results, which have showed that 60% of the sample goes to public spaces, while 30% goes to private. Which means that 30% of the residences use 67% of the city's green space, while 60% use 33%. In other words, two-thirds of the city's green space is provided as either private goods or entrepreneurially-organised club goods. Even the public green spaces, are supplied as a club good, being enclosed with access rights priced on entry.

- The third empirical study also included that when measuring the demand, usage and valuation of GS in Cairo (Chapter Seven), several main interrelated points have been established. a) Demand for green space is not homogeneous. (b) Demand varies by person type (such as income level), neighbourhood type and type of green space. (c) Private spaces have clearly emerged to fill the gap in supply left by government planning and the principle of enclosure and payment seems broadly accepted. (d) There is a tension among poorer people between a clear preference for large open green spaces and a desire to have free or cheap access. (e) There is also evidence of the inevitable consequence of enclosure for the poorest.
- Overall the findings suggest that enclosure and charging may well be among the best ways to supply urban green spaces in arid and high density contexts, it makes it possible for entrepreneurs to supply additional green space to the city. They are a market response to green space scarcity. Without them, the city would be browner and poorer. However, that still leaves a large proportion of the city's residents excluded from (a) private recreational clubs and (b) enclosed municipal parks. This leaves an unanswered crucial question of, how can the excluded part of the population fulfil their essential needs of greenery and public spaces?
- The government is clearly trying to address the scarcity, but under very difficult circumstances of lack of both finance and spaces. The redevelopment of the city's ancient refuse dump as a big park was an inspired achievement.
- The emergence of institutions that supply green spaces through private entrepreneurs, voluntary resident collective action and government-managed commercial parks (pay on entry) has clearly improved the problem. Private/ enclosed greens space is provided efficiently in the sense of meeting needs at a price consumers and suppliers are willing to pay/ accept. Cairo's green space enclosures might be accused of being exclusionary but they have created venues where a large part of the population can fulfil their essential needs.

In the 'recommendation' section of this chapter this analysis is used to simulate a discussion of creative methods and techniques for enhancing greenery in the city. The thesis is mainly about providing evidence for such discussions, however. The following sections summarise the main findings and conclusions, and these are classified into; a)

reviewing the context, b) understanding the supply, and c) understanding needs and demand.

The significant contributions of this thesis to knowledge can be summarised in the following points:

1. The production of a reliable updated digital public green spaces distribution map overlaid on Cairo's satellite image. This simple map took months of hard work and provided a basis for analysing green space in Cairo that has not been available to the municipal agency (CCBA). The improved data set has provided a basis for identifying deprived areas, deciding priorities of development and assessing the green space supply service in any locality within the city.
2. The production of an unprecedented digital private green spaces distribution map overlaid on Cairo's satellite image.
3. The production of neighbourhood typology for Cairo's districts, which provides a useful tool for analysing green space issues and creating policy adapted to specific needs in different parts of the city
4. Perceiving and learning lessons from the successes and failures of different green space supply institutions and understanding the causes behind and consequences of these success and failures. This will help in guiding any future plans for the city.
5. The methodology developed in this research could be applied in many arid contexts where green spaces are scarce.
6. The research has drawn a clearer picture than ever before of the supply and demand of GS in the compact arid city of Cairo. It not only revealed many issues regarding residents' preferences of and attitudes towards GS, but it also correlated these preferences with neighbourhood typology, making it much easier for planners and policy makers to arrange more precisely their priorities of development. Moreover, the demand analysis can be used in guiding any future interventions.

Reviewing the context

The built environment of Cairo is facing many serious problems such as deterioration of buildings; encroachment of the green lands in and around the city; over-population to a point at which the city's infrastructural capacity and capacity for growth is insufficient;

traffic jam and inefficient congested transportation networks; squatters and poor quality spontaneous urban expansions; high and threatening levels of pollution; centralization of services; and a decline in the levels of urban services per capita in general and green space specifically. All these factors shape the unique planning and urban management context of Cairo.

This thesis addresses the contemporary status of the urban green space in Cairo through analysing, describing, and attempting to explain the pattern of green space supply and demand in Cairo. The main goal of the research has been to build a clear holistic understanding of factors, variables and influences playing a role in shaping the green spaces in the city. This thesis is probably the most detailed study yet undertaken of, (a) the actual quantity and distribution of green space in the city (as opposed to the quantity reported in official statistics) (b) the historical institutions responsible for the production of green space and (c) demand for green space among Cairo's residents.

Understanding the supply

By examining the history of green space in Cairo and the reported key indicators of the city's green space supply performance (chapter five); by reviewing the issues of norms and standards (chapter three); and by analysing the different patterns of green space supply in Cairo (chapter six); it can be concluded that there is a real scarcity problem within the city. My analysis suggests that the city has 901 hectares of public green space and 1847 hectare of private green space. The analysis also shows that two-thirds of the city's green space is provided as either private goods or entrepreneurially-organised club goods⁷⁴. This is both good and bad news. It is good for those who have the rights to these enclosed spaces and it is good for the city as a whole, since these private and club mechanisms are a way of inducing greater supply. Without them, green space provision would be very much lower. It is bad news from the point of view of those who do not have access. However, the story is more complex than this. Chapter six attempts to move beyond the idea that the government alone has responsibility to supply green space. It shows that both governments and the market have failed and succeeded at various times in the city's recent history in supplying green space. The supply of green space in Cairo's various types of neighbourhood can be understood by classifying neighbourhoods into seven patterns,

distinguished by their morphology and the institutions that created and shaped them. Each of these patterns tells a different story of the failure or success of government and markets (private transactions) in delivering green space in each neighbourhood type. One conclusion from this chapter's analysis is that 'enclosure' and charging makes it possible for entrepreneurs to supply additional green space to the city. Without them the city would be browner and poorer. Enclosure may well be among the best ways to supply urban green spaces in arid and high-density contexts. It maintains and preserves the quality and value of greenery. As a strategy, it might partially solve the problem of under supply in the city. However that still leaves the question of the remaining proportion of the city's residents who are excluded from private recreational clubs and enclosed municipal parks. How can they fulfil their essential needs of greenery and public spaces? I briefly touch on this later on in this chapter. For now, we can conclude that in the present time, both municipal and entrepreneurially provided green space in Cairo tends to be enclosed and charged for. This seems to be an institutional response to the city's extreme level of scarcity arising from (a) a very low historical level of supply and (b) intense population pressure through very high densities.

Government was successful in providing green space during the renaissance period of the city and in the current time, in the new peripheral urban areas. It should be noted, however, that the success and sustainability of green spaces rests on more than mere design: it requires powerful commitment to protecting green spaces from (a) encroachment and (b) over use. Regulations and management go hand in hand in preserving designed green spaces. This is a problem in a city where there is inexperience in green issues among policy and decision makers and municipality officers, a lack of awareness of the importance of green spaces to enhancing communities, inefficient municipal management, apparent absence of strategies or policies in the city, general problems of poor maintenance and dumping and littering in publicly managed green spaces (Kafafy, 2009d).

Understanding needs and demand

In the process of answering to the research questions, a classification of six main categories was adopted:

- | | |
|--------------------------|---|
| 1- Demand and Perception | 2- Problems of GS |
| 3- Satisfaction | 4- Preference of green space type |
| 5- Private GS | 6- Willingness to participate in enhancing local GS |

In terms of the first category (demand and perception), it was found that Cairo city suffers from an uneven distribution of GS, where nearly 40% of the respondents have to cover a distance of more than 900m to reach the nearest green space. The median distance varied across the city neighbourhood patterns dramatically from 20m in the new cities and settlements to 1350m in spontaneous and squatter areas. Nearly 1/3 of respondents do not have any green space within a walking distance of 500m. Only 53% of female respondents agreed that green spaces are safe places for them to go to. Among the 15 listed motives to go to GS, nearly 63% of the whole sample stated that enjoying greenery was their main motive for going to green spaces. In the 'GS problem' category, misbehaviour of some users was the major problem, followed by security (impudence or anti-social behaviour) and lack of maintenance and essential public services.

In regards of the 'people's satisfaction' category, nearly 2/3 stated their non satisfaction with the existing green space, stating that it does not fulfil their essential needs and that they need more public spaces especially for their children to fulfil their needs. Only in 2 types of neighbourhood: colonial developments and new cities, did the respondents state that they have sufficient quantity of green spaces. This is due to the efficient supply provision in these neighbourhoods.

More generally, though, 30% of respondents stated that the reason for the people's needs not being fulfilled is the non existence of green space in their neighbourhoods. Interestingly it was found that there is a relationship between satisfaction with quality and income, where low and high income residents are more likely to be unsatisfied while middle income residents are more likely to be satisfied. Moreover, it was found that city parks are the top demanded investment. Pattern four (government block housing with poor public space planning) was the top demanding type of neighbourhood. This illustrates the detailed relationship that the thesis has uncovered between, existing supply levels, institutions of supply, patterns of use and specific demands.

A relation between income and preference for the kind of space to go to was found, with high monthly income people more likely to go to private spaces. For example, high monthly income married respondents with children are 3 times as likely to go to private space than public spaces.

In terms of Private Green space category, interviewees have shown a general preference for fenced, gated and controlled green spaces. This fits with the finding that 67% of the green space in Cairo is private space and only 33% is public. On the other hand, questionnaire results have shown that 60% of the sample goes to public spaces, while 30% goes to private, meaning that 30% of the residents use 67% of the city's green space, while 60% use 33%. Unsurprisingly, private space users are much more likely to be satisfied with the maintenance of their usually visited green space. Nearly 3/4 of the respondents stated their willingness to positively participate in enhancing local green space, including the low-income interviewees. Unexpectedly, 18 interviewees stated their willingness to donate a plot of land to the public use as a garden and these came from all neighbourhood types, including the very poorest.

To conclude, this thesis has evidenced the general scarcity of green space in Cairo and explored the many dimensions of this scarcity in great detail. It is a seriously demanding problem. The emergence of institutions that supply green spaces through private entrepreneurs, voluntary resident action and government-managed commercial parks (pay on entry) has clearly improved the problem. Private/ enclosed green space is provided efficiently in the sense of meeting needs at a price consumers and suppliers are willing to and can afford to pay. Cairo's green space enclosures might be accused of being exclusionary but they have created venues where a large part of the population can fulfil their essential needs. Private spaces have clearly emerged to fill the gap in supply left by government planning and the principle of enclosure and payment seems broadly accepted. Private spaces have attracted a huge population of users (30% of Cairo's residents if the survey is taken as broadly representative), relieving public green spaces from some burden by reducing the number of users of those spaces. This leaves the municipality with relatively smaller problem to solve.

Green space is not a priority expenditure for the urban poor, but their demand is not zero either. Society as a whole, also has an interest in providing green spaces for the poor –

green space is a merit good in terms of its health and social benefits. This suggests that mechanisms need to be found to overcome the over-development problem and the funding problem. Public private partnership projects such as Al-Azhar Park in historical Cairo offer an institutional model that embeds cross-subsidy. So do the micro-governed pocket parks in the late private developed neighbourhoods discussed in Chapter Five. These create local incentives to invest at levels that match demand and affordability. As the analysis in Chapters Seven and Eight show, people travel for large distances and pay entrance fees to reach and utilise better quality green space. There are actually plentiful residual spaces in the poorer neighbourhoods and throughout the city that with smart financing and collective action institutions could be captured for collective consumption and greened (Kafafy and Webster, forthcoming).

Table (9-1), summarises the outcomes and conclusions of the thesis.

<i>Table (9-1), Summary of the conclusions outcome</i>	
Review the context	Outputs
<ul style="list-style-type: none"> - Review Cairo's local context - Identify key characteristics of the city - Identify key problems - Review standards for quantity, quality and accessibility for GS 	<i>Understanding Cairo's GS context</i>
Understand the supply	Outputs
<ul style="list-style-type: none"> - Review GS supply history - Identify all green spaces in the city - Identify bodies responsible for GS supply in the city - Categorise open spaces by function, size and ownership - GS supply overlaid on city's municipal district map and satellite image - Identify deprived areas in the city. - Categorise the city's neighbourhoods into a green space based typology 	<i>GIS database of green space data and key information overlaid on a satellite image of the city</i>
Understand demand and need	Outputs
<ul style="list-style-type: none"> - Questionnaire survey to assess People's demand and need - Consider existing demographic information - Correlate the demand with GS neighbourhood typology supply - Correlate the GS supply with people's perception, satisfaction and preference - Analysing people's perceived problems in GS - Analysing people's willingness to participate in enhancing local GS - Analysing the role of private entrepreneurially GS in the supply provision 	<i>Understanding the actual contemporary demand and need</i>

9-3- What can be said in summary about the general conditions of green space scarcity in Cairo?

- First, that there is a demonstrable demand for more green space. Chapters Seven and Eight clearly reveal that the problem is not lack of demand (lack of willingness to pay) but lack of instruments (market or government) to turn this demand into supply. Only in two types of neighbourhood and a fraction of the people of Cairo, are residents happy with quantity.
- Second, the same can be said of demand for quality. There is a widespread demand for improved quality. The detailed measures and investments that this implies are discussed in detail in chapters Seven and Eight.
- Third, private green space provided as entrepreneurial clubs is an important means by which the quantity and quality of green space in the city has been improved.
- Fourth, it seems that the institution of pay-on-entry public parks has become widely accepted in Cairo. I have not investigated the history of this policy, but it is clear from both observation and the quantitative analysis in this thesis that enclosure and payment can improve quality and security.
- Fifth, there is a price paid by enclosure and this is reduced accessibility for the low income. Ways need to be found therefore to address this access problem.
- Sixth, governments and markets have failed to provide green space at different times in the city's history. At other times, both have been successful. The key for the future is to ask what, respectively, governments and private individuals, entrepreneurs and community groups can offer together by pooling their knowledge and other resources in partnership projects. I elaborate on this further below.

9-4- Recommendations⁷⁵

Among the most important aims of any public authority or municipality is improving quality of life. Neighbourhoods should be somewhere people want to be and are happy to belong to. Green spaces are key to this main aim, as they succeed in meeting a range of social, environmental, economical and health benefits which cause areas to be more attractive. That is why it is vital to keep creating, protecting and enhancing spaces as an essential phase in the process of making neighbourhoods more attractive, more liveable and more joyful places to live in.

It should be recognised that, as important as the immediate benefits of green spaces to communities, is the future benefits. A good, well-managed green space today will leave a real legacy for coming generations.

The following section is a list of recommendations regarding green space planning in Cairo. For reasons of simplicity these are classified into three main categories: strategy and policy, public and private productive partnership, cultural and social recommendations.

Strategy and policy recommendations

- An integrated approach is needed in which green spaces are highly valued within the physical environment. The approach should encourage the creation of new venues and institutional frameworks for public-private efficient partnerships and effective community involvement.
- Encouraging the adoption of a long term strategic approach to the physical greening of urban environments is needed instead of relying on a narrowly focused incremental project-led approach. The former provides an opportunity of a holistic vision for the whole city allowing the linkages between green spaces and consequently improving the distribution among the city's different districts. While the latter focuses only on solving one-project's problems without exploring the benefits of integration. The English Department of the Environment (1996) summed it up in the following:

"Urban greening is therefore not just cosmetic afterthought: it is a key component of regeneration and can help to ensure developments are sustainable. Good practice requires a strategic approach in which greening principles are located at the heart of the planning process and regeneration strategies."

- Awareness needs to be raised among policy makers about the different benefits of green spaces and their vital role in establishing sustainability within built environments. They need to be trained to think creatively in introducing methods of urban greening.
- Local assessments of the contemporary situation of urban green spaces in Cairo need to be undertaken, in order to stand on the actual dimensions of the shortage issue. One of the main findings of the thesis is that different groups in different areas of the city have very specific demands. The thesis findings can be used to guide a set of neighbourhood-specific studies, policies and action plans.
- Attention must be paid, not only to providing green spaces but providing and maintaining quality spaces. As the demand analysis shows, quality means different things to different groups and this needs to be understood.
- This would include investigating the best ways to supply urban green spaces in contexts like Cairo with high densities and congested non porous urban tissue.
- Project managers need to be trained up with the necessary skills to secure a variety of funding sources beyond cash-short local authorities, which are busy facing other responsibilities with higher priority.
- With thoughtful design, greening projects can address a range of objectives simultaneously, as in Al-Azhar Park. Thus, in-depth study of such projects and seeking multi-functionality will lead to more efficient higher quality developments and policies, which will consequently enhance the city's development plans.
- There needs to be modification to the contemporary legislations and laws that protect and preserve green spaces and new laws that embrace tools to enhance the City's green assets, and produce new instruments for the enriching of green space.
- Strategies of urban greening must reflect sustainability concepts, issues and principles of nature enhancement and conservation, which include protecting existing species that

have successfully colonised urban areas, over and above the need to promote diversification.

- Advice and training needs to be provided on how to improve greening projects, policies, action plans, implementation, management, maintenance and monitoring for both new and existing projects.
- Policy makers and planners need to take into consideration that the median distance to the nearest green space is 600 meters; that 38.3% of Cairo residents (accepting the survey as broadly representative of the city as a whole) have to cover a distance of more than 900m to reach the nearest green space. This raises a serious and quantified challenge about the equity of GS distribution between the city's neighbourhoods. Planners need to have this detailed level of research analysis in planning for the future green space distribution of the city and to prioritise investments to the neediest places. The analysis in chapter Seven indicates, for example, that 73% of the citizens who do not have any green spaces in their districts were situated in only three types of neighbourhood: the 3rd (administrative block housing), 4th (early private developments) and the 7th (spontaneous settlements & squatters). This finding narrows down the scope for planners in conducting further planning research and analysis.
- A significant finding for GS planning is the disproving of two prevailing perceptions. The first is that green spaces are not a safe place for females, and the second is that females are particularly un-safe in the new settlements. Moreover, it was found that females feel safer in a crowd (of families and children) and thus prefer busy spaces than abandoned and deserted ones.
- Planners should pay attention to the obvious but important finding in the thesis that the larger the number of green spaces, the more satisfied the respondents are with the quantity, and the more their needs are fulfilled, and vice versa: the less the number of green spaces the less the satisfaction with the GS quantity and the less the fulfilment of their needs. This suggests that people value choice.
- Other findings that planners ought to consider include: 1) the farther away respondents are from any green spaces, the more they appreciate large green space; 2) the presence of local green space induces more family visits to GS; and 3) the less the number of

children, the more the dissatisfaction with quality. Such findings give a clearer perception of what specific communities and users want from green spaces in Cairo.

- Building on the finding that seeing GS from home increases satisfaction with quantity and quality and can make up for both lack of quantity and quality, planners and policy makers should try to make the best use of urban designers in maximising lines of sight.
- GS planners and managers need to consider the significant finding that all classes of respondents within the community perceive 'misbehaviour' as a critical problem, with 56% of respondents mentioning it as a problem issue. This finding will affect the usage and perception of designed spaces and proper policies and solutions need to be adopted in order to make the most of these valuable investments
- Policy makers should appreciate and make the best use of the general apparent willing to contribute in enhancing local GS. The thesis throws detailed light on this 'willingness to pay' measure of green space value in the city. For example, it finds that the more the number of green spaces within 10 minutes, the more strongly people express their willingness to contribute by paying and donating of plants. This clearly reflects the people's willingness to pay to have neighbourhood spaces that they can take a sense of ownership of and pride in.
- It has been observed from the analysis of the neighbourhood typologies in Chapter Six that the legal basis of developments is one of the most influential aspects in urban green space supply outcomes. As can be seen clearly in patterns four and seven, where the development was mainly privately organised, the lack of legal control gave rise to imbalances in supply and demand of green space. In neighbourhood type 4, spontaneous development of land allocated by government but without good green space planning led to crowding and a 'tragedy of the commons'. In this sense, too many rights were given to the private developers, who over-consumed land at the expense of themselves and others. In pattern 7, the same happened on illegally settled land. This situation has resulted in an urgent need for new approaches and policies to retrofitting these areas with essential green space amenities. This requires a detailed study of the physical form and legal structure of these areas and the identification of mechanisms for bringing residual spaces, cleared spaces and derelict or contaminated spaces into productive use.

Public-private participation and partnership ideas

- Creating a partnership working arrangement that includes local communities alongside private sector and public agencies is essential for overcoming the collective action problems that prohibit individuals realising their demand for green space.
- There is a need to offering suggestion, models and legal, organisational and financial guidance on how to frame and develop such partnership.
- These should involve local communities at as early a stage as possible to ensure local acceptance and encourage local ownership and pride.
- Developers and owners of industrial and commercial land can be persuaded of the various advantages of adopting urban greening and design principles as an integrated part of their developments. They need examples and case studies to understand that green can be profitable, even in an arid city.
- There needs to be facilitation of the involvement of the private sector in urban greening projects and investments, and incentives to get engaged in these projects, such as tax reductions and managing or maintenance long terms contracts.
- The focus of public-private partnerships should be to produce local public goods, which serve a wider range of residents than club goods and private goods. The public part of the partnership can widen the scale of the benefits while the private part can ensure the necessary financial and organisational conditions to make the project work. For example, the government could secure access to land and package it into a network of linked micro green spaces in the squatter neighbourhoods, using its landowner and regulatory powers, while the private sector could organise financing, design and construction, access control if appropriate, payment collection (from individuals or via civic or religious organisations for example), and ongoing management. The principle is for each party to do what it is best able to do. The demand (willingness to pay) that the analysis in Chapters Seven and Eight clearly reveals very often does not result in new green space because no single agency is empowered to organise these different sets of expertise into a single organisation or partnership.

- An agency should be set up to develop public-private partnership green projects in the deprived areas of the city.

Cultural and social recommendations

- There is a need to continue to spread public awareness of urban green spaces benefits. This is currently being attempted in Cairo by various public and community education initiatives.
- There is further potential for appealing to peoples' religious beliefs such as the Islamic belief that we are all trustees of God's creation and must therefore seek to leave the world a better place than it was before us. This is an effective method of persuading people to embrace sustainability concepts and to participate positively in enhancing their built environments.
- Public awareness needs to be increased of the importance of creative, well-designed, well-managed, well-maintained and affordable spaces for shaping the character of children and youths.
- There needs to be public discussion about the distribution of urban green space among the city's different neighbourhoods. The distributional statistics reported in chapter Five need to inform public green space planners, as do the detailed analyses in Chapters Seven and Eight of specific needs and demands of children and elderly as the most fragile members of society.
- Green spaces should be more forcefully projected as essential parts of the city's ecosystems, with a vital role in preserving biodiversity and a balanced built environment.
- The role of the river Nile as a green public corridor, which people since the dawn of Cairo's history considered as their main refuge, should be consolidate. The public's imagination needs to be captured to once again turn the Nile into a green and watered life line of the city, connecting. Nile is a source of pride for Egyptians, it is considered among the very few pure public assets within the city that needs to be preserved as a

public good and enhanced for future generations. There is scope for the Nile to be used to help impassion Cairo residents with a new sense of urgency to green the city more generally. Private, club and publicly organised green space can each play their part in extending the Nile's influence into the heart of the dense metropolis.

9-5- Proposed practical recommendations on the city level

Creative solutions turn problems and weaknesses into opportunities and strengths. There is much scope for turning the analysis and findings of this thesis into creative, out of the box thinking.

The overall findings of this thesis are (a) there is a strong and distinctly diversified demand for green space in Cairo; (b) the institutions of production have constantly evolved over time, with changes in the politics of the country and city, changes in demand and changes in the market's ability to deliver; (c) starting from a low base, the stock of green space is still very low. The analysis shows that traditional venues of urban green space supply are limited in both preserving green spaces and providing the city with the new and good quality green areas. Thus, new untraditional methods have to be explored. The market can be relied upon to do its own exploration as the widespread growth of private green space clubs shows. But there are other innovations that may be too risk for entrepreneurs to lead on; or too costly or unprofitable, especially those that are targeted at the city's poor. For these, the kind of partnership organisation that I have briefly sketched in the previous section (following the model of Al-Azhar Park) will be important. So too will the community-led green space enhancements as exemplified by the self-organised spaces in the late private development neighbourhoods (pattern 5). Government can play an important part in facilitating such developments through advice, finance and other ways of reducing the transaction costs of local collective action. In the last part of this chapter, I take these ideas further (and strictly speaking beyond the scope of the main part of the thesis) by sketching out some of the technical innovations that could be adopted to expand the quantity and quality of Cairo's green infrastructure.

The greening methods listed are applicable to Cairo, many of them having already been practiced in the city, mostly on a very limited scale or on single occasions. Other methods are drawn from worldwide experiments. The methods include: green roofs, hillsides and plateau greening; using endowments and unused military premises; converting refuse and other neglected and degraded areas into green lungs; using derelict riverbanks as urban green corridors; greening the cemeteries; gradual replacement of industrial areas and parts of squatter areas with public parks and gardens; greening airport and railway premises; implementing the planned green belt; vertical gardens; urban agriculture and allotments. These methods can produce urban green space at different places on the public-club-private good continuum. Some, such as the green belt can provide both local and pure public goods (green lungs to improve the overall city environment and image); while others can produce private goods with local public good benefits or club goods enjoyed only by members. All are beneficial and needed in the city. The trickiest challenge is to provide the urban poor with green spaces. Having established a wide reaching, systematic and in depth analysis of the green space economy for the city as a whole, this task will become my priority project in the next stage of scholarly advancement.

1. Green roofs⁷⁶

Green roofs are those roofs of a building that partially or completely covered with vegetation and soil, or a growing medium, planted over a waterproofing membrane. The demand for and appreciation of roof gardens is mounting all over the world and green roofs are more than just a fashion fad. Thousands of unused square metres can be planted to absorb carbon dioxide, release oxygen, and insulate buildings and more. As demonstrated in chapter four, researchers are suggesting that people in cities are less stressed and more productive in a "green" environment and they argue that humans need greenery as much as food and water for their wellbeing (Cooper, 2008). Kafafy (2009c) argues that green roofs and roof gardens are very common in many urban centres worldwide - seen, for example, in Paris, Toronto, Chicago, New York, Frankfurt, Amsterdam, Melbourne and Tokyo (Figure 9-1). He adds that the benefits of green roofs are now so apparent that some of the world's local governments are providing builders with incentives to install them. In Switzerland and Germany any roof over a certain size has to be green by law – a situation that easily could be applied in Cairo⁷⁷. In Australia they are,

interestingly, currently doing a lot of research into how to promote green roofs in arid climates, standing to benefit millions of residences in arid cities worldwide.



Figure (9-1) Examples of green roofs

A- Chicago City Hall Green Roof

Source: http://en.wikipedia.org/wiki/File:20080708_Chicago_City_Hall_Green_Roof.JPG

B- An intensive green roof in Manhattan

Source: http://en.wikipedia.org/wiki/File:Green_City.jpg

Alexandri and Jones (2004) suggest that green roofs can cool local temperatures by between 3.6°C and 11.3°C, depending on the city. They simulated the microclimate around and inside buildings using computer modelling and found that green walls and roofs would cool the local climate in and around a building and ***the hotter the climate, the greater the cooling effect***. A group of buildings in Riyadh, Saudi Arabia, is entirely clad in vegetation, and according to the researchers' model, will become 9.1°C cooler during the day than the outside temperature, while the peak temperature of the day is brought down by 11.3°C. In Cairo, Ayman AbuHadid, the head of the agricultural research centre, states that roof greening not only decreases the temperature of the floor underneath it by 7°C, but cuts the cooling expenses by 50%, and the warming expenses by 25% as well (Salem, 2009).

On 17 October 2009, the Egyptian national newspapers wrote that there is a successful national campaign to plant the roofs; starting in Cairo by planting the roofs of 26 schools in Cairo (Salem, 2009). This reflects the awareness of the municipality of the vital role that green roofs play in enhancing the built environment. In an empirical study in Cairo, Kafafy (2009c) calculated the built area in the city to be 34038 hectare (Calculated from a Cairo interpreted IKONOS Satellite image taken in May 2005), he then subtracted 15% for roads and utilities, and assumed that green roofs will be implemented to Only 5% of the remaining 85% of the city's built area. Figure (9-2) shows the interesting outcome of 1446 hectare that can be added to the city's green asset, - equivalent to 1.5 times of the existing

amount of urban public green spaces. Causing an upturn in the amount of GS per person with 2 m²/person of green space added to the existing figure.

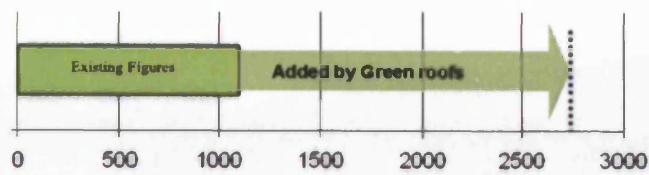


Figure (9-2), The positive influence of green roofs on the amount of GS in Cairo

Source: Kafafy, 2009d

Kafafy (2009c), argues that green roofs are mostly needed in very congested overbuilt environments with very limited chances for creating horizontal green space like Cairo. *Green roofs can reach where municipal gardens and parks can not reach.*

However, the ownership and accessibility to green roofs present technical and legal problems to overcome, if this method is to take off. Institutions must be found to incentivise or coerce individual and collective land owners and condominium members to invest in their roof spaces.

2. Hillsides and plateaus greening

Greening the hillside will achieve several goals; as it will prevent illegal urban expansion on these hillside. Moreover, it will reduce the threats of hillside sliding, which have been threatening the illegal slums dwellers in Cairo for decades. Previous slides have haunted hundreds of people lives, and left thousands of homeless families. Greening can stabilize the hillsides.

Theories of stepped gardens could easily be applied on these vast unused areas of hilly lands, which abound in the capital, El-Zafarany (2005) argues that it can add 420 to 1260 hectares of green spaces to the city, depending on the geological and soil mechanics studies. The real value of these areas as part of a greening strategy is that they are not suitable for urban development. Figure (9-3) shows an example of the Arabic contractors'

medical centre that is constructed on a hill, where the landscape architect tamed the hillsides to form attractive stepped gardens.



Figure (9-3), Hillside greening, in the Arab contractors' medical centre, Cairo

Source: El-Zafarany, 2005

3. Using endowments and unused military premises

Military and governmental endowments are a real opportunity for expanding the city's green areas. It is estimated that this areas totals nearly 840 hectare (64% of the municipally reported figures of green space areas, and 91% of the green space total calculated from satellite imagery in this thesis). The usage of these areas needs to be reassessed, and proper feasibility studies and research needs to be undertaken. As these areas are considered to be among Cairo's last defence lines. The Egyptian national army has set a leading ideal example, by donating a parcel of land in one of Cairo's busiest districts (Zayton district), which was used as a military area. It has been converted into a garden and is now operating now as a 'public club' good, tolled at the point of entrance and serving the whole district.

These endowments and military premises areas are generally huge and can actually have an enormous positive influence on Cairo, breaking up and shaping the built environment, as does the Central Park in New York, figure (9-4).



Figure (9-4), Central Park, Manhattan, New York

Source: http://en.wikipedia.org/wiki/Central_Park

4. Converting abandoned lands, debris, refuse dumps and neglected areas to green lungs⁷⁸

Cairo's municipality has several stories of success in this field. The method gave birth to Cairo's newest landmark - Al-Azhar park, figure (9-5). The park was launched in 2005. The 36 hectare (74 feddan) areas was a 600-year-old rubbish dump and rubble mound named by locals as Darassa hill. The builders had to clear more than 80,000 truckloads of material piled up over the centuries. The park was chosen to be among the world's greatest 60 public places by the PPS website.⁷⁹ The Park project success lies in its addressing a variety of development challenges, ranging from environmental rehabilitation to cultural restoration. The main objective of the project was to create models of development that could be replicated in other settings, particularly in Islamic historic cities which - considered to be almost one-third of historic cities on UNESCO's list of world heritage sites (Aga Khan Trust for culture, 2005,2007).



Figure (9-5), Al-Azhar Park, before, and after development, photos were taken in 2000, 2003 consequently

Source: Kafafy, 2009

5. Using derelict Riverbanks as urban green corridor

Since the onset of civilisation in Egypt, the river Nile was always the refuge for Cairiens. It is the national public good that all residents value without question. Cairo originally extended parallel to river Nile, expanding along the riverside edges for more than 45 kilometres. There is not enough public green space on the river, however, a stretched green corridor is much needed, which will weave both the blue and green ways of the city together. River gardens will add a very precious added asset to the capital's contemporary green infrastructure. They could act as Cairo's green nervous system spreading from the spinal cord of the Nile. With the right legal tools and political will, this can easily be accomplished using derelict land on the riversides. It can act as a pure public good, that serves the whole city in general, and the poor population specifically. Riverbanks have always been the refuge from the private and tolled public spaces that exclude the poorer members of the community.

6. Greening the cemeteries

Cemeteries and Cairo's ancient 'City of the dead' occupy huge areas in the central city. El-Zafarany (2005), suggests that more than 500 hectares of green space could be added to the city by greening the cemeteries, which is the equivalent to 38% of the total contemporary municipally reported figure. Of course the idea might face the obstacle of cultural and religious beliefs but it should be noted that there is already a Cairo governor's decision, approved by the municipal government, of moving the cemeteries, and constructing open green spaces in its place. This could become a reality in the next few years, emboldened by the Al-Azhar park success, which is adjacent to the cemetery area.

7. Gradual replacement of industrial areas and selected squatter areas with parks and gardens

Squatters are amongst Cairo's most testing problems as they are increasing rapidly and encroaching peripheral farmlands ruthlessly. An example of the positive influence of upgrading using greenery, is the case of Arab-el-Mohamadie area, which was a deteriorated squatter area and a core of crime and outlaw activity. Removing the squatters and replacing the dwellings with a public garden, won high approval from local residents, who reported their satisfaction and a positive influence on land values, retail prices and commercial shop business. Another type of urban land use reengineer is to replace Cairo's two main industrial poles, the first in the north, and the second in the south, these were launched 5-6 decades ago, according to a politically unplanned urban growth strategy. The huge industrial pole in the north lies in the way of the usual wind direction, causing dispersion of fumes and pollution to the entire city. Thus, the gradual replacement of these industrial areas will firstly rescue the city from a disastrous polluting land use, and secondly provide the city's most deprived areas (north districts) with the much needed green space. Thirdly it will help in break up the solid massive urban block of these area.

8. Greening the airport and railway premises

Airport and railway premises and rights of ways form huge derelict areas in the city. El-Zafarany argues that by greening them not less than 500 hectares of greenery could be added to the city. With regards to the ownership of these lands, they will remain privatized, but they will bestow their other benefits (Aesthetical, environmental, security etc) to the city. By greening these areas, new green corridors can be created in some central congested parts of the city, such as the city centre which at the moment possess nearly no green spaces and are subject to very high pollution levels, which can be reduced by greening the railway rights of way. A positive example comes from metropolitan Cairo, Giza governorate, in the recent decision to convert the premises of Imbaba airport into a park that serves some of the poorest neighbourhoods in metropolitan Cairo. Of course, this decision met difficult obstacles before seeing the light, with most policy makers voting to use the huge airport area for high rise, high density block housing.

9. Implementing the planned green belt

In Cairo's 1991 master plan, a green belt was supposed to surround the existing built area, reinforce the proposed ring road (the road was built in the early 2000s) and combat the spontaneous urban growth, in particular squatters. A reviewed version of the master plan was launched in 1997, figure (9-6), in which the green belt was reduced to half (from 8400 to 4200 hectare) for the sake of the new planned settlements. Eventually the green belt was not established, and many areas of this proposed green belt have been eaten away by squatters that have appeared in the last few years. Implementing this green belt properly will achieve many important goals for Cairo, as it will hinder the unlawful and illegal urban expansions, it will help in reducing the dangerous levels of pollution that the city is suffering from and it will more than double the amount of green space per person in the city.

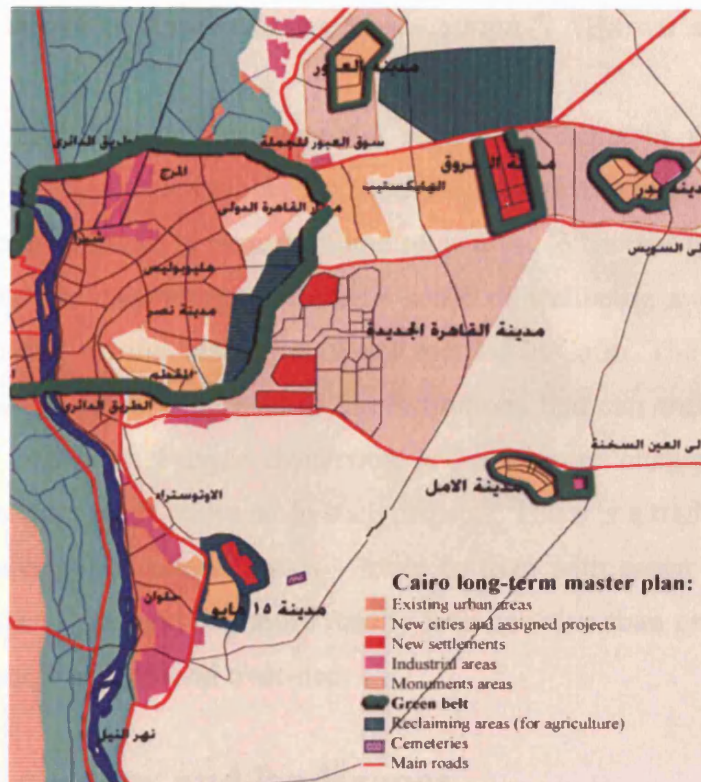


Figure (9-6), Cairo's master plan, 1997
Source: GOPP, legend translation by author

10. Urban agriculture, allotments and urban farms

Brown and Carter (2003) define urban agriculture in simple terms as;

*"The growing, processing, and distribution of food and other products through intensive plant cultivation and animal husbandry in and around cities."*⁸⁰

Meanwhile the United states' council on Agriculture, Science and Technology (CAST) have a more comprehensive definition that takes into account all aspects of agriculture and its associated businesses, natural resources, and its influences on humans, as the definition states:

"Urban agriculture is a complex system encompassing a spectrum of interests, from a traditional core of activities associated with the production, processing, marketing, distribution, and consumption, to a multiplicity of other benefits and services that are less widely acknowledged and documented. These include recreation and leisure; economic vitality and business entrepreneurship, individual health and well-being; community health and well-being; landscape beautification;

and environmental restoration and remediation." (Brown and Carter, 2003:3).

Urban agriculture and farming are generally seen as sustainable practices. They are generally practiced for income-earning or food-producing activities, although in some communities the main impetus is recreation and relaxation. Whatever the motive, they add greenery to the city and contribute to residents sense of wellbeing and health. There are enormous opportunities for the adaptation of this method in Cairo. The issue of ownership is crucial and attention needs to be paid to the institutions that can encourage more viable urban agricultural practices. Private ownership and enclosure ensures that the directly gained profit will encourage investment in such projects. There is a trade off in this respect with recreational and public access issues – more so than with green space designed for recreation since agriculture land can more readily lose its value than green recreation land by trespassing, damage and general over-use.

11. Vertical gardens and landscapes

Vertical gardens are one of the effective tools to increase greenery and add an environmental artistic touch to the rigid urban built environment, as can be seen in many places, such as the musée du Quai Branly, just few meters from the famous Eifel tower of Paris, (figure 9-7), - one of the daring designs of Patrick Blanc (Leenhardt and Lambertini, 2007; Blanc, 2008).

With the huge build urban stock that Cairo has at the moment, applying the idea could have a major impact on the city's environment. Among the advantages that vertical gardens provide, is that it reduces the temperatures by up to 3°C in and between buildings. Beside it acts as a natural isolation membrane which reduces the loss of heat in the winter, and protects the walls from burning hot sun rays, thus keeping buildings warmer in winter and cooler in summer, with less energy consumption.

The mechanism is simply that green surfaces cool local temperatures in two ways. Firstly, the green surfaces absorb less heat from the sun. Hot surfaces warm the air around them, so by cooling the surface, the vegetation also affects air temperatures. Secondly, the plants also cool the air by evaporating water in a process known as evapotranspiration.



Figure (9-7), Vertical gardens, the author in front of the famous Musée du Quai Branly, Paris.

Source: The researcher, February 2010

Figure (9-8)⁸¹, is a conceptual visualization of the influence of green roofs, vertical gardens and other greening policies on Cairo. It captures the author's vision for a Cairo with enhanced green infrastructure; a Cairo that is even more adventurous and robust in innovating to improve green space supply; and in which the diverse kinds of demand for green space documented in Chapters Seven and Eight are met in many and various ways – as public goods with private benefits, private goods with public benefits and club goods with club member and wider public benefits.

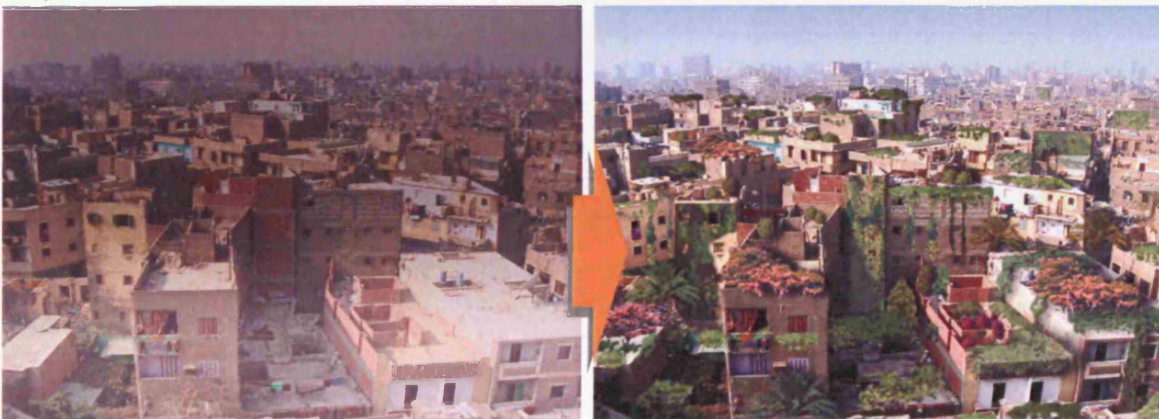


Figure (9-8), Illustrative assumption of the affects of green roofs & vertical gardens on Cairo's built environment.

Source: kafafy, 2009c;d.

Practical recommendations conclusion

Table (9-2), shows a comparison of the Cairo's practical recommendation, the items of comparison includes the ownership, the developer or provider type, and both are divided into public and private, then the type of supplied good, which is classified into 4 categories⁸² of; Public good Local public good Club good Private good. While the last item of comparison is the benefits⁸³ which includes; environmental, economical, social and cultural, human health, safety and aesthetics.

Table (9-2), *Practical recommendations comparison*

Characteristics Proposed solutions	Ownership		Developer/ Provider type		Type of supplied good				Benefits					
	Public	Private	Public	Private	Public good	Local public good	Club good	Private good	Environmental	Economical	Social and cultural	Human Health	Safety	Aesthetics
- Green roofs	√	√	√	√	-	√	√	√	√	√	√	√	√	√
- Hillside and the plateau greening	√	√	√	-	√	√	-	-	√	-	-	√	√	√
- Using endowments and unused military premises	√	√	√	√	-	√	√	√	√	-	√	√	-	√
- Converting debris and dumb neglected areas to green lungs	√	-	√	√	√	√	√	-	√	√	√	√	√	√
- Using derelict Riverbanks as urban green corridor	√	-	√	√	√	√	√	-	√	√	√	√	√	√
- Greening the cemeteries	√	-	√	-	√	√	-	-	√	-	-	√	-	√
- Gradual replacement of industrial areas and poor squatters with GS	√	-	√	-	√	√	√	-	√	-	√	√	√	√
- Greening airports & railways premises	√	-	√	√	-	-	-	√	√	-	-	√	√	√
- Implementing the planned green belt	√	-	√	-	√	-	-	-	√	-	√	√	-	-
- Vertical gardens and landscapes	√	√	√	√	-	√	√	√	√	√	√	√	√	√
- Urban agriculture and allotments	√	-	√	√	-	-	-	√	√	√	-	√	-	-

9-6- Further research

- A comprehensive assessment of green space supply not only in Cairo, but for all Egyptian cities, is needed, using Geographic Information Systems (GIS) to document attributes such as; site name and ID, area, type of GS (private, public etc), space category, details of ownership /management, available facilities, access points and planning policy designations.
- Research is needed not only to evaluate the modern institutions involved in the designation and management of urban GS, but also to propose best practices and create solutions to the many kinds of problems identified in Chapters Seven and Eight. In particular, a fruitful research agenda is suggested by combining the historical institutional analysis in Chapter Six with the demand analysis of Chapters Seven and Eight. What existing and new collective action mechanisms can convert degraded green spaces in various type of neighbourhood into sustainable and useful green spaces and what mechanisms can induce a greater supply in a way that is targeted at the specific and differentiated kinds of demand identified in Chapters Seven and Eight?
- More research is needed in assessing the demands and needs of residents generally, and within each public space specifically, in order to design specific green space policies for the various types of needs that this thesis has started to uncover.
- Research is needed on public-private partnership models for supplying urban green space, in which there is more focus on ownerships, property rights and demand/needs.
- An urban green space local typology would be helpful in green space planning. It should develop and verify norms on the basis of the kind of behavioural performance data (stated and revealed preferences) analysed and documented in this thesis.
- The precise benefits of green spaces (distinguishing aesthetic, environmental, economic, health and so on), need to be more explicitly articulated in policies.
- Particular attention needs to be paid to economic benefits and the distinction between private and public benefits. This is essential to the creation of innovative public-private partnership delivery mechanisms which attract private investment for private (and club) benefits while yielding wider social benefits.
- Further research is needed in the degree to which private and public green spaces contribute to systemic urban green spaces benefits such as heat island moderation.

- Further research is needed in studying the relationship between size, function, density of vegetation and benefits of urban green spaces.
- Systematic relationship between ownership, size and funding mechanism on the one hand and the density of vegetation on the other (including the number, type of and performance of trees) needs to be researched.
- More research needs to be conducted on how to create multifunctional green spaces that achieve multiple economical, social and environmental objectives.
- Further research needs to be conducted into what legal and organisational frameworks are needed in order to realise the potential of the kinds of technical solutions listed in the previous section. For example, what new laws might be required to stimulate a market in gardens and urban agriculture on Cairo's rooftops?

Questionnaire form

*Measuring use, attitudes and views of households to
Urban Green Space in Cairo*

This questionnaire is the empirical study for a PhD thesis about *urban green spaces dynamics in arid contexts*, in which the application is chosen to be on Cairo city, the main researcher is *Nezar A. Kafafy*,

The lecturer assistant in the department of Urban Design – Faculty of Urban & Regional Planning – Cairo university, who is studying for PhD degree in the School of City and Regional Planning – Cardiff University – Cardiff - UK.

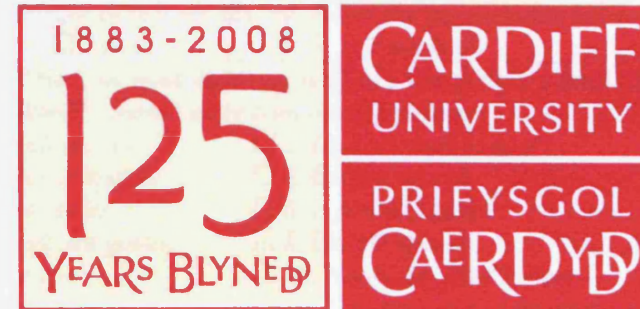
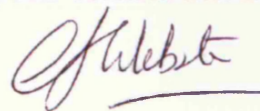
To define what is meant by green space in this questionnaire it is any space you and your family go to recreation that has vegetation.

It is assured that the questionnaire is anonymous, and all the answers and outcomes are used for research purposes only.

Please do not hesitate to ask the interviewers about any unclear question, and feel free to add your worthy comments

Thanks you for your contribution

Main Supervisor *Professor Chris Webster*



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1-Demographic information:

1/1 Gender: 1. Male 2. Female

1/2 Age: (1) < 20 (2) 20 - 35 (3) 35-50 (4) 50-65 (5) >65

1/3 Amount of education: (choose from the list below)
 (1) Cannot Read& Write (2) Finished Primary education
 (3) Finished Secondary education (4) University degree
 (5) Above University degree (Diploma, masters, PhD ...etc)

1/4 How can you describe your marital status? (1) Married - No children
 (2) Divorced (3) Single (4) Married- have children (5) Widower/ widow

1/5 If you are married, how many children do you have?
 (1) No children (2) 1 or 2 children (3) 3 or 4 children
 (4) 5 or 6 children (5) 7 children or more

1/6 I describe my employment status as: (1) Employed (2) Unemployed

1/7 What is the area of your flat? (1) < 60 m² (2) 60 < 80 m²
 (3) 80 < 100 (4) 100 < 120 (5) 120 < 150 (6) 150 < 180 m² (7) > 180 m²

1/8 How many people are living in the flat? (1) < 2 persons
 (2) 2 < 4 person (3) 4 < 6 person (4) 6 < 8 person (5) > 8 person

1/9 What is your monthly income? (1) < 500 L.E (2) 500 < 1000 EGP
 (3) 1000 < 1500 (4) 1500 < 2000 (5) 2000 < 2500 (6) 2500 < 3000 (7) > 3000 EGP

2- Urban district characteristics:

2/1 In your district, Parks and gardens are safe places to go to especially for females (women and girls)
 1. I Strongly agree 2. I Agree 3. I do not know
 4. I Disagree 5. I strongly Disagree

2/2 Green spaces in your district are sufficient in quantity
 1. Yes, I totally agree 2. Yes, I agree 3. Neutral
 4. No, I disagree 5. No, I totally disagree

2/3 Green spaces in your district are sufficient in quality
 1. Yes, I totally agree 2. Yes, I agree 3. Neutral
 4. No, I disagree 5. No, I totally disagree

2/4 How many urban green spaces are there around your house in a walking distance of 10 minutes? (insert number, or 0 for none)

2/5 How far is the nearest urban green space to you?meters

2/6 How much time does it take to walk to:
 • 1-The nearest urban green spaceminutes
 • 2- Your usually visited urban green spaceminutes

2/7 How would you describe the urban green spaces in your district:
 1. Several small spaces 2. Some small spaces, and some large ones
 3. Few large spaces 4. None

5. Other

2/8 Do the green spaces in your district fulfill the people's needs?
 1. Yes 2 No 3. I do not know

2/9 In case of "No", in your opinion, why are the people's needs in your district not fulfilled? (choose more than one if you want)
 1. Lack of small spaces 2. Lack of large spaces
 3. General lack of spaces 4. Distant spaces
 5. Expensive to enter 6. Is fenced / gated
 7. Is not fenced/ not gated 8. Unsafe spaces
 9. Unclean spaces 10. Not maintained spaces
 11. Lack of site furniture 12. Non existence of green space:

2/10 Can you see any green space from your home? 1. Yes 2. No

3- Usage & activities :

3/1 How would you describe the intensity of using public green spaces in your district for different users? Please prioritize the most **three** intensive user, where (1) is the most , and (3) is the least
 1- Families 2- Elderly people 4- Children
 3- Females (individual girls and women) 5- Young people

3/2 How often do you visit the following types of urban green spaces? (insert number, or 0 for none)

Green space	Number of visits
1- City public parks (e.g. Azhar park, Zoo, ...etc)/year
2- Neighbourhood major gardens (e.g. Fosatate, ...etc)/year
3- Community Pocket small public spaces/year
4- Play spaces (playgrounds, children play yards, ...etc)/year
5- Natural open spaces (fields – countryside)/year
6-Waterfront Green corridors (Andalus, ...etc)/year
7-Private clubs with annual membership (Alahly, ..etc)/year
8- Youth community centres (elJazera, Rod elFarag, ..etc)/year
9- Private owned gardens/year

4- Motives, Sensations & Feelings:

4/1 Which feeling does urban green space evoke you? Please choose from the list below,
 (1) Freedom (2) Calmness & peacefulness (3) Adventure (4) Happiness
 (5) Meditation (6) Unity with nature (7) Unity with community and others
 (8) Safety (9) Nostalgia (10) Enthusiasm and refreshment
 (11) Other feelings :

4/2 How important are these feelings for your daily well being?
 1. Essential 2. Important 3. Neutral
 4. Not important 5. Not important at all

4/3 Generally what are the main problems perceived by you in the surrounding urban green spaces?

- (1) Security (impudence or anti-social behavior) (2) Safety (4) Scarcity
 (3) Maintenance (5) Too far (6) Accessibility (transportation to/from)
 (7) Area problems (insufficient small areas) (8) Expensive entrance fees
 (9) Space shape problems (10) Lack of shaded areas
 (11) Lack of seats and site furniture (12) Site design problems
 (13) Lack of trees and greenery (14) Lack of essential public services
 (15) Misbehavior of some users (16) Youth drug addiction and smoking

5- State preference Questions:

5/1 I prefer small enclosed spaces, where boundaries are easily perceived.

1. Yes, I totally agree 2. Yes, I agree 3. Neutral
 4. No, I disagree 5. No, I totally disagree

5/2 I prefer open green spaces, which are extended to the horizon.

1. Yes, I totally agree 2. Yes, I agree 3. Neutral
 4. No, I disagree 5. No, I totally disagree

5/3 I prefer fenced, gated and controlled green spaces.

1. Yes, I totally agree 2. Yes, I agree 3. Neutral
 4. No, I disagree 5. No, I totally disagree

5/4 If the government have funds for developing urban green spaces, Please prioritize the following, where (1) is first priority, (5) is the least priority

- (A) City public parks (.....)
 (B) Preserve Natural open spaces (fields – countryside) (.....)
 (C) Play spaces (playgrounds, children play yards, ...etc) (.....)
 (D) Community Pocket small public spaces (.....)
 (E) Neighbourhood major gardens (.....)
 (F) Pay to enter parks (.....)
 (G) Waterfront Green corridors (.....)
 (H) Establishing new community youth centers (.....)
 (I) Establishing new private clubs (.....)
 (J) Other: (.....)

5/5 Do you think that having a single large open green space is better than having small distributed pockets?

1. Yes 2. No 3. I do not know

5/6 What are your motives to go to urban green spaces?

- (1) To sport (2) To meet friends and family (3) To play with children
 (4) To walk the dog (5) To listen and observe nature
 (6) To contemplate and meditate (7) To get artistic inspiration
 (8) To practice certain hobby(ies) (9) Children to play with others
 (10) To meet new friends and socialize (11) Change regular day routine

- (12) To enjoy greenery (13) To spend leisure time
 (14) To enjoy sun and air (15) To escape from urban rigid life
 (16) Other motives:

5/7 Rank the 5 most important reasons for having or investing in green spaces in cities, where "1" is the most important "5" is the least.

- (1-) Outdoor recreation () (2-) Stress relief ()
 (3-) Meditation in nature () (4-) Breathing clean air ()
 (5-) Environmental balance () (9-) Exercising ()
 (7-) Children's mental health. () (8-) Increasing physical health ()
 (6-) Valuing nature, aesthetic experience ()
 (10-) Providing spaces for urban ventilation ()
 (11-) Other factors:

5/8 Regarding area of green space, arrange the following photos in order of preference: where (1) is the first preference, (6) is the least



(1-) (City public huge parks) (2-) (Pay to enter fenced gardens)



(3-) (Neighbourhood gardens) (4-) (Community Pocket space)



(5-) (Waterfront Green corridors) ... (6-) (Children Play spaces)

إستمارة إستبيان

لقياس احتياج وإستخدام السكان للفراغات العمرانية الخضراء بالقاهرة ومشاعرهم تجاهها

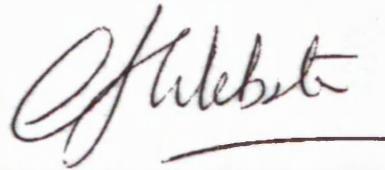
تمثل هذه الإستمارة التي بين أيديكم الكريمة الإستبيان الخاص بالدراسة التطبيقية لرسالة دكتوراه بعنوان دراسة ديناميكية الفراغات العامة الخضراء والمفتوحة كوسيلة أساسية للوصول إلى التشكيل العمراني المستدام في المناطق الجافة بالتطبيق على مدينة القاهرة. من إعداد المهندس نزار كفاي المدرس المساعد بقسم التصميم العمراني بكلية التخطيط العمراني - جامعة القاهرة والمبتعث للحصول على درجة الدكتوراه من كلية التخطيط الإقليمي والعمراني بجامعة كارديف بالمملكة المتحدة.

المقصود بالفراغات الخضراء في هذا الاستبيان هو كل فراغ تقصده أنت وعائلتك للإستجمام أو الترفيه ويحتوي على مسطحات خضراء عاماً كان أو خاصاً و مهما صغرت مساحته.

جدير بالتأكيد أنه لا ولن يعرف أي من المشاركين بالإستبيان. كما يضمن الباحث ويؤكد أنه لن يتم إستخدام أي من البيانات المعطاة إلا لأغراض البحث العلمي فقط.

رجاءاً لا تتردد في الرجوع للباحث في أي سؤال غير واضح وأضف مشكوراً أي تعليقات أو آراء ترونها مفيدة.

وتفضلوا بقبول جزيل الشكر والتقدير



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الخرى:.....

5/5 هل تعتقد أن وجود فراغ واحد كبير أفضل من مجموعة متناثرة من الفراغات الصغيرة؟
 نعم لا (3) لا أعرف

6/5 ما هي اسباب ودوافع زيارتك للفراغات العمرانية الخضراء؟ (انتز من القائمة اثناء حيث (11) سبب ثانوي - (5) سبب رئيسي)

- (1) ممارسة الرياضة مقابلة الأهل والأصدقاء (3) اللعب مع الأطفال (4) تمشية الكلب
- (5) مشاهدة الطبيعة التأمل (6) التأمل (7) للإيجاعات الفنية (8) لممارسة هوايات خاصة
- (9) حتى يتسنى للأطفال اللعب مع قرنائهم (10) لمقابلة والتعرف على أصدقاء جدد
- (11) تغيير الروتين اليومي (12) للاجتماع بالخضرة (13) لقضاء وقت الفراغ
- (14) للاجتماع بالشمس والهواء (15) للهروب من الحياة المصرية الجافة
- (16) أخرى:.....

- 7/5 رتب أهم 5 أسباب لأهمية الفراغات الخضراء في المدن؟ (حيث (11) الأهم- (5) الأقل أهمية)
- أ- التزهه الخارجية ب- الإسترخاء من ضعف الحياة
 - ج- التأمل في الطبيعة د- إستشراق هواء نظيف
 - هـ- الإتران البيئي و- القيم الجمالية وتقدير الطبيعة
 - ز- الصحة النفسية للأطفال ح- تحسين الصحة العامة
 - ط- ممارسة الرياضة ي- توفير مساحات لتهوئة الكتلة العمرانية

8/5 فيما يخص مساحة الفراغات العمرانية الخضراء - رجاءا رتب صور الفراغات التالية من حيث تفضيلك للفراغ (حيث (11) أعلى تفضيل - (6) أقل تفضيل)



أ) المتنزهات والحدائق الكبرى
 ب) حدائق مسورة ممتيزة برسم دخول

4- الأحاسيس والمشاعر والدوافع

1/4 ما طبيعة الاحساس الذي تثيره داخلك الفراغات الخضراء؟ (انتز من القائمة)	2/4 ما مدى أهمية الاحاسيس السابقة في حياتك اليومية؟ <input type="checkbox"/> (1) أساسية لا غنى عنها <input type="checkbox"/> (5) لا قيمة لها بالمره
(1) الحرية <input type="checkbox"/> (2) الهدوء والسلام <input type="checkbox"/> (3) المغامرة <input type="checkbox"/> (4) السعادة <input type="checkbox"/> (5) التأمل	(6) الوحدة مع الطبيعة <input type="checkbox"/> (7) الإسترخاء مع المجتمع والأخرين <input type="checkbox"/> (8) الأمان
(9) الحنين للماضى <input type="checkbox"/> (10) الحساس والنشاط <input type="checkbox"/> (11) أحاسيس أخرى:	

3/4 ما هي المشاكل التي تواجه الفراغات الخضراء العامة المحيطة بك من وجهة نظرك بوجه عام؟ (انتز أكثر من اجابة لو اردت)

- (1) مشاكل الأمن (معاكسات ومضايقات) (2) قلة الاحساس بالأمان (3) مشاكل الصيانة
- (4) ندره الفراغات الخضراء (5) بعد المسافة (6) قلة وصعوبة المواصلات (من-إلى)
- (7) مشاكل المساحة (مساحات صغيرة) (8) تكاليف مرتفعة للدخول
- (9) مشاكل خاصة بالتشكيل الفراغي (10) ندره المناطق المظلمة (11) ندره اماكن الجلوس
- (12) التصميم السيء للموقع (13) ندره المناطق الخضراء والأشجار
- (14) قلة الخدمات العامة (الحمامات- الكافيتريات...)
 (15) عيب بعض المستخدمين
- (16) مشاكل التخزين وتعاطي المخدرات

5- أسئلة تفضيل المستخدمين:

- 1/5 انا أفضل الفراغات الخضراء الصغيرة محددة المساحة والتي يسهل ابراك حدودها
 (1) أو افق بشدة (2) أو افق (3) لا أعرف (4) لا أو افق (5) لا أو افق بشدة
- 2/5 انا أفضل الفراغات الخضراء المفتوحة والتي تمتد فيها المساحات الخضراء للأفق
 (1) أو افق بشدة (2) أو افق (3) لا أعرف (4) لا أو افق (5) لا أو افق بشدة
- 3/5 انا أفضل الفراغات العمرانية الخضراء المسورة والتي يوجد فيها جهات مختصة لتدبيرها
 (1) أو افق بشدة (2) أو افق (3) لا أعرف (4) لا أو افق (5) لا أو افق بشدة
- 4/5 ابدأ علمت أن الحكومة ستوجه إستثمارات لتطوير الفراغات العامة الخضراء - رتب الفراغات التالية من حيث أولوية التنمية (حيث (11) أولوية أولى و (5) أولوية أخيرة)
 (1) إنشاء المتنزهات والحدائق العامة الكبرى
 (2) المحافظة على المساحات الخضراء والفراغات الطبيعية
 (3) إنشاء حدائق كبرى على مستوى الاحياء
 (4) إنشاء وتطوير حدائق المجارات والتجمعات السكنية
 (5) إنشاء وتطوير الملاعب والفراغات المفتوحة وملاعب الاطفال
 (6) إنشاء حدائق ممتيزة برسم دخول
 (7) إنشاء وتطوير حدائق الممرات الخضراء والمائية
 (8) إنشاء وتطوير مراكز شباب بالأحياء

This appendix demonstrates the full list of independent variables used in each of the regression models reported in chapter Eight, they are organised in the same sequence of the chapter under the relevant category of regression model type, which are:

Continuous regression models, which are used for dependent variables derived from questionnaire questions which the interviewee has the freedom to write any number as a response, Three models were run:

- Time to usually visited GS
- Distance to nearest GS
- Number of GS within a walking distance of 10 minutes

Ordinal regression models were run for variables relating to questions in which respondents had to choose from a number of stated answers. Ordinal models include:

- People's satisfaction with quantity of GS
- People's satisfaction with quality of GS
- People's fulfilment of needs

Binary models are run for variable derived from questions in which the respondents had to choose one from only two choices. Models include:

- Seeing GS from home
- Type of green space usually visited
- Perceived problems in the green space, which was categorized into three different groups, where the first is the Social behaviour and sensational problems, the second is problems in users' perception of GS, its components, features and characteristics and Third is the accessibility and location problems
- Willingness to participate in enhancing local GS

Models are shown in detail in the following section with their independent variable list.

A- Continuous regression models' list of independent variables

1. Time to usually visited GS

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Time to nearest GS (2/6) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + Does the interviewee see GS from home (2/10) + How often do s/he visit different types of GS (3/2) + What are the feelings evoked in GS (4/1) + how important are these feelings (4-2) + General Problems (4/3) + Preference of small enclosed spaces (5/1) + Preference of open large GS (5/2) + Preference of gated or fenced space GS (5/3) + Motive of going to GS (5/6) + With whom (6/1) + length of stay per visit (6/5) + Means of reaching GS (6/6) + Have to pay (6/7) + Willingness to participate (6/19)}

2. Distance to usually visited GS

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Time to nearest GS (2/6/1) + Time to usually visited GS (2/6/1) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + Does the interviewee see GS from home (2/10) + How often do s/he visit different types of GS (3/2) + What are the feelings evoked in GS (4/1) + how important are these feelings (4-2) + General Problems (4/3) + Preference of small enclosed spaces (5/1) + Preference of open large GS (5/2) + Preference of gated or fenced space GS (5/3) + Motive of going to GS (5/6) + With whom (6/1) + length of stay per visit (6/5) + Means of reaching GS (6/6) + Have to pay (6/7) + Willingness to participate (6/19)}

3. Number of GS within a walking distance of 10 minutes

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Time to nearest GS (2/6/1) + Time to usually visited GS (2/6/1) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + Does the interviewee see GS from home (2/10) + How often do s/he visit different types of GS (3/2) + What are the feelings evoked in GS (4/1) + how important are these feelings (4-2) + General Problems (4/3) + Preference of small enclosed spaces (5/1) + Preference of open large GS (5/2) + Preference of gated or fenced space GS (5/3) + Motive of going to GS (5/6) + With whom (6/1) + length of stay per visit (6/5) + Means of reaching GS (6/6) + Have to pay (6/7) + Willingness to participate (6/19)}

B- Ordinal regression models' list of independent variables

4. People's satisfaction with quantity of GS

f {Neighbourhood typology (1) + Amount of education (1/3) + Number of children (1/5) + Monthly income (1/9)+ Female's safety (2-1) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Distance to nearest GS (2/5) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + Preference of small enclosed spaces (5/1) + Preference of open large GS (5/2) + Type of GS (6/3) + Means of reaching GS (6/6)}

5. People's satisfaction with quality of GS

f {Neighbourhood typology (1) + Number of children (1/5) + Monthly income (1/9) + Female's safety (2-1) + GS Quantity sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Distance to nearest GS (2/5) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + General problems (4/3) + Preference of small enclosed spaces (5/1) + Preference of open large GS (5/2) + Means of reaching GS (6/6)}

6. People's fulfilment of needs

f {Neighbourhood typology (1) + Age (1/2) + Female's safety (2/1) + why are peoples needs not fulfilled (2/9) + General Problems (4/3) + Feelings evoked (5/6)}

C- Binary regression models' list of independent variables

7. Seeing GS from home

f {Neighbourhood typology (1) + Gender (1/1) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ Female safety (2/1) + GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Distance to nearest GS (2/5)}

8. Type of GS usually visited

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ Female safety (2/1) + GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Distance to nearest GS (2/5)+ Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + Does the interviewee see GS from home (2/10)}

9. Perceived problems in GS

In this section there was 16 models classified into three main groups which are ***Social behaviour and sensational problems***, which included models of (Security – Safety- Youth drug addiction and smoking - Misbehaviour of some users) ***Users' perception of GS***, which included models of (Lack of shaded areas - Lack of seats and site furniture - Lack of trees and greenery - Lack of essential public services - Maintenance problems) and ***Accessibility and location problems***, , which included models of (Site design problems - Remoteness - Accessibility (transportation to/from) - Area problems (insufficient small areas) - Expensive entrance fees - Space shape problems – Scarcity). All of the previous models used the same independent

variables list, which was:

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ Female safety (2/1) + GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Distance to nearest GS (2/5)+ Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + General Problems (4/3) + With whom (6/1) + Type of GS (6/3) + Means of reaching GS (6/6) + Have to pay (6/7)}

10. Willingness to participate in enhancing local GS

Pay money

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + General Problems (4/3) + With whom (6/1) + Type of GS (6/3) + Means of reaching GS (6/6) + Have to pay (6/7) + Willingness to participate [other categories] (6/19)}

Donate plants & site furniture

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + General Problems (4/3) + With whom (6/1) + Type of GS (6/3) + Means of reaching GS (6/6) + Have to pay (6/7)}

Provide advice & consultancy

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not

fulfilled (2/9) + General Problems (4/3) + With whom (6/1) + Type of GS (6/3) + Means of reaching GS (6/6) + Have to pay (6/7)}

Do not want to participate

f {Neighbourhood typology (1) + Gender (1/1) + Age (1/2) + Amount of education (1/3) + Marital status (1/4) + Number of children (1/5) + Monthly income (1/9)+ GS Quantity sufficient (2/2) + GS Quality sufficient (2/3) + Number of GS within 10 min walking distance (2/4) + Does existing GS fulfil residents needs (2/8) + why are peoples needs not fulfilled (2/9) + General Problems (4/3) + With whom (6/1) + Type of GS (6/3) + Means of reaching GS (6/6) + Have to pay (6/7)}

Where for the previous models:

- 1- Neighbourhood typology: [*seven patterns¹ previously introduced in chapters 6 and 7*]
- 1-1- Gender: [*male or female*]
- 1-2- Age: [*categories were: (1) younger than 20 – (2) from 21 to 35 – (3) from 36 to 50² – (4) from 51 to 65 – (5) older than 65³*]
- 1-3- Amount of education: [*categories were: (1) cannot read & write – (2) finished primary education – (3) finished secondary education – (4) university graduate² – (5) above university degree (Diploma, masters, PhD ...etc)³*]
- 1-4- Marital status: [*categories were: (1) married with no children – (2) divorced – (3) single – (4) married and have children² – (5) widower/ widow³*]
- 1-5- Number of children: [*categories were: no children- 1 or 2 children – 3 or 4 children – 5 or 6 children – 7 children or more³*]
- 1-9- Monthly income: [*categories were: (1) less than 500 EGP² – (2) from 500 to 1000 – (3) from 1000 to 1500 – (4) from 1500 to 2000 – (5) from 2000 to 2500 – (6) from 2500 to 3000 – (7) more than 3000 EGP³*]

¹ Pattern One was the reference group in the continuous regression models, while pattern Seven was the reference group in the binary regression models using this independent variable.

² Reference group in **Continuous** regression models

³ Reference group in **Binary** regression models

- 2-1- Safety of females in GSs in interviewee's district: [categories were: (1) *Yes, I totally agree* – (2) *Yes, I agree* – (3) *Neutral* – (4) *No, I disagree* – (5) *No, I totally disagree*³]
- 2-2- GS Quantity sufficient in the interviewee neighbourhood: [categories were: (1) *Yes, I totally agree* – (2) *Yes, I agree* – (3) *Neutral* – (4) *No, I disagree* – (5) *No, I totally disagree*³]
- 2-3- GS Quality sufficient in the interviewee neighbourhood: [categories were: (1) *Yes, I totally agree* – (2) *Yes, I agree* – (3) *Neutral* – (4) *No, I disagree* – (5) *No, I totally disagree*³]
- 2-4- Number of GS within 10 minutes walking distance [*continuous variable*]
- 2-5- Distance to nearest GS [*continuous variable in meters*]
- 2-6- Time to nearest GS [*continuous variable in minutes*]
- 2-8- Does existing GS fulfil residents needs [categories were: (1) *Yes* – (2) *No* – (3) *I do not know*]
- 2-9- Why are peoples needs not fulfilled: [choose as much as wanted from; (1) *Lack of small spaces* – (2) *Lack of large spaces* – (3) *General lack of spaces* – (4) *Distant spaces* – (5) *Expensive to enter* – (6) *Is fenced / gated* - (7) *Is not fenced/ not gated* – (8) *Unsafe spaces* - (9) *Unclean spaces* - (10) *Not maintained spaces* - (11) *Lack of site furniture* - (12) *Non existence of green space*]
- 2-10- Does the interviewee see GS from home [(1) *Yes* – (2) *No*]
- 3-2- How often do s/he visit different types of GS [insert number of visits per year for the following GS types: (1) *City public park s*– (2) *Neighbourhood major gardens* – (3) - *Community Pocket small public spaces* – (4) *Play spaces (playgrounds, children play yards, ...etc)* – (5) *Natural open spaces (fields – countryside)* – (6) *Waterfront Green corridors* - (7) *Private clubs with annual membership* – (8) *Youth community centres* - (9) *Private owned gardens*]
- 4-1- What are the feelings evoked in GS [choose as much as wanted from the following list; (1) *Freedom* - (2) *Calmness & peacefulness* - (3) *Adventure* - (4) *Happiness* - (5) *Meditation* - (6) *Unity with nature* - (7) *Unity with community and others* - (8) *Safety* - (9) *Nostalgia* - (10) *Enthusiasm and refreshment*]
- 4-2- How important are these feelings [categories were; (1) *Essential* - (2) *Important* - (3) *Neutral* - (4) *Not important* - (5) *Not important at all*]
- 4-3- General Problems [Choose as much as wanted from: (1) *Security (impudence or anti-social behaviour)* - (2) *Safety* - (3) *Maintenance* - (4) *Scarcity* - (5) *Too far* - (6)

Accessibility (transportation to/from) - (7) Area problems (insufficient small areas) - (8) Expensive entrance fees - (9) Space shape problems - (10) Lack of shaded areas - (11) Lack of seats and site furniture - (12) Site design problems - (13) Lack of trees and greenery - (14) Lack of essential public services - (15) Misbehaviour of some users - (16) Youth drug addiction and smoking]

5-1- Preference of small enclosed GS [categories were: (1) *Yes, I totally agree* – (2) *Yes, I agree* – (3) *Neutral* – (4) *No, I disagree* – (5) *No, I totally disagree*]

5-2- Preference of open large GS [categories were: (1) *Yes, I totally agree* – (2) *Yes, I agree* – (3) *Neutral* – (4) *No, I disagree* – (5) *No, I totally disagree*]

5-3- Preference of gated or fenced space GS [categories were: (1) *Yes, I totally agree* – (2) *Yes, I agree* – (3) *Neutral* – (4) *No, I disagree* – (5) *No, I totally disagree*]

5-6- Motive of going to GS [Choose as much as wanted from: (1) *To sport* - (2) *To meet friends and family* - (3) *To play with children* - (4) *To walk the dog* - (5) *To listen and observe nature* - (6) *To contemplate and meditate* - (7) *To get artistic inspiration* - (8) *To practice certain hobby(ies)* - (9) *Children to play with others* - (10) *To meet new friends and socialize* - (11) *Change regular day routine* - (12) *To enjoy greenery* - (13) *To spend leisure time* - (14) *To enjoy sun and air* - (15) *To escape from urban rigid life*]

6-1- With whom does the interviewee usually go to GS with [Choose as much as wanted from: (1) *Do not go at all* - (2) *My family (children, parents)* - (3) *Alone* - (4) *Relatives* - (5) *Work colleagues* - (6) *Friends*]

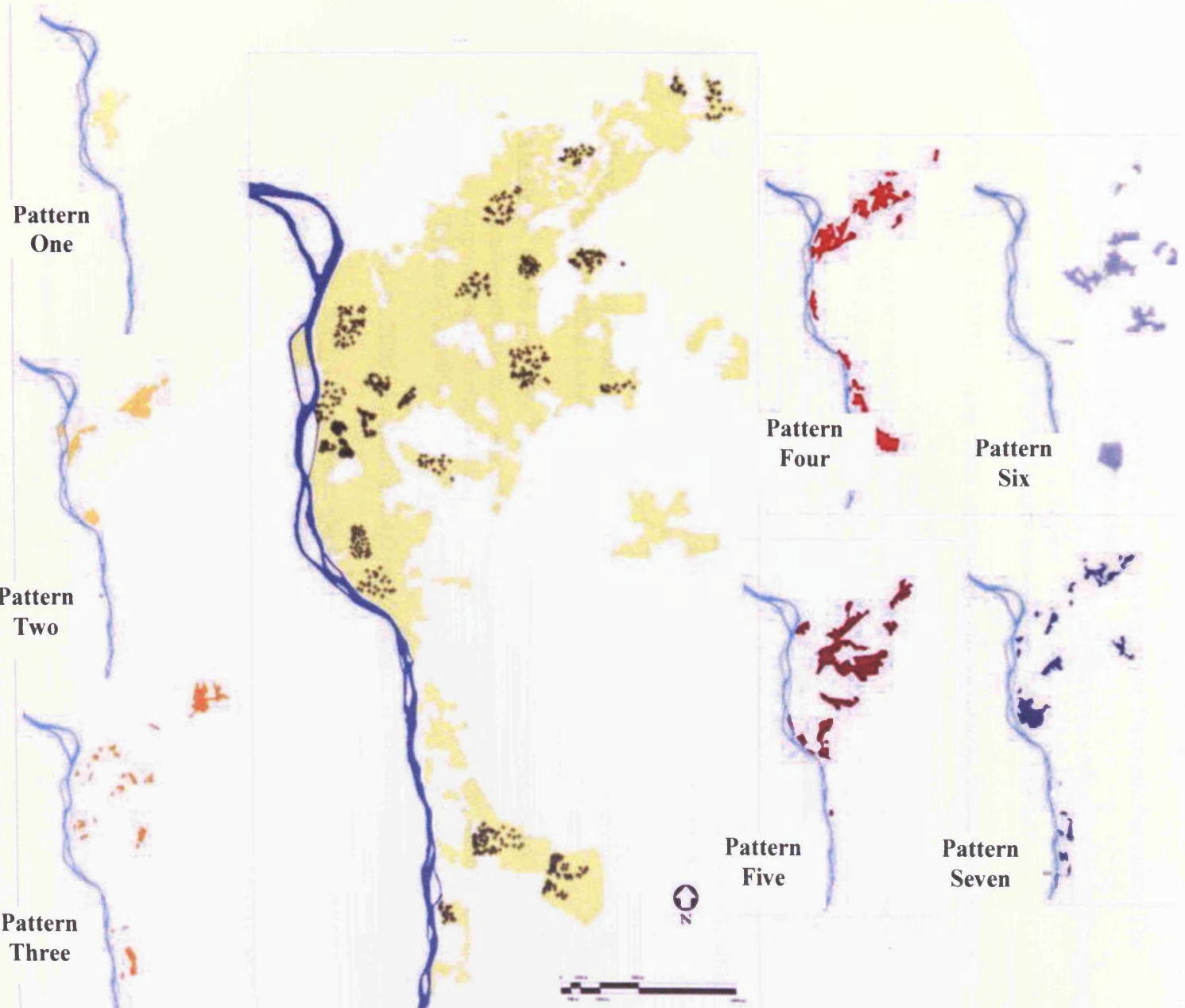
6-3- Type of space visited [categories were: (1) *Public (municipal garden and parks)* – (2) *Private (membership clubs, or privately owned)* – (3) *I do not know*]

6-5- length of stay per visit [*continuous variable in hours*]

6-6- Means of reaching GS [categories were: (1) *Walking* – (2) *Cycling* – (3) *Bus* – (4) *Private car* – (5) *Underground* – (6) *Microbus*]

6-7- Have to pay to reach and/or utilise the GS [(1) *Yes* – (2) *No*]

6-19- Willingness to participate to enhance local green space [Choose as much as wanted from: (1) *Pay money* - (2) *Give time & effort* - (3) *Donate plants & site furniture* - (4) *Provide advice & consultancy* - (5) *Donate a plot of land* - (6) *Do not want to participate*]



Pattern One

Pattern Two

Pattern Three

Pattern Four

Pattern Six

Pattern Five

Pattern Seven

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