



Urban growth and environmental degradation

The case of Cairo, Egypt

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The immense growth of cities, especially in developing countries, is resulting in the urbanization of both poverty and environmental degradation to a greater degree than ever before. This paper examines the processes of growth and degradation in the Greater Cairo Metropolitan Region (GCMR), currently the world's tenth largest mega-city. It reviews the region's growth and selected environmental issues as well as impacts of current efforts on managing the region. The assertion of this paper is that current management policies and bodies lack a comprehensive view of urban governance for the region, which does not bode well for the future environmental and economic sustainability of the region.

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Introduction

At the close of the 20th century, the concentration of population in the world's cities is occurring almost exclusively in the underdeveloped countries, such as Egypt. During the 1990s, the world's urban population increased from 2.4 to 3.2 billion people, with significant urban growth to follow in the current century (Setchell, 1995). Up to 95% of the 800 million additional people who came to live in cities during the 1990s are in developing countries (UNDP, 1997, p 1–2, 10). Not only is urban growth soaring there, but the number of very large cities – those over four million people, often known as mega-cities – is growing rapidly as well (Setchell, 1995). In 1960, the world contained 19 mega-cities, with nine in developing countries. By the year 2000, 66 such cities were predicted, with 50 in developing countries (UNDP, 1997, p 12–15). The world's largest, Mexico city, has a population of approximately 25 million, a total equal to the world's entire urban population at the dawn of the Industrial Age in 1750 (World Bank, 1997, p 16).

This pattern of urban growth has two contradictory

facets. On the one hand, mega-cities act as engines of economic and social growth, but on the other hand, most of this is also being accompanied by the urbanization of both poverty and environmental degradation. The definitions of poverty vary widely. Conventionally, Third World poverty was viewed as a rural-based phenomenon. However, this definition would become obsolete when the number of poor urban households living in absolute poverty exceeded those living in rural areas (Rodenbeck, 2000). Moreover, rural-based notions of environmental degradation in developing countries are in need of revision as well. Cities, where more than half of humanity is living by the end of the century, are generators of enormous amounts of domestic and industrial wastes of various kinds. These wastes often cause severe and widespread environmental damage to ecological systems within and adjacent to urban regions (Setchell, 1995).

The growth of the Greater Cairo Metropolitan Region

Egypt's Greater Cairo Metropolitan Region (GCMR), with over 12 million people (CAPMAS-a, 1997, p 89), is now the tenth largest mega-city in the world and could grow to 16 million by the year 2006 (World Bank, 1997). The GCMR occupies 928 km² of central

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Egypt, located adjacent to the Nile river. The region contains the Greater Cairo Metropolitan Area (GCMA), which itself includes two major cities, Cairo and Giza. The region is spatially distributed over three governorates: Cairo, Giza and Qaliubiah, while the GCMR contains the cities of Cairo, Giza, Shubra El Kheima, five small towns, 10 villages and contiguous suburban and agricultural areas (Fig. 1). There are also five satellite towns, the Tenth of Ramadan, Sixth of October, Obur, Fifteenth of May and Asalam, which are located adjacent to the boundary of the region but not included in it.

Not unlike most mega-cities, the GCMR is the most important settlement in the country, and serves as the center of government, finance, commerce, education and culture, as well as transportation. Again, like many other mega-cities, these features also make the GCMR the national citadel of the expertise, resources, and political power needed to combat chronic economic, social and environmental problems.

Unlike most other cities, however, the GCMR is also the hub of one of the world's hottest political and economic areas – the Middle East – and is a connection between east–west and north–south regions. The GCMR region, also, has witnessed dramatic economic changes, including the transformation of the Egyptian economy from state-controlled to state-

organized economic mechanisms, during the last 40 years. In the 1990s, after privatization, economic reform and liberalization of the market mechanisms, the region observed the growth of national economies, which expanded in real terms at an annual average rate of approximately 6.2% during 1994–1997 “boom” period (Rodenbeck, 2000). Furthermore, the GCMR’s role as the center piece of the Egyptian economy actually increased during this period, and now accounts for over 45% of GDP, and nearly 40% of manufacturing output. The boom had its origins in the late 1980s, when the Egyptian government adopted an economic reform strategy that largely followed the standard prescriptions of the International Monetary Fund and the World Bank (Bush, 2001). The Economic Reform Policy emphasizes the stimulation of private investment and promotion of national-export-oriented industrialization, based primarily on manufacturing activity. The measures adopted include privatization, public sector reform, price liberalization, and opening markets to the world economy (Bush, 2001). These measures also include the passage of business-friendly commercial legislation, and the offering of incentives to foreign investors (Rodenbeck, 2000). Pursuit of this strategy has tended to pander to wealthy industries and foreign investors rather than encouraging small-scale enterprises. This process led to a rapid transformation of small-scale industries into other GCMR-based service businesses, and increased the number of large manufacturing-oriented and service industries in the region. The policies which helped spawn rapid, GCMR-based growth served as the basis for the IMF’s recent recognition of Egypt as a “model” for other developing countries to follow. This model, however, has less to do with specific policies per se than a combination of both policies and conditions in and out of Egypt, which acted to accelerate growth and concentrate it in the GCMR.

This rapid, export-oriented manufacturing growth, along with other factors, has also been a major source of environmental degradation in the GCMR. There are now over 27,000 registered factories in the CMR (Cairo Metropolitan Region which contains the cities of Cairo and Giza), more than 40% of the national total (CAPMAS-b, 1997, vol 2, SA7, p 18). Moreover, factory growth in the two satellite towns of Tenth of Ramadan and Obur outside the GCMA increased by 52% during the 1985–1989 period alone, leading to the emergence of a new industrial belt. However, due to a lack of effective land management policies, factories are scattered throughout the GCMR, and interspersed with other land uses, making it difficult and costly to provide services. Furthermore, housing compounds, recreation, and media and service developments in the Sixth of October satellite town alone increased by 76% in the period 1994–2000. This type of development, also, is a burden on the GCMR, as the satellite towns are not independent in terms of services and infrastructure. Compounding

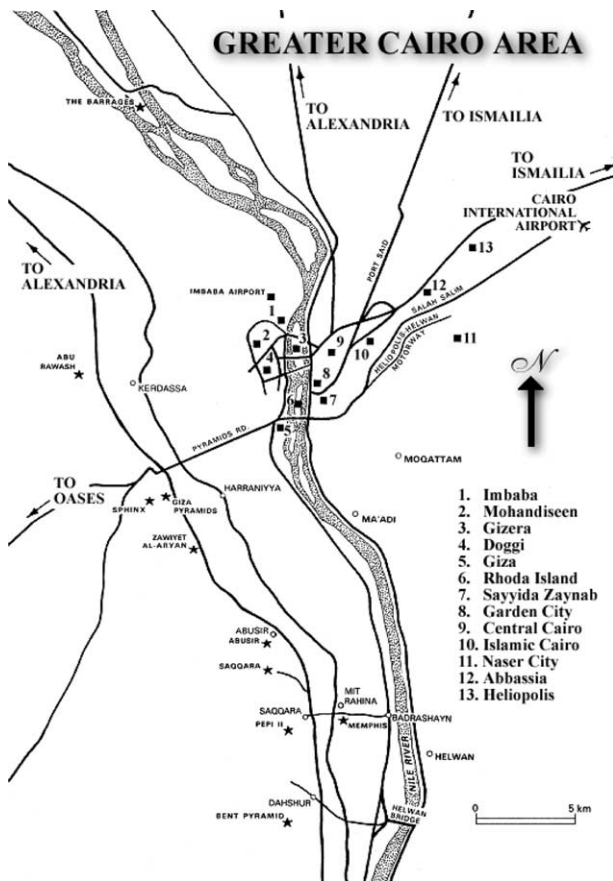


Figure 1 The GCMR (adapted from Touregypt, 2001)

the lack of planning and services to mitigate the adverse impacts generated by factories is the structure of the manufacturing sector. Nearly 92% of the GCMR's factories employed 50 or fewer workers in 1987 (CAPMAS, 1990, vol 2, SA7, p 40), and while factories opened since that time have employed larger number of workers, the manufacturing sector remains dominated by small firms. Typically, these firms do not have the space, funds or incentive to build and manage water and air pollution control systems. Efforts to relocate highly polluting factories into the GCMR's roughly 250 industrial estates, where infrastructure is marginally better, are both very costly and poorly organized. In combination with rapid industrial growth, other forms of GCMR-based development have severely exacerbated a range of problems that have existed for many years – these include chronically inadequate infrastructure, rapid and widespread environmental degradation, and growing social inequities (Bush, 2001). A key underlying problem has been the inability of state institutions to produce effective urban development policies or provide adequate public services. Resolving the GCMR's many problems, then, will have to include an effort to redefine the state's role in the urban sector.

The assertion of this paper is that current urban management policies and institutional bodies do not constitute the degree of reform needed to alter the trend of increasing environmental degradation caused by Egypt's on-going economic transformation and concentration of GCMR-based economic growth. Instead, a concerted effort is needed to transform urban policy and institutions to manage the impacts of the on-going economic transformation. Unfortunately, such an effort has no precedent in recent Egyptian history, which does not bode well for the long-term environmental and economic sustainability of the GCMR. In the remainder of this paper, demographic, economic and physical changes associated with rapid growth in the GCMR are noted, followed by a discussion of the major environmental impacts associated with that growth. The changes and impacts noted are generally similar to those found in other mega-cities. Finally, current efforts to manage GCMR development will be reviewed, as well as recent changes in urban and environmental policy aimed at fostering more effective management of the development process.

Recent demographic, economic and physical changes in the GCMR

Demographic change

A century ago, Cairo was already a rather crowded capital, with more than half a million inhabitants. The 1996 census estimated the population for Greater Cairo to be 11.2 million (CAPMAS, 1990; CAPMAS-a, 1997; CAPMAS-b, 1997) and, given the present population growth of Cairo, estimates under status quo conditions for the year 2005 of around 15–20

million inhabitants seem not at all unrealistic (Towfighi, 1987). The GCMR population has increased by an annual average rate of approximately 4.7% since world war II, and currently totals over 12 million people (CAPMAS-a, 1997; CAPMAS-b, 1997). Moreover, the GCMR share of national population increased from 12.5% in 1960 to 22.7% in 1996, and could reach 25% by the year 2010, which would be wholly consistent with the trend of population concentration occurring in other mega-cities (Setchell, 1995). This concentration is also occurring in a period of rapid urbanization. During the 1976–1996 period, population growth in urban areas accounted for 35.2% of the 20 million people added to the national population (CAPMAS-a, 1997; CAPMAS-b, 1997, SA-1, p 28). This trend – of rapid urban growth – will continue for the foreseeable future. While garnering an increasing share of national population, growth within the GCMR is assuming an increasingly decentralized pattern. The population of Giza, Qalubiah increased by 49.5% during the 1976–1996 period, while Cairo increased by 24.8% during the same period (see MHNCU, 1988 and 1992). This pattern of decentralization is also occurring in many other mega-cities (Setchell, 1995; Table 1).

For a number of reasons, including higher levels of education, rising incomes, and a highly successful family planning program, the average GCMR household size declined from 6.23 to 4.47 people during the 30-year period ending in 1990 (NUPS, 1960; 1970; 1980; NUPS, 1992). Thus, while the GCMR population increased by 161% during the same period, the number of households increased by 263%. Each of these smaller, though far more numerous, is currently generating tremendous demands for housing, urban services of all kinds, motor vehicles and a wide range of other consumer items. This cumulative demand for goods and services is also further placing strains upon environmental conditions.

Economic change and the growth of poverty

While GDP was increasing in Egypt during the 1986–1996 period by 118%, the GCMR share was increasing from 42.4 to 50.1% (Rodenbeck, 2000). By the end of 1990, GDP per capita in the GCMR was roughly US\$ 1890, whereas GDP per capita in the rest of the country was barely US\$ 820. The trend towards an increasing GCMR share of economic output shows no sign of abating in the near future, however. Increasing spatial disparities in economic activity have also produced growing disparities in household income. During the 1975–1988 periods, the share of total income earned by Egyptian households in the bottom 20% of the household income spectrum declined from 6.1 to 4.5%, while the share earned by households in the top 20% increased from 38.9 to 55.0% (USAID, 1997, vol 2, SA6, p 47). This increase in income disparity gave Egypt the distinc-

Table 1 Rates of annual population growth in the GCMR on the governorate level

Governorate	1937–1947	1947–1960	1960–1966	1966–1976	1976–1986	1986–1996*
Cairo	4.7	3.6	4.1	1.7	3.4	3.1
Giza	2.4	4.2	5.0	3.9	4.5	5.4
Qaliubiah	2.0	3.1	4.2	4.3	5.8	6.2
Total GCMR	3.9	3.7	4.2	2.5	4.0	4.5

Source: NUPS (1992), CAPMAS (1987), CAPMAS-a (1997), CAPMAS-b (1997). * Estimates according to the census of 1996.

tion of having the most inequitable income distribution among several countries in Africa and elsewhere. By 1995, the spatial disparity in income had also become extreme, with monthly household income in the Greater Cairo Area (GCA) averaging US\$ 124, in contrast to the rest of the country, where it was only US\$ 68. A recent World Bank study of poverty in six African countries found that roughly 16 million Egyptians are now living in absolute poverty (World Bank, 1997). Not only was there a negligible reduction in the percentage of Egyptians living in poverty – 17% in 1980, compared to 16% in the 1990s – but also population growth during the 1980s ensured that Egypt registered an increase in the number of people living in poverty (UNDP, 1991). This increase was not insignificant, for during the 1980s the number of Egyptians living in absolute poverty grew by roughly more than one million (UNCSD, 1997).

Widening income disparities, concurrent with increasing economic growth, also resulted in an increase in the incidence of absolute poverty within the GCMR. During the 1985–1988 period alone, the number of households living in absolute poverty in the municipal areas of the five CMR (Cairo Metropolitan Region) provinces outside the GCMR increased by 225%, the largest percentage increase of any municipal area in Egypt during the period. Thus, the aforementioned shift of population to urban areas has been accompanied by an increase in poverty, particularly in rapidly growing areas of the GCMR.

As long as extreme spatial disparities in levels of economic activity and household income remain at the national level, which appears likely, the flow of people to the GCMR, and the demands they place on services and the environment, will increase beyond projected levels. Efforts to tackle both the income disparity and absolute poverty problems will thus have to be considerable in the extreme if any notable change is to occur.

Physical change

Cairo’s urban structure and its public facilities were laid down for 2 million inhabitants. As a consequence of the immense growth in the population of Cairo, the agglomeration diseconomies and disadvantages have become more and more challenging, for the national as well as for the city government (Jenssen et al,

1981). The official physical development goals for the city are shown in the Master Plan for Cairo (1970). The decentralization features – de-concentration of industry, housing, and social facilities to the near periphery of Cairo, are the specific features of this plan (RCTDP, 1979), which is, 30 years later, still the only official guideline for infrastructure investment in Greater Cairo. Master planning in Cairo emphasizes physical development; eg road network, water supply, and sewage disposal (MHR, 1976), probably as a result of local political and technocratic attitudes towards urban planning and the management of a city. It is still, however, doubtful whether that plan succeeded in achieving its goals. The urban portion of the GCMR, at roughly 602 km² has increased more than three-fold since 1974 (Fig. 2).

The population of the Cairo metropolitan area has

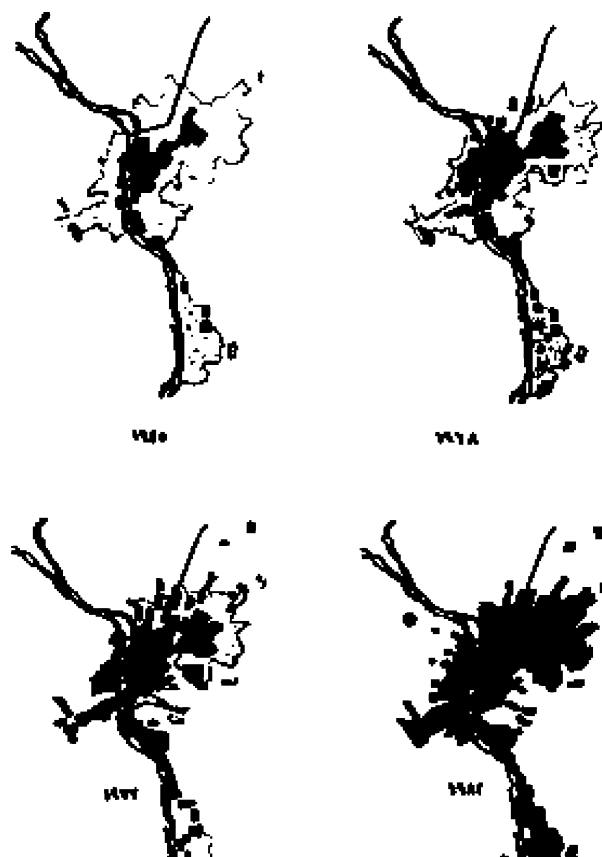
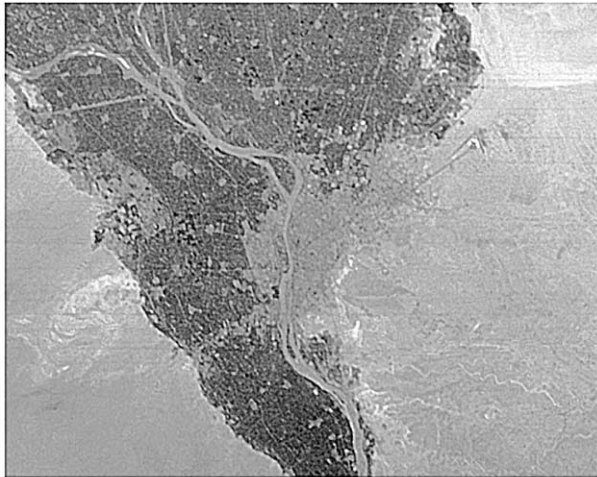


Figure 2 Greater Cairo urban fabric 1945–1988

increased from less than 6 million in 1965, when Fig. 3 was taken, to more than 10 million in 1998 (UNPD, 1999). Population densities within the city are some of the highest in the world, and the urban area has doubled to more than 400 km² during that period. This growth will lead to more spatial expansion of the region.

Much of the land converted to urban use was highly productive agricultural land. The loss of this resource during the 1981–1988 period alone was 340 km². Moreover, farmland has often been replaced by development along major transport routes in ribbon-like fashion, particularly in areas outside the GCMA. These corridors are intensively utilized to the point of severe congestion, in stark contrast to the large tracts of relatively underutilized land located between major corridors. Furthermore, this form of decentralized development has been occurring at a rapid rate.



Cairo 1965



Cairo 1998

Figure 3 Urban growth of Cairo 1965–1998 (collated from NASA, 2001)

During the 1976–1984 period, for example, 45% of the land converted to urban uses occurred at a distance of 11–20 km from the urban center. The trend continued during the 1984–1988 period, as 45% of the land converted to urban uses occurred at a distance of greater than 30 km from the urban center (PADCO, 1990, p 123). These extensive development patterns will not only add but also guarantee higher infrastructure costs and energy consumption levels in the future (Fig. 4).

As alluded above, base economic growth has included the location of finance and other activities related to the management of investment capital. These activities in particular have changed the face of the GCMR. In the GCMA alone, for example, more than 2100 buildings of six or more stories were approved for construction during the 1987–1992 period. These approvals could result in a 230% increase in the high-rise inventory because most of these buildings have been built and occupied, while others are in various phases of completion.

The current, haphazard form of urban growth can be explained, in part, because the GCMR was, until the earthquake of 1992, perhaps the largest urban area in the world without an officially adopted development plan. While plans were proposed in the past, none were formally adopted as an official “statement” regarding Cairo’s future until 1992. The new plan, for example, had been in draft status since 1965, owing largely to the influence of powerful real estate interests and the corresponding lack of an institutionalized urban planning process or urban planning ethic. Thus, the lack of effective land management institutions and policies prior to and during the recent economic



Figure 4 Development of Cairo over suburban and agricultural areas in 1999 (extracted from: IKONOS Space Imaging, 2001)

changes has led to a predictable result: the congestive expansion of urban activities throughout the region (see also Sutton and Fahmi, 2001). Public sector inability to adopt effective land management policies, coupled with the emphasis on the facilitation of rapid economic growth, has produced an urban region so very complicated in its nature of both problems and proposals for development.

The environmental impacts of the GCMR urban growth

Traffic and transit

Transportation is currently the most widely debated development issue in the GCMR, because its traffic conditions are so severe and they affect so many people. It is increasingly difficult to identify peak travel periods, for congestion now exists throughout the metropolis from early morning to late evening. The notion that one can escape congestion by moving to the suburbs has become more of an illusion in the GCMR than perhaps in any other city. In 1989, the average travel speed on main roads in the Cairo metropolis was 8.1 km per h during peak hours especially in downtown areas (TETC, 1990, Executive summary, 1-6 to 1-7). Despite the design and execution of major transportation projects, that include the Cairo subway, ring road and bridges, the GCMR is suffering from congestion, accidents and delays in many points of connections, and bad road conditions. The principal causes of this are the rapid growth and the unrestrained use of private vehicles; a poorly developed road network; inefficient investment in the current mass transit system (ie the public bus fleet); lack of monitoring and maintenance; and poor planning and government indecision. During the 1978–1991 period, the number of motor vehicles registered in the GCMR alone increased from 0.5 million to over 2.6 million, an annual average rate of 13.5% (GCU DS, 1992, A-16). While on an average 446 vehicles were added to the GCMR motor vehicle fleet every day during this period, future projections are even more ominous, as the phase of large absolute growth of the motor vehicle fleet is only just beginning. By 2006 the number of private vehicles may increase by three to four times the 1991 level. By comparison, while the number of motor vehicles increased by 250% during the 1978–1988 period, the number of buses – owned or franchised by the Cairo Mass Transit Authority – increased by just 6.7% during the 1978–1989 period. Moreover, despite the low level of bus fleet growth during this period, the average number of passenger trips per day increased by 84.7% (TETC, 1990).

A major reason for GCMR traffic problems is the lack of a fully developed road network, even though the government introduced new ring roads, new bridges and direct expressways to connect different parts of the region. However, the missing links in the network are the secondary roads that connect arterials

with the interior of the city, especially in the downtown area (Fig. 5). There, streets are mostly narrow and are often crowded, serving mixed land uses, and are typically connected directly to the arterials. As a result, large areas of the metropolis delimited by major arterials have no interior network of roads to link the network together to permit movement through the areas. These “super blocks” thus preclude the route options created by a network of secondary roads, forcing drivers to arterials for even the shortest of trips.

The GCMR will remain in contention for having the world’s worst traffic conditions well into the future due to the limited potential of proposed projects to ameliorate prevailing conditions, let alone solve traffic problems. Until recently, seven major transport projects, including three rail mass transit systems (Cairo Subway Rail System), were being promoted as solutions to current and foreseeable traffic conditions, at a cost approaching US\$ 15 billion. A 1991 consultant report on these “mega-projects” identified 33 design and routing conflicts which would prevent them from acting as a unified and coordinated transport system (TETC, 1991), thereby all but eliminating the benefits to be derived from building the projects. It could take several additional years to resolve the contractual, technical, institutional, and financial problems associated with the eight mega-projects, and several more years before they become operational. In the interim, of course, traffic conditions will continue to deteriorate. After the completion of the third stage of the subway rail system and the ring road, it is still evident that traffic conditions in major central parts of Cairo and Giza will be congested.

Apart from the impact of some or all of the mega-projects, a number of low-cost traffic management measures can be implemented immediately and result in noticeable improvement in current conditions. Among them is the use of – and enforcement – bus lanes, along with increased number of buses, with a major reduction in the operation and number of private minibuses. Bus lanes have been used on main roads in central Cairo on occasions in the recent past, but opposition from private vehicle users has always resulted in the removal of bus lanes after a short period of time. Other measures could include the decrease of parking spaces, increased parking fees, encouraging car pooling, staggered work hours, road pricing, and area licensing schemes.

Idling traffic has become an issue of national consequence, for this unproductive activity millions of dollars of fuel are wasted annually. In 1986, about 56% of final energy demand was in the transport sector, from 46% in 1973. More importantly, the 56% share was the highest such level of 13 African countries surveyed by World Bank (UNDP, 1991). Only South Africa, with a 36% share, approached the Egyptian figure. While the share is projected to fall slightly to about 52% by 2001, largely due to

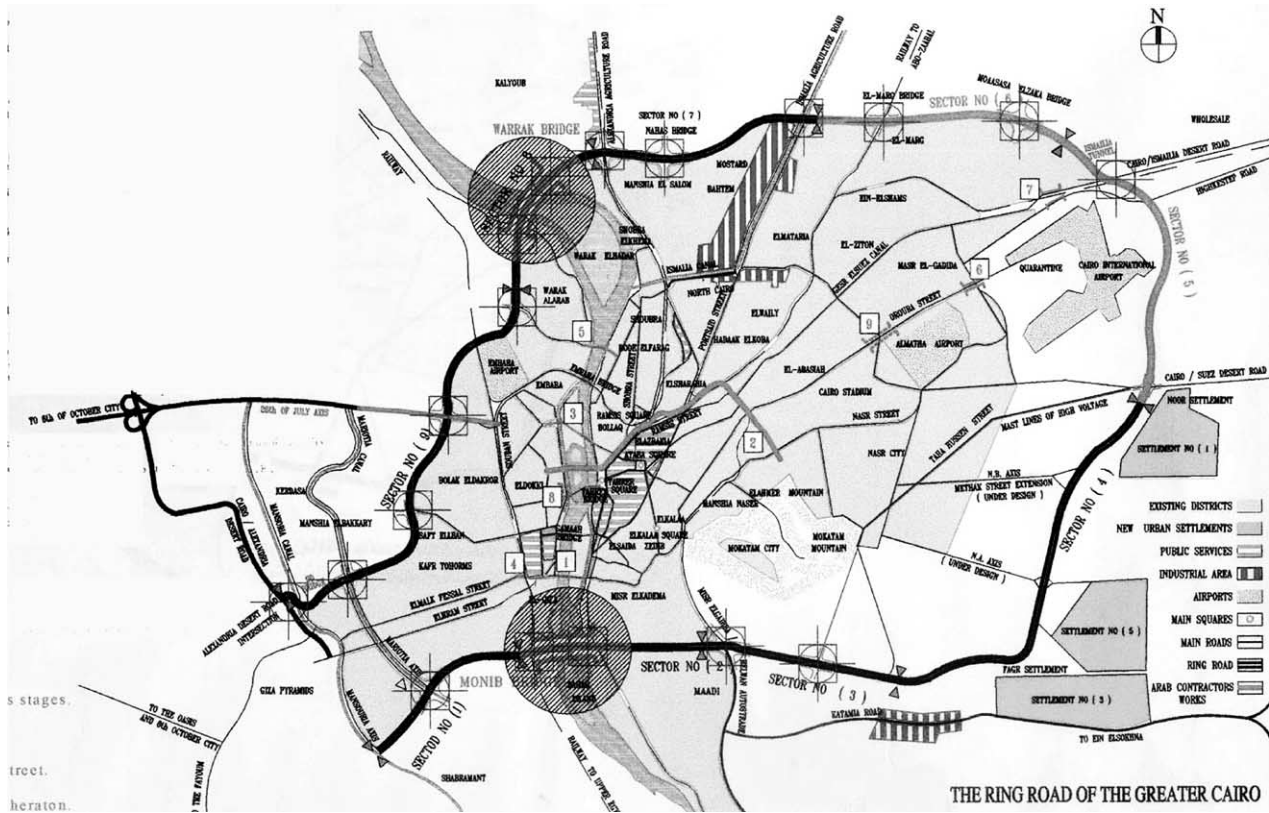


Fig. 5a (A) A map showing the ring road around Greater Cairo (TETC, 2000).



Fig. 5b (B) the ring road was executed over agricultural lands on the fringes of Cairo (The Arab Contractors, 2001)

increased consumption in other economic sectors, the share of final energy demand in the transport sector will still be much higher than in neighboring countries. The unplanned settlement pattern and accompanying traffic congestion of the GCMR, as well as other cities, thus appear to have become a major drain on the national economy. The woeful state of traffic conditions recently prompted Egypt's Ministry of Transportation to estimate the cost of fuel consumed while idling in traffic to be US\$ 500 million per year. While the range of cost estimates is quite broad, the direct cost to GCMR residents is not insignificant. Each of the nearly 1.92 million households living in the GCMR in 1996 "paid" US\$ 260 per year or the equivalent of 16 weeks of average household income, solely for the purchase of fuel to be wasted while idling in traffic.

Air quality and public health

Motor vehicle emissions currently account for 60–70% of all air pollution in the GCMR. In addition to contributing to various atmospheric problems, vehicle emissions along major roads in the more intensively developed portions of the region were found to be dangerous to human health between 1989 and 1997, based on studies conducted by the national environmental board (UNCSD 1997). Using an air quality index of 100 as the maximum acceptable tolerance

level, the board measured an annual average of 277. Another study found that approximately 900,000 GCMR residents – almost 10% of the total population – suffered from respiratory illnesses due to air pollution (Rodenbeck, 2000; UNCSA, 1997). The introduction of low-lead fuel in 1991 was a positive step, but it will take years of concerted effort to improve the city's air quality. Cairo's children now have the highest blood lead levels in the world, even exceeding the levels found among the children of Mexico city, long viewed as the city with the worst air pollution in the world (UNICEF, 1990). For some, exposure starts early: new-born babies are now showing signs of lead poisoning, due to large part of exposure of mothers to air-borne lead during pregnancy. Chief among the adverse impacts of high lead levels in children are mental retardation and IQ loss, as well as neurological and muscular disorders (UNICEF, 1990). Fig. 6 depicts the exposure of pedestrians to motor vehicle emissions on a regular basis, like the sidewalk pictured here; often street vendors' commodities are laid open to the highly polluted air.

Industrial emissions are the other major source of air pollution in the GCMR. Not only has the number of industries grown rapidly in the recent past, but also many factories now burn lignite (a soft coal) to cut operating expenses (CAPMAS-b, 1997, vol 1, SA7, p 50). As long as pricing policies favor lignite over cleaner fuels – and readily available ones – the growing number of factories in the GCMR could also result in exceptionally high levels of industrial air pollution (Fig. 7).

The severity of GCMR air pollution is underscored by a recent study of thousands of children in Los Angeles, an American mega-city with far better air quality than the GCMR. The study found that children in Los Angeles have permanent lung damage from air pollution by the age of 10 (UNICEF, 1990). When

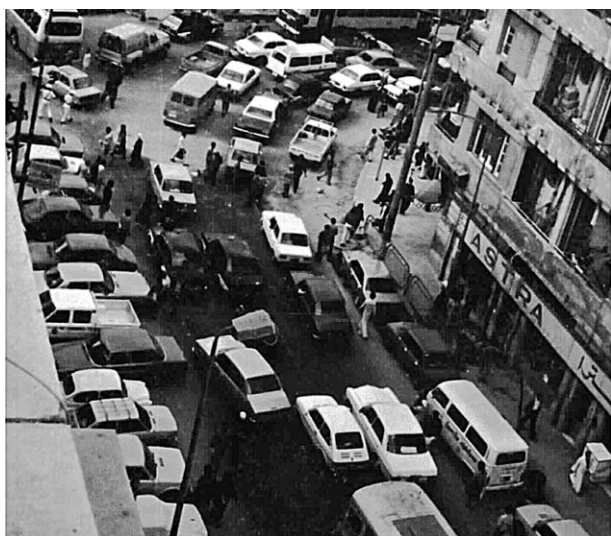


Figure 6 Pedestrians are exposed to motor vehicle emissions in downtown



Figure 7 Example of industrial pollutants in the region

applied to the GCMR, this suggests that current air quality conditions pose a far greater risk to public health than it is currently known.

Water quality

Cairo's river once served as the basis for the Egypt's description as "Egypt is the gift of the Nile". The Nile, some of its canals that have not been filled for use as roadways, along with the other waterways, now receive all manner of untreated industrial and domestic pollutants and have become dangerously polluted. The Nile river, for example, which nearly bisects the CMR north to south, typically has a level of dissolved oxygen (a measure of the "ability" of water to support life and synthesize organic pollutants) of almost zero. Within the GCMR alone, about 1.5 million m³ of wastewater are released into waterways every day. The latest in a long line of proposals to improve GCMR water quality is a US\$ 256 million sewerage and secondary treatment system; however, this recently approved system is only capable of treating 510,000 m³ of wastewater per day, or only 33% of current wastewater volume. Even with the improvements of the wastewater treatment system, water quality is not anticipated to improve radically due to predictable population growth.

Waste management

The GCMA was burdened with the task of collecting and disposing of 6100 t of garbage per day in 1987. The total rose 17.6% to approximately 7000 t per day in 2000 (UNCSA, 1997). By comparison, the GCMA population increased by only 4.5% during the 1987–1996 period, reflecting a trend found elsewhere of increasing levels of waste per capita as incomes and purchases of heavily packaged consumer items increase. In addition, although collection rates have improved dramatically over time, the treatment and disposal of garbage is still a major problem. Runoff from the GCMR's three open dumpsites, for example,

enters ground and surface water supplies, posing unknown but potentially hazardous problems. Furthermore, given current rates of waste generation, the dumpsites will reach capacity in six to seven years. Although roughly 90% of the garbage generated per day in the CMA in 1991 was collected and disposed of, most of the 6000 t per day that was not collected was either burned or dumped into waterways or onto unauthorized sites. Most of the estimated 2760 t of refuse generated daily in the five towns outside the GCMA were disposed of in a similar manner, due to much lower collection rates. The rapid emergence of manufacturing activities in recent years has resulted in a shift from largely organic forms of refuse to greater quantities of hazardous (and toxic) waste. GCMR-based industries alone generated over 1.4 million t of hazardous waste in 1991, which represented 70% of the national total at that time (CAPMAS-b, 1997, vol 2, 5A7, p 86). Nearly all of this waste, along with increasing amounts of medical waste, is disposed of in much the same way as garbage. Only one hazardous waste treatment plant exists in the GCMR, but it only has a treatment capacity of 40,000 t per year (UNCSO, 1997). Therefore, <3% of the hazardous waste generated by GCMR factories in 1991 was treated prior to disposal. Domestic and industrial waste generated in the GCMR has never been adequately and safely treated and disposed of. Additional GCMR growth in the coming years is likely to mean greater generation of hazardous, toxic and medical waste, as well as the distinct possibility that these wastes will generate irreversible and significant adverse public health and environmental impacts.

The growth of slums and informal housing

The link between poverty and environmental degradation in mega-cities is often most visible in slum and informal settlements. These dense concentrations of human and economic activity are often located near factories, garbage dumps, or other noxious activities where eviction pressures are relatively low. While slum residents typically plan, finance, and build their own communities, they do not have the financial resources to also construct basic infrastructure like waste disposal and drainage facilities. With little assistance forthcoming from outside the slums, these facilities are often inadequate, resulting in degraded and unhealthy living and poor environmental conditions. Informal housing and slum areas are, in most cases, the source of environment pollution, both above and under ground, slum and informal communities in the GCMR are typically found in the developed portions of the GCA. During the 1977–1987 period, the GCA slum housing stock declined in relative terms compared to the overall housing market (PADCO, 1987). This declining share of stock was attributed largely to the dramatic increase in housing built by the private (informal) sector. However, dur-

ing the 1987–1992 period, when average annual economic growth was 10.6% in real terms, the GCA informal housing market increased in size by 69%, while the overall GCA housing stock increased by 34% (El Araby, 1993). This relative growth of informal housing apparently reversed the trend of relative decline during the 1977–1987 period. As of 1992, then, roughly 19.4% of the GCA urban population, or nearly 2.5 million people, were living in slum and informal communities, compared to 19.3% in 1974. Not unlike the persistence of poverty noted earlier, the 1992 share of GCA population living in slums was similar to the share found in 1974.

Estimates of demand for GCMR slum and informal housing during the Seventh Plan period (1992–1996), based on ability to pay, indicate that the official 1992 slum housing stock could have increased by 81% to roughly 426,000 U by 1996 (CAPMAS, 1991, p 111). By comparison, the remainder of the GCMR housing stock was projected to increase by 26%. Rapid urbanization, coupled with growing poverty and income inequality, could thus give rise to higher rates of slum formation in the coming years, and thus expose even more people to unhealthy and degraded environmental conditions (Kardash, 1992). Fig. 8 depicts the urban fabric of *Manshiet Nasser*, one of the largest informal areas in Cairo, where urban poverty, informality and degradation were no obstacles for incessant development.



Figure 8 Informal development at Manshiet Nasser, South Cairo

The Seventh Plan contains four policies aimed at improving the living and environmental conditions for the GCMR slum and informal residents. These policies, however, are generally similar to those found in previous National Plans, which have proven to be ineffective, if current slum conditions are considered at least a partial outcome of past policy performance. It thus appears that reliance on recently adopted policies alone will do little to improve the living and environmental conditions of nearly 1.5 million GCMR slum and informal residents.

Efforts to manage the GCMR

There are now over 30 local and national government agencies and ad hoc committees involved in some aspect of planning and management in the GCMR. However, only one region-wide institutional entity – the GCMR Development Committee, or GCMRDC – exists to address the many and complex issues posed by rapid economic growth. The GCMRDC could have a major impact on planning efforts simply because it is a cabinet-level committee chaired by the Prime Minister. However, this committee has met only once since it was established in 1986. With so many actors and overlapping mandates, and an inactive GCMRDC, it is extremely difficult to coordinate efforts or enforce existing regulations, let alone initiate new programs designed to improve living and environmental conditions.

Not unlike in other countries, where government authority is highly centralized, local governments in the GCMR are unable to address the impacts of growth in an effective manner because they are dependent upon national government ministries for technical and financial resources. Moreover, these ministries are typically focused on promoting economic growth rather than supporting local efforts to address the adverse impacts of growth. Furthermore, these efforts are weakest in precisely that area of the GCMR which is growing fast outside the GCMA and which has, already, an equally rapid deterioration of environmental conditions. This deterioration is occurring because of ineffective planning policies and inadequate services.

Despite the conflicts noted above, recent political and institutional changes at the national government level enhance the potential to address CMR-based planning and environmental issues. The previous government with Prime Minister Atef Sidqi included a Ministry of Environment. With its creation, two major institutions were introduced to respond to pressing urban development issues. First, a new National Environment Act was enacted, which includes both investment incentives for would-be polluters and much stricter and more comprehensive regulations. The Act also created an Office of Environmental Policy and Planning, within the newly created Ministry of Environment. This ministry replaced the National Environment Board, which had

been an advisory body that was not attached to any ministry. While the government's general concept of environmental awareness is absolutely the last chance to tackle the region's spatial development problems, some factors work against that. First, most of the official development programs and concepts lack economic vitality. They are, rather, purely physical planning concepts, which distribute land uses to suitable areas and claim immense investments in roads and facilities. These concepts are in part based on assumptions which politically, financially and economically turn out to be unrealistic. Secondly, despite Egypt's success in following the IMF model of economic reform – the Economic Reform policy of the 1980s and Privatization act of the 1990s – attracting foreign investment is still very limited, may be because it depends on many other factors. With the impact of globalization, some major local industries are suffering from competition, investments and finance. Lacking further investments in existing local industry – most of them are polluters – will add a new burden on these industries for paying and funding clean-up efforts. The relative absence of foreign and private local investment is an unexpected reality for environmental economic planners. Thirdly, the informal housing and economic sector is an essential element of Cairo's urban economy and urban structure (Eldemery, in press). This sector has not yet found official support. Unfortunately enough, this sector is still considered as a parasitic element of underdevelopment. However, efforts to manage the region's environment have to take into account the impacts of rapid and uncontrolled development within that sector. The positive factors of the informal sector for the development process, eg job creation, community development and training, are not officially recognized. Thus, they are not introduced as an element in any ambitious environmental development programs. Fourthly, NGOs and other groups are now emerging as perhaps the most promising force to elevate the social and environmental consequences of growth to the status of issues on the agenda of governance. Government inability to manage growth, coupled with increasingly intolerable living and environmental conditions, has even stirred the GCMR's elites to act. Sometimes, government gives positive responses to the pressure of those elites. In turn, this response may encourage other, less influential groups to demand greater participation in addressing other environmental issues. Fifthly, hindered by the often-criticized Egyptian bureaucracy, that seems to be unchangeable under local conditions, development projects often lack efficient management and responsible implementation. And finally, following Western (European or American) goals and concepts imported by the local elites, educated and trained abroad and transferred by foreign experts in all sectors, many of the projects seem to be very ambitious in the Egyptian context. The standards selected are in many cases far too high, they consume most funds

and the resulting benefits are for a few only. Nevertheless it can be stated that the national efforts for environmental control – despite the qualifications made above – are essential and absolutely indispensable in taming the agglomeration of Greater Cairo Region.

Summary and conclusions

Worldwide, shelter, service, transports, social, and environmental shortcomings constitute a major part of the growing urban crisis, and pose a direct threat to long-term economic sustainability and urban environmental quality. As centers of thought, power and resources, mega-cities like the GCMR also provide the greatest hope for change, as well as models for urban development in smaller cities. Not unlike in other mega-cities, the main problem of managing GCMR growth is not the lack of attention, expertise or resources, but an inability to translate widespread public frustration with existing conditions to the political pressure necessary to compel the state to manage the metropolis effectively. A state response to any pressure that does evolve, however, cannot be based on past practices, for they have not worked, and will only lead to a continuation of rising social and environmental costs. Furthermore, the more capital-intensive form of urban development attendant upon the continuing transformation of the Egyptian economy will require more services, and greater coordination of activity, than ever before. This form of urban development is thus even more dependent upon effective state action to sustain it than in previous years, which underscores the need for new and different state responses. Decentralization of activities, services, industries, political power, governments and institutional bodies is a key factor if the government hopes to ease the current environmental problems in the region. The long-deferred costs of GCMR development activity, coupled with the need for innovative state responses to reduce these costs, make the short-term prospects for improvement of GCMR social and environmental conditions seem dim. Unfortunately, the degree of current efforts for managing the growth of GCMR does not bode well for the long-term environmental and economic sustainability of the GCMR.

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