

| Edition | Date | Purpose of edition / revision |
|---------|------------|--|
| 1 | July 2000 | Creation of document – DRAFT – Version française |
| 2 | Sept. 2000 | Final document– French version |
| 3 | Nov. 2000 | Final document – English version |

| EDITION : 3 | Name | Date | Signature |
|----------------------|--------------|------|-----------|
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WORLD BANK URBAN TRANSPORT STRATEGY REVIEW

THE CASE OF CAIRO EGYPT

WORLD BANK URBAN TRANSPORT STRATEGY REVIEW

**THE CASE OF CAIRO
EGYPT**

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

A) INTRODUCTION

The purpose of the study is to measure the impact of a transport policy on the accessibility and development of the Cairo urban area over the last 30 years. As stated in the terms of reference, the report will focus on the poorer sections of the population.

The increased density and sprawl of the built areas are the consequence of a number of factors of which the major ones are the physical and geographic features, transport supply, urban policy and the control of urban development, market laws, government aid, the weight of the property developers, consumer sensitivity to building quality and costs, travelling distances, tariffs, the immediate surrounding area, etc.

In this report, and in conformity with the terms of reference, we will limit our analysis to the influence of the transport policy on urban development, even though we might occasionally refer to other influential factors with a view to better understand the urban evolution of Greater Cairo.

B) THE TRANSPORT POLICY SINCE 1970

Since the Seventies, the transport policy in Cairo has been remarkable for the following aspects:

1. Continuous development of major road infrastructures (bridges over the Nile, urban motorway viaducts, underground carriageways and underpasses, ring roads, radial motorways). Many of these infrastructures are not accessible to public transport in the urban environment,
2. Development of a heavy metro network over 60 km long along the major transit corridors,
3. Partial liberalisation of the surface public transport network resulting in a considerable expansion of private microbus lines,
4. Progressive desertion of the tramway network and abandonment of all trolley-bus lines,
5. Failure to build the planned railway links with the planned new towns,
6. Control and limitation of fare increases on public transport networks in order to progressively make it more accessible to the poorer members of the society,
7. Extension of the bus network at the expense of the density of supply and of regularity, and without creating segregated lanes as recommended in successive transport and urban studies,
8. Absence of consultation between the various authorities in charge of transport despite the recommendations in the various transport and master plans.

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Moreover, the increase in living standards had the following consequences between 1971 and 1998:

1. Marked increase in the number of cars per household (+ 220 %),
2. Increase in transport mobility (+ 77%) which, together with the sharp population increase, resulted in:
3. a spectacular increase in the number of trips (+ 213%)
4. a more or less marked increase in congestion levels and travelling times depending on the geographic areas.

It follows that, in thirty years or so, the market share of the motorised transport modes have been completely turned round :

TABLE B1: Evolution in motor transport uses between 1971 and 1998

| Motor modes | Market share in 1971 | Market share in 1998 |
|---|----------------------|----------------------|
| Car and taxi | 13 % | 26 % |
| Metro | 0 % | 17 %* |
| Tramway | 15 % | 2 % |
| Bus and minibus | 62 % | 19 % |
| Microbus | 0 % | 28 % |
| Sundry (ENR, school and factory buses, boats) | 9 % | 7 % |

Source: Household surveys in 1971 and 1998 (in travels per main mode).

(*) In 2000, since the recent opening of new sections of line 2 of the metro to Cairo University, the market share of metro has reached 20% or so of all motor transports.

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C) CONSEQUENCES OF THE TRANSPORT POLICY ON MODE SPLIT

The relative drop in fare prices (increases less than the inflation rate) has encouraged the use of public transport in the poorer social classes.

Conventional surface networks such as buses and minibuses are badly affected by the traffic congestion. The drop in commercial speed generates extra operating costs and affects their attraction. The operating cost of the bus network have steadily increased year after year and are now higher than the operating cost of the metro per passenger per kilometre (taking into account depreciation costs).

The metro network serves major North - South travel corridors. Other corridors, which are equally important, do not benefit from efficient and suitable public transport infrastructures, with the result that they suffer from extensive traffic congestion due to the increased recourse to private cars. This mainly affects the East - West corridor between Nasr City and Heliopolis on one side and the wider centre of Cairo and Giza on the other side, where the viaduct motorways are not accessible to public transport vehicles and have undoubtedly encouraged further the use of private cars.

The private shared taxi network now accounts for a substantial share of transport modes and has taken advantage of the increasing shortfall in the bus supply. It has now amply demonstrated its economic justification, although this is far from optimum in so far as these small capacity transport vehicles play a major part in the surface traffic congestion.

Briefly, the development of the metro network was slower than the increase in the number of travels hence an increase in traffic congestion in certain districts where the metro is not available; this in turn penalises the performances of the bus network leading, among other aspects, to an increase in its operating costs. This situation, together with the policy of economic liberalisation implemented by the country, probably encouraged the development of the private shared taxi network.

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D) TRANSPORT USE AND USER CATEGORIES

As illustrated in the table below, the use of modes of transports is strongly linked to the level of income of the household.

TABLE D1: Use of motor transports per household income category in 1998

| Income level per household per month | Shared taxi | CTA bus | Metro | Private car | Taxi | Bicycles and motorcycles |
|--------------------------------------|-------------|---------|-------|-------------|------|--------------------------|
| Under £ 300 | 38% | 28% | 16% | 7% | 2% | 1% |
| £ 300 - £ 500 | 33% | 23% | 19% | 13% | 4% | 0% |
| £ 500 - £ 1000 | 24% | 15% | 19% | 25% | 6% | 0% |
| £ 1000 - £ 2000 | 14% | 7% | 14% | 39% | 11% | 0% |
| In excess of £ 2000 | 8% | 3% | 7% | 57% | 13% | 0% |
| No answer | 28% | 20% | 16% | 20% | 6% | 1% |

Source: 1998 household survey (SYSTRA-DRTPC) £ 1 (EGP) = FRF 2 as of 1/9/2000

Middle and well-off classes with an income in excess of £ 1000 per month and per household account for circa 8% of the population and use the private car or taxi in their majority.

Middle classes earning between £ 500 and 1000 per month and per household (over 23% of the population), use virtually exclusively public transport. Their favourite modes of public transport are the metro if available (which only serves part of the urban area) and shared taxis.

The poorer classes (under £ 500 per month) which account for more than half the population use more the shared taxis and bus, as well as the metro if available.

It should be noted that bicycles and motorcycles are very little used which is paradoxical given the conditions (low acceptable price, flat city). One of the reasons for not using cycles is mainly to do with safety; indeed, riding a bicycle in Cairo in the general traffic is either sheer madness or suicidal.

The metro is used by the population as a whole, and there are few variations between the different social classes, which is not the case for other modes of transport. In the metro corridor (which is directly available to 30 % of the population in GCMA situated within 1 km on either side of the line), this mode is

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the most used, irrespective of the social class, with the exception of the wealthiest category (in excess of £ 2000 and 2% of the population) which still uses private cars.

As regards women, for whom the activity ratio remains very low compared to Western countries, they are noticeable in that they use motorised modes much less than the men do (0.64 as opposed to 1.16).

Whenever women go about, they walk more than men, and on shorter distances (more frequently for purchases, etc.).

TABLE D2: Market share of motor transport per sex

(for 100 travels)

| | Shared taxi | CTA bus | Metro | Other public transport | Car | Taxi | Bi- and motorcycles |
|---------|-------------|---------|-------|------------------------|-------|------|---------------------|
| Men | 27.4% | 19.9% | 16.9% | 7.9% | 22.8% | 4.3% | 0.7% |
| Women | 30.2% | 17.5% | 18.2% | 11.4% | 14.3% | 8.3% | 0.1% |
| Average | 28.4% | 19.1% | 17.4% | 9.6% | 19.9% | 5.6% | 0.5% |

When they use a motor transport, they prefer those which expose them to less promiscuity with men (shared taxi, minibus, metered taxi and coaches reserved for women in the metro). Although its price is more attractive, women tend not to use the bus if other modes of public transport are available.

E) TRANSPORT USES AND THE ASSOCIATED FORMS OF HOUSING

The consumer forms a link between transport and the forms of housing, since he is both a transport user and he rents or owns his dwelling. He is characterised by a level of income and a varying sensitivity to the tariff and comfort of available modes of transport.

The table below sums up the findings of the study in this respect. It shows mainly that the poorer classes opt for precarious housing in the immediate vicinity of a centre of activity or of a wealthy district with plenty of small jobs to which they can walk. As for the wealthier classes, they go for good quality housing, in an environment where they can use their private cars, but in quieter districts that are increasingly remote from Cairo.

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The metro is the most democratic mode of transport in Cairo since it is used by all social classes, whenever it is available, with the exception of the wealthiest (2% of the population), who always prefer to use private cars.

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TABLE E1: Relation between standard of living and type of housing in 1998

| Level of income of the household per month | Distribut. throughout GCMA | Overall mobility | Share of walking | Social class | Type of housing or of district | main modes of transport for regular travels |
|--|----------------------------|------------------|------------------|--------------|---|--|
| Under 300 | 22% | 1.31 | 46% | Very poor | Spontaneous, informal, near centres of activity or wealthy districts | Walking, bus and metro* for short distances, train* for short and long distances |
| £ 300 - £ 500 | 32 % | 1.39 | 39% | Poor | Spontaneous, poor, old, fairly near to centres of activity | Walking, bus and metro* for short distances, train* |
| £ 500 – £ 1000 | 23 % | 1.54 | 31% | Middle | Working-class districts, planned districts within 10 km of activity centres | Bus for short and medium distances if comfortable, metro* and train* for short and medium distances, shared taxi for short distances |
| £ 1000 – £ 2000 | 6 % | 1.64 | 21% | Affluent | Planned districts, good quality housing in an area suited for using private cars | Metro*, Shared taxi, private car |
| In excess of £ 2000 | 2 % | 1.78 | 12% | Wealthy | High quality districts or villas sometimes distant or not planned (distant new towns or villas in an agricultural area) | Private car, taxi |
| No answer | 15 % | - | - | - | - | - |

Source: 1998 household survey (SYSTRA-DRTPC) (*): if available under current transport conditions

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F) INFLUENCE OF TRANSPORT ON THE DEVELOPMENT OF THE URBAN AREA

The 1970 and 1982 master plans aimed to meet the strong demographic expansion with:

1. The intention to develop Greater Cairo as a polynuclear town, where the extended town centre would no longer be the only centre of activity, in order to reduce travel distances, improve transport conditions and limit associated costs. A second major services centre was projected to the East of Cairo,
2. The construction of new towns and of priority housing districts called new settlements, designed to meet the rapid expansion of Cairo,
3. The construction of a more ambitious public transport network (metro, regional railway lines, extension of the tramway network to Giza, bus lanes),
4. The construction of a ring road around Cairo, delineating the urban area.

The construction of new regional train lines between the new towns was intended to make it easier to reach the new satellite housing areas by means of a long distance mode of transport that was affordable for social classes without cars in order to curb the illegal settlements in agricultural areas.

In fact, the population "only grew by 5 million inhabitants" between 1982 and 2000 instead of 7 million as initially forecast, as a consequence of a simultaneous drop in birth rates and in migrations from the country to Cairo.

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In fact, **the effective development of Cairo between 1970 and 2000** was translated in:

1. A reinforcement of the central area and the overflowing of CBD to the West bank of the Nile (Mohandesseen, Dokki), together with the abandonment of the project to build a major services centre to the East of Cairo,
2. A continued uncontrolled expansion of lower class housing along the edges of urban or wealthy districts,
3. Increased density of Cairo along the corridor of the first metro line (43 km long),
4. Migration of the wealthier classes who leave the centre of town (flats being transformed into offices) for good quality developed districts (Nasr City, 15th of May, Mokkatam, Gizah Al Arham),
5. The belated launching of new towns (New Cairo, extension of 15th of May, Al Sheik Zayeb, 6th de October, Al Shorouk) which currently house circa 250,000 inhabitants as opposed to the 2.8 million initially forecast. Given the absence of rapid and affordable public transport (train) these new towns are populated by fairly wealthy social classes with cars,
6. The natural and more recent development of secondary centres of activity at Nasr City et Heliopolis encouraged by the poor transport links between the Eastern districts and the central districts of Cairo.

The first metro line, which runs **North – South** probably increased the attraction of the centre from the areas it serves, but it also altered the range of activities there, which became more popular reflecting the social classes served by the metro. Will the second metro line, which will link wealthier areas, restore a balance? At the beginning of the century, the tramway which linked the Heliopolis districts and the centre of town was used by a wealthy population, similar to that in the extended town centre.

The development of the central area extensively encroached on the West bank of the Nile (Giza-Mohandesseen) following the construction of several road bridges and an increase in planning density. These districts accommodate services activities represented by many multinational groups. This state of affairs caused a further increase in **East-West** travels generating substantial traffic flows between the wealthy districts (Heliopolis, Nasr City) and Giza leading to huge traffic congestion.

The creation of a second centre of activity would probably have better distributed traffic flows and limited this problem. It seems that a similar project is being

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reactivated in the East sector of Mokkatam near the new ring road. One of the purposes of the current project for a third metro line is to solve this problem.

Government policy also influenced the development of Cairo through the rent freeze in the centre of town and aids to the construction of council houses and of blocks of flats during the Seventies with two major operations in Nasr City and the development of Mohandesseen. Later on, the policy of economic liberalisation saw the introduction of the private public transport, with the shared taxi and the development of luxury districts, in lesser numbers, by private developers. This policy was implemented at the expense of the public bus network and of the most underprivileged sections of the population.

The launch of the new towns probably was handicapped by the absence of fast public transport links that the poorer classes could afford. However, given a constant budget, is it preferable to attend to the most urgent needs first by building efficient metro lines used by millions of inhabitants, or to take the risk of building railway tracks in the desert to towns that do not exist yet?

Now, one of the very few developed district in the outskirts aimed to middle-classes that made a good start, is Al Salam, which is tied to Heliopolis. This district is served by a good bus link. This suburban service is not yet affected by traffic congestion. It is worth noting that this district could not have been launched without a political determination and government aid (servicing, facilities).

The other new towns have been populated by wealthier sections of the population that own cars. It follows that they are less densely populated than had been anticipated. The creation of employment areas (industry, university) did not suffice to settle middle-class and underprivileged populations in the absence of a direct public transport link to the centre of town. Family ties in Cairo, a preference for a rural agricultural environment and the price of housing stop the Cairo inhabitants from moving to these desert zones and many dwellings remained vacant.

How would Cairo have developed without the metro? It is difficult to answer that question, which was put in the terms of reference, owing to the multiplicity of economic and human parameters. That would amount to removing 20% of Cairo's transport capacity (over 50% in the North - South direction), which would make the situation far worse, probably with even more dramatic traffic congestion on the city's North - South roads. Such a "spatial recentering" of the congestion problems would probably have led to a more concentric development of the urban area which would have encroached even further on the agricultural areas relatively close to the central districts.

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**THE CASE OF CAIRO
EGYPT**

MAIN REPORT

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1 INTRODUCTION

1.1 - General environment

Greater Cairo (GC) is made up of the three authorities of Cairo, Gizah and Qualubia and, in 1996, totalled 13.5 million inhabitants. In 1996, the Greater Cairo Metropolitan Area (GCMA) had a population of 11.27 million, which made it the 15th largest urban area world-wide. It is characteristic for its very high demographic density (about 40,000 inhabitants per sq. km) immediately after Bombay and Jakarta but before Tehran, Delhi, Manilla and Calcutta (source: United State Census Bureau).

In December 1998, over 14 million travels per day were registered there. Public transport plays a major role by catering for over 70% of motor travels. Individual transport, although still the minority, is accounting for an increasingly large, bothersome even, share.

1.2 - Overall purpose of the study

The overall purpose of the study is to assess the influence of a transport policy on the accessibility and development of the Cairo urban area over the last 30 years. Especial attention will be focused on the less favoured sections of the population. As stated in the terms of reference, the influence of the transport policy will be appraised through the four aspects below:

1. Evolution of the transport supply and demand,
2. Analysis of user behaviour as a function of the income category, housing type and tariff sensitivity,
3. Spatial development of the urban area,
4. Evolution of urban structure and characteristics (residential, informal, new towns, commercial activity centres, employment zones)

In addition, the study will attempt to identify an alternative and realistic policy for transport and urban development which could have been implemented over these last years, and to measure its influence on the urban development as objectively as possible.

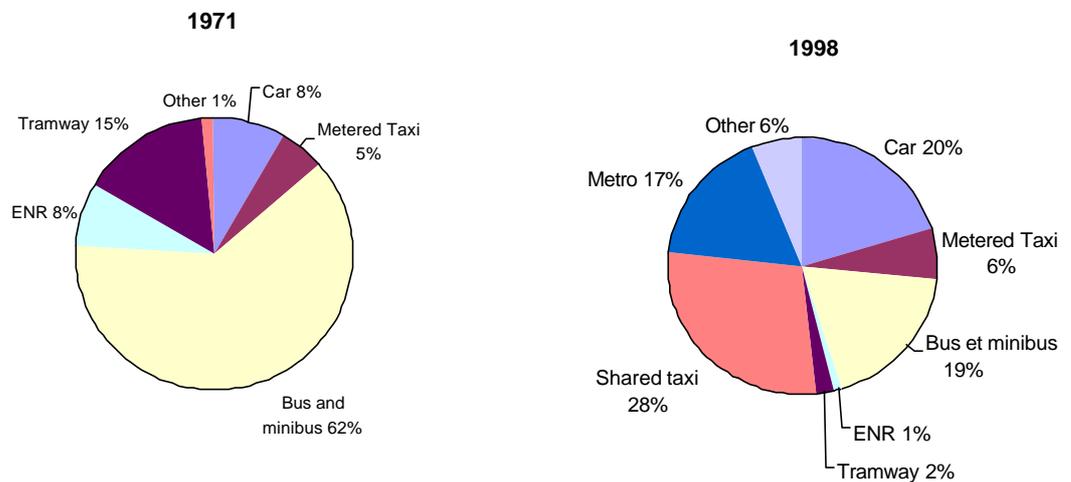
2 TRANSPORT DEVELOPMENT

2.1 - Overall environment

Over the last 30 years, the expansion of transport in the Greater Cairo urban area was characteristic for:

- The construction of two heavy metro lines (Mass Rapid Transit),
- The inadequate development of the bus public network compared with the increase in demand,
- The increased supply in shared taxis,
- The dilapidation of the tramway network and the abandonment of the trolley-bus lines,
- The increased recourse to private cars,
- The construction of major road infrastructures around as well as inside the town centre.

In addition, since 1970, the transport demand has markedly increased from 4.5 million travels in 1971 to 14.1 million in 1998. The evolution of the market shares of each mode of transport between 1971 and 1998 is illustrated in the diagrams below:



ENR : Suburban railway network

Transport demand increased substantially as a consequence of the twin effects of demographic growth and of increased mobility.

TABLE 2.1.1 : EVOLUTION OF THE NUMBER OF DAILY TRIPS BETWEEN 1971 AND 1998

| | 1971* | 1998* | 73/98 |
|--|--------------|--------------|---------------|
| Population (million) | 6.6 | 11.3 | +71 % |
| Mobility per person and per day (over 6 years old) | 0.8 | 1.42 | + 77% |
| Daily Trips in the metropolitan area (million) | 4.5 | 14.1 | +213 % |

(*) 1971 and 1998 household surveys (SOFRETU and SYSTRA-DRTPC)

The increase in mobility and in the motorization ratio is linked to the improvement in the standards of living per inhabitant.

2.2 - The metro network

2.2.1 - Description of supply

The first metro line, called regional metro opened to the public over its whole length in April 1989. That line connects two old suburban railway lines (Helwan to the South and Kobry El limon to the North) with a new underground section 4.2 km long under the extended town centre (CBD).

The first phase (Helwan - Mubarak) opened to the public in October 1987. The second phase (Mubarak - El Marg) opened to the public in April 1989. An extension of the line (El Marg – New El Marg) opened to the public in June 1999.

The second metro line, called urban metro, is still under construction. An initial phase (Shubra - Tahrir) opened to the public in October 1996. A second section (Tahrir-Cairo University) opened in April 1999. The third phase (Cairo University – Giza suburban) will open in October 2001. The fourth section (Giza suburban – Mounib) should open in 2004.

(see Figure no. 1)

Both metro lines in Cairo were built on corridors with the most growth potential in the urban area, in accordance with the recommendation in the 1973 transport plan prepared by SOFRETU.

TABLE 2.2.1: THE CAIRO METRO NETWORK

| | Sections: | Length | Date of opening |
|-----------------|---------------------------|---------|----------------------|
| Line 1 | Regional | | |
| Phase 1 : | Helwan - Mubarak | 27.3 km | October 1987 |
| Phase 2 : | Mubarak – El Marg | 15.4 km | April 1989 |
| Phase 3 : | El Marg-New el Marg | 1.0 km | June 1990 |
| | Total | 43.7 km | |
| Line 2 : | Urban | | |
| Phase 1 : | Shubra - Tahrir | 10.9 km | October 1996 |
| Phase 2 : | Tarhir – Cairo University | 5.5 km | April 1999 |
| Phase 3 : | Cairo Un. Gizah suburban | 2.5 km | October 2000 |
| Phase 4 : | Gizah suburban - Mounib | 2.1 km | Scheduled: 2004-2005 |
| | Total | 21.0 km | |

The first Cairo metro line (43.7 km of which 4.2 km underground and 2.0 km on a viaduct) was financed by France up to 67%. There are many resemblances with the Paris RER A line (junction between two suburban railway lines, high capacity ALSTOM rolling stock), which remains the most frequented line in the Paris network.

The second line of the Cairo metro (21 km on completion of which 8.5 km underground and 1.5 km on a viaduct) was financed by Egyptian capital (MITSUBICHI rolling stock).

This is an MRT-type metro network capable of transporting, on completion and under optimum operating conditions, 52,000 (line 2) to 73,000 (line 1) passengers per hour in each direction. The running frequency is 3 min 30 sec. on lines 1 and 2 with a possibility of reaching 2 minutes, under optimum operating conditions.

This network is characterised by a high commercial speed between 32 and 39 km/hour depending on the line (compared with the 10 to 12 km/h registered by the surface networks at peak hours).

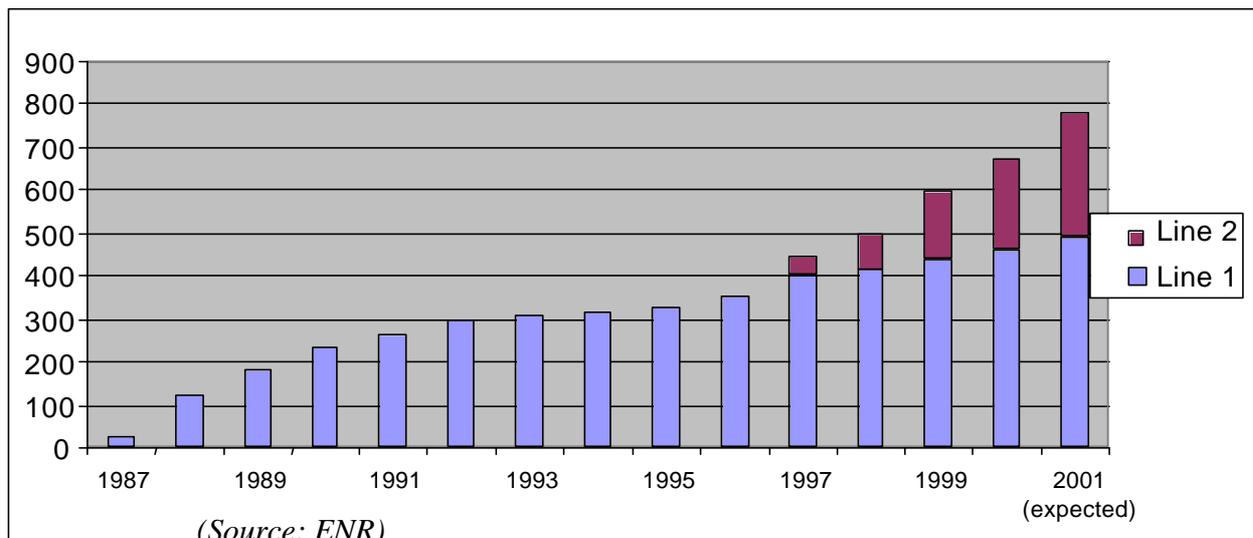
TABLE 2.2.2: OPERATING CHARACTERISTICS OF THE METRO LINES IN 1999

| | Unit | Line 1 | Line 2 |
|--|--------------|------------------|-------------------------|
| Length | km | 43.7 | 21.0 km (on completion) |
| Number of stations | nr | 34 | 20 (on completion) |
| Average distance between stations | km | 1.342 | 1.105 (on completion) |
| Commercial speed | kph | | |
| Peak hours | | 35 | 32 |
| Off peak hours | | 39 | 34 |
| Current frequency | | | |
| Peak hours | min s | 3.30 | 3.00 |
| Off peak hours | min s | 7.00 | 7.00 |
| Rolling stock capacity (7/m2) | nr | 2466 (9 coaches) | 1750 (8 coaches) |
| Maximum available capacity in each direction (98/99) | Pass/h | 42,270 | 35,000 |
| Potential capacity (2 min frequency) | Pass/h | 73,280 | 52,500 |
| Trains Kilometres (98/99) | Million/year | 5.907 | 1.249 |
| Vehicles Kilometres (98/99) | Million/year | 53.166 | 9.994 |
| Seat / kilometre available (98/99) (7/m2) | Million/year | 14,567 | 2,185 |

2.2.2 - Evolution of demand

The number of passengers per day has increased steadily since the opening of the first section in 1987.

Number of passengers per year (million travellers)



Demand increased substantially between 1987 and 1989 as a consequence of the opening up of phase 2 of line 1. Later, the number of passengers continued to rise on line 1 owing to:

1. the increased frequency of trains at peak hours (7 min 30 in 1989, 3 min 30 in 1999),
2. the relative fares reduction perceived by the user (see the section on fares),
3. the steady worsening of congestion of the surface network which encourages the transfer to the metro,
4. the overall increased mobility per person,
5. the increased urban density in the corridor of line 1.

As for line 2, the number of passengers increased as a consequence of the opening of new line sections.

In May 2000, daily demand totalled 1,325,000 passengers on line 1 and 600,000 passengers on line 2 on the temporary section between Shubra el Keima – Cairo University (source: ENR).

On line 1, demand is limited by supply, so that the weight of peak hours is being constantly reduced. Fridays, which are a holiday in Egypt, still register intense passenger trips (90% of an average day as opposed to 60% on line 2). It follows that the coefficient between year and day is near 350 on line 1 and 340 on line 2 (temporary phase). It is expected that the traffic demand will also soon be limited by supply if the frequency at peak hours remained at 3 min 30.

2.2.3 - Fare system

The fare structure is based on a sliding zone system; the price of the ticket varies according of the number of stations crossed.

TABLE 2.2.3 : FARE STRUCTURE AND TARIFFS – MAY 2000

| | | | | |
|------------------------|-------------|-------------|-------------|-------------|
| Piastres | 1 zone | 2 zones | 3 zones | 4 zones |
| | 9 stations | 16 stations | 22 stations | 34 stations |
| Single fare | 50 | 60 | 70 | 80 |
| Single fare (reduced)* | 30 | 30 | 40 | 40 |
| EGP | 1 zone | 2 zones | 3 zones | |
| | 13 stations | 25 stations | 34 stations | |
| Weekly ticket | 9 | 10 | 11 | |
| Quarterly pass | | | | |
| Private sector | 40 | 60 | 70 | |
| Public, Gov & Mil. | 25 | 35 | 45 | |
| Students & Blind | 11 | 16 | 18 | |
| passengers | 10 | 15 | 17 | |
| ENR | | | | |

(*) *Police, army, journalists, children (from 4 to 9) and blind users.*

1 EGP=100 piastres

The public sector is granted attractive fares. Students and the ENR personnel enjoy even more attractive fares. This scale of fares is also more favourable to long distance travels.

The difference between single tickets and the unit price of a travel using a quarterly pass is quite high, so that, in 1999, 52% of passengers with a quarterly pass accounted for only 12% of fare income.

The fare structure has changed little since 1987, and fares have increased less than the inflation.

TABLE 2.2.4: EVOLUTION OF FARES ON THE METRO NETWORK BETWEEN 1987 AND 1999

| Year | 1987 | 1999 | 1987/99 |
|---------------------------------|------|------|---------|
| Inflation * | 133 | 440 | + 231% |
| Single ticket (Piastres) | | | |
| (9 stations) | 25 | 50 | + 100 % |
| (16 stations) | 40 | 60 | + 50 % |
| (22 stations) | 50 | 70 | + 40 % |
| (34 stations) | 70 | 80 | + 14 % |
| Quarterly pass (EGP) | | | |
| (13 stations) Private sector | 25.5 | 40 | + 57 % |
| (25 stations) Private sector | 36.5 | 60 | + 64 % |
| (34 stations) Private sector | 45.5 | 70 | + 54 % |
| (13 stations) Public gov mil | 9.5 | 25 | + 163 % |
| (25 stations) Public gov mil | 15.5 | 35 | + 126 % |
| (34 stations) Public gov mil | 21.5 | 45 | + 109 % |
| (13 stations) Students Blind p. | 4.75 | 11 | + 132 % |
| (25 stations) Students Blind p | 7.75 | 16 | + 106 % |
| (34 stations) Students Blind p | 10.8 | 18 | + 67 % |
| (13 stations) ENR | 3.35 | 10 | +199 % |
| (25 stations) ENR | 4.85 | 15 | + 209 % |
| (34 stations) ENR | 6.35 | 17 | + 168 % |

(*) Source: CAPMAS Consumer price index for the urban sector. (1999 first estimate)

The fare increases which took place between 1987 and 1999 encouraged long distance travels and reduced the substantial difference between the private sector and other passenger categories. On average the increase was half that of the cost of living.

The low fare increases played a major role in making the metro attractive and in broadening the spectrum of the social classes which use it in favour of the less prosperous sections of the population

2.3 - The Bus and Minibus network

2.3.1 - Description of the supply

The bus and minibus network is operated by CTA, a state-owned company. It covers virtually the whole urban area.

The main supply indicators, and their evolution since 1971 are listed in the table below.

TABLE 2.3.1: INDICATORS OF THE EVOLUTION OF BUS SUPPLY BETWEEN 1971 AND 1998

| Bus network | Unit | 1971 | 1998 | 1971/98 |
|---------------------------------------|---------|------|------|----------|
| Number of lines | u | 196 | 448 | + 128 % |
| Kilometres of line | km | 1820 | 8456 | + 364 % |
| Average length of a line | km | 9.3 | 18.9 | + 103 % |
| Rolling stock fleet | u | 1415 | 2561 | + 80 % |
| Vehicles x kilometres per year | million | 125 | 248 | + 98 % |
| Number of buses per kilometre of line | u | 0.77 | 0.30 | - 61 % |
| Average interval | min | 10 | 25 | + 15 min |

Source: CTA

The coverage of the network has increased, The increase in the vehicles kilometres supply was nevertheless not on a par with the expansion of the network, with the result that the bus supply diminished per geographical area unit (frequency cut by half).

(See Figure no. 2)

A minibus network was opened in 1985 with a view to provide a more comfortable transport supply (higher fares, seats only) to compete with shared taxis on the town centre with a specific tariff scale targeted at users from the middle classes. This network serves districts mostly frequented by middle class and wealthy sections of the population (Nasr City, Heliopolis, Gizah, Mohandesseen and Dokki)

TABLE 2.3.2: INDICATORS OF THE EVOLUTION OF MINIBUS SUPPLY BETWEEN 1986 AND 1998

| Minibus network | Unit | 1986 | 1998 | 1986/98 |
|---------------------------------------|---------|-------|--------|---------|
| Number of lines | u | 42 | 74 | + 76 % |
| Kilometres of line | km | 380 | 1012 | + 166 % |
| Average length of a line | km | 9.0 | 13.7 | + 52 % |
| Rolling stock fleet | u | 498 | 750 | + 50 % |
| Vehicles x kilometres per year | million | 24.8 | 42.4 | + 71 % |
| Number of buses per kilometre of line | u | 1.31 | 0.74 | - 43 % |
| Average interval | min | 8 min | 13 min | + 5 min |

Source: CTA

As was the case for the bus, the minibus network expanded to the detriment of the supply density per geographical unit.

CTA also created a number of bus lines with air conditioning targeted at wealthy customers (high fares).

The bus and minibus networks share a major joint section running along the first metro line between Mataria and CBD. This helps relieve metro frequentation as the line cannot cope with the excessive demand on that section.

Few bus stops are marked outside of terminals; passengers often have to run after the bus and leap on it to catch it. This tends to restrict their frequentation to fairly fit users (mostly men).

The CTA network (bus and minibus) is a victim of the increased traffic congestion and the commercial speed of bus lines in an urban environment is dropping continuously, resulting in a steady increase in operating costs per vehicle kilometre.

Finally, very few sections on dedicated site or bus lanes have been created. The existing section (2 km one-way) runs above the first metro line between Nasser and Tahrir Square. Another section of dedicated, unprotected lane, was created on Pyramid Avenue. This lane, which was constantly used by cars, has been abandoned. No bus lane was created in the centre of town, contrary to the recommendations in the 1973 transport plan.

It should also be said that the viaducts in the town centres are not open to buses or minibuses. Buses, which are the slowest motorised mode together with tramways, are affected by an outmoded image. They are often wrongly blamed for the traffic congestion.

2.3.2 - Evolution of demand

Between 1971 and 1998, the evolution of the number of passengers kilometres (+83%) did not follow the increase in overall transport demand in Cairo (+213%), nor the increase in bus supply (+98%). On the minibus network, the increase in demand was higher than the supply increase, so that it is not infrequent to see standing passengers in minibuses although they were initially reserved for seated users.

TABLE 2.3.3: INDICATORS OF THE EVOLUTION OF DEMAND ON THE BUS AND MINIBUS NETWORKS

| | | | | |
|---------------------------------|-------------|-------------|-------------|----------------|
| Bus network | Unit | 1971 | 1998 | 1971/98 |
| Number of passengers | million | 909 | 1.304 | + 43 % |
| Number of passenger kilometres | million | 4.545 | 8.345 | + 83 % |
| Minibus network | Unit | 1986 | 1998 | 1971/98 |
| Number of passengers | million | 37 | 136 | + 267 % |
| Number of passengers kilometres | million | 185 | 707 | + 282 % |

Source: CTA

Even though the number of passengers is still increasing slightly on the bus network, its efficiency and attraction has been reduced due to:

- the increased traffic congestion and the resulting drop in commercial speed,
- the relative reduction in supply (lower frequency per geographical area),
- the slowness of the bus network to react to the evolution of supply and demand (terminals still exist where tramway lines have disappeared, inadequate metro service),
- the failure to create specific installations (segregated lanes), although it must be said that this is not easy in a town where there is a shortage of road space.
- the introduction since 1973 of new faster (metro) and / or more comfortable (metro, shared taxi, minibus) public transport modes which have won substantial market shares, more often than not to the detriment of buses.

2.3.3 - Fare system

The fare system applied to the bus and minibus networks is listed in the table below:

TABLE 2.3.3: INDICATORS OF EVOLUTION IN BUS AND MINIBUS FARES BETWEEN 1986 AND 1998

| Bus network | Type of fares | 1986 | 1998 | 1986/98 |
|------------------------------------|----------------|-------|--------|------------|
| Single ticket | | | | |
| Regular lines + Students | Flat | 10 | 25 | +150 % |
| CGBC lines. Special. Long distance | Distance based | - | 25-50 | |
| Air conditioning | Flat | - | 200 | - |
| Pass : | | | | |
| Standard | Flat 1 month | - | 5 | - |
| Standard | Flat 3 month | - | 15 | - |
| Student | Flat 1 month | - | 2 | - |
| Student | Flat 3 month | - | 6 | - |
| Minibus | | | | |
| Single ticket | Distance | 15-40 | 30-100 | + 66-150 % |

Source: CTA

In 1973, the range of fares included 7 sections and differentiated between first and second class.

Fare increases were lower than those registered on the metro network and markedly lower than the cost of living (inflation). On the other hand, minibus, "special" or long distance bus lines were often introduced to replace certain regular bus lines, with the consequence that the fare increases felt by the user were in effect slightly higher.

2.4 - The shared taxi network

2.4.1 - Description of the supply

Back in 1977, given the constant increase in transport demand which was not met by the conventional bus network, and at the request of the private taxi driver union, the law made it possible to operate shared taxis on a limited number of routes (11 in all) using vehicles with 11 seats maximum. To begin with, 800 vehicles were granted the right to offer this type of service.

In 1984, and in 1986, given the success registered by the shared taxis, the law authorised vehicles with 14 and later 18 seats on an unlimited number of routes. In 1985, over 14,000 vehicles ran on 133 different routes! The routes and scale of fares have to be approved by the governing bodies at the level of each authority.

According to the Cairo and Gizah authorities, there were 27,300 shared taxis in 1998 and over 650 routes.

In exchange for the license granted by the authorities, the owner of the vehicle must pay between 50 and 100 piastres at the beginning of each ride, or the equivalent of a license that is valid for three months.

The shared taxi network covers the whole urban area. It has expanded more on those areas where bus supply was inadequate. It also offers a better local service by accessing narrow lanes where buses cannot enter owing to their size. Shared taxi lines are more developed in Heliopolis, Ains Shams and Gizah and in all outskirts areas such as Al Shorouk, Al Badr, 6th de October.

(See Figure no. 3)

In addition, this mode of transport which reacts more rapidly to demand has grown to be the most popular mode to access the metro network.

On the other hand, this mode of transport plays a major share in the traffic congestion and in the damage to the environment (pollution, noise, safety). Oddly enough, contrary to the bus and the tramways, the Cairo inhabitants do not seem to blame the shared taxis for the congestion. The route of each line is set from terminal to terminal (the route can vary depending on the traffic conditions), so that stops are not identified, the vehicles stop where they feel like stopping, sometimes on major thoroughfares (bridges of 6th October) and slow down the traffic flow.

2.4.2 - Demand

The demand for shared taxis literally exploded since they were put in operation. The three household surveys carried out in 1971 (SOFRETU), 1989 (JICA) and 1998 (SYSTRA-DRTPC) in the Greater Cairo Metropolitan Area have shown that the number of users per day of that mode has risen from 0 to 1.27 and 2.6 million, exceeding the bus on that area (GCMA).

Note: The figures published by CTA in 1998 are far more favourable to the bus than to shared taxi: 3.4 million passengers for bus and 1.4 million passengers on the shared taxi network, which would mean that the number of shared taxi users has remained stable since 1989 despite the doubling of the number of vehicles and the multiplication by five of the number of routes. On the other hand, the figures published by the Cairo Authority claim over 4.33 million daily users of shared taxi solely on the area of the Cairo Authority. The results of the household surveys are more reliable, and based on a sample with a virtually zero margin of error for this type of highly general information.

2.4.3 - Fare system

In 1986, the fare based on distance varied between 14 and 40 piastres. Nowadays, it ranges between 40 and 100 piastres, depending on the distance travelled. It should be noted that, as is the case with the metered taxi, the scale of fares is not necessarily complied to and often increased depending on the variation in supply and demand.

Between 1986 and 1999, the fare increase averaged 160%, less than inflation but more than that of other public modes of transport.

2.5 - Tramway

2.5.1 - Description of supply

The tramway network consists of two networks:

- The Heliopolis network serving Heliopolis, Nasr City, Mataria, Shubra and Kheima, Darrasa and Abbasia.
- The Helwan network serving Tibbin and 15th of May from the terminal of the first regional metro line to the South of the town.

The construction of the tramway network began in the early Nineteen Hundreds and continued up to 1988 (15th of May line). Nowadays, the network is managed by CTA (Cairo Transport Authority) which took over the Heliopolis company in 1991.

This network consists in over 280 kilometres of joint section lines. It is particular for its segregated lanes, often isolated from the general traffic and away from crossroads. However, the tendency of car drivers to use the tramway lanes does impede their operation.

The operating conditions of this network have steadily become worse over the last thirty years owing to inadequate investments in maintenance and the renewal of rolling stock. As a result:

The rails, which are not maintained and distorted no longer authorise a high commercial speed.

The ageing vehicles are uncomfortable and their number is diminishing.

Tramway lines are being dismantled as the vehicles are being taken out of operation. Over the last two years, 10 km of lines on dedicated lane have disappeared (Port Said street and the section between Bab Al Sharia – Abbasia). According to the projects prepared by the Cairo Authority, other line sections are also due to disappear to be replaced by automobile traffic (removal of the section on Salah Salem to widen the existing dual carriageway between the future El Azar road tunnel and CBD).

The 1973 transport plan (SOFRETU) and the 1989 one (JICA) were not followed in this respect. They recommended a limited extension of the tramway and trolley-bus network on the left bank of the Nile in 1973 (Giza) and to the East of Cairo in 1989 (new town and airport).

TABLE 2.5.1: INDICATORS OF THE EVOLUTION OF TRAMWAY SUPPLY BETWEEN 1971 AND 1998

| Tramway network | Unit | 1971 | 1998 | 1973/98 |
|------------------------------------|---------|------|------|---------|
| Number of lines | u | 29 | 22 | - 24 % |
| Kilometres of line | km | 382 | 284 | - 25 % |
| Kilometres of joint section | km | 98 | 88 | - 10 % |
| Average length of a line | km | 13.2 | 12.9 | - 2% |
| Rolling stock fleet | coach | 335 | 88 | - 73 % |
| Vehicles x kilometres per year | million | 25.1 | 5.5 | - 78 % |
| Number of tramways per km of line | u | 0.88 | 0.31 | - 65 % |
| Average interval (peak hours) (HP) | min | 12 | 18.5 | + 54 % |

Sources: *SOFRETU transport plan 73 and CTA 98.*

The drop in supply is mostly the result of the non renewal of the rolling stock fleet since 1973. The deterioration of the service expressed in the number of vehicles effectively in operation / number of vehicles scheduled began in 1966, when the optimum ratio of 92% was registered.

2.5.2 - Evolution of demand

The number of tramway users has dropped constantly since the 1973 record of 270 million passengers. In 1998, CTA recorded 75.6 million passengers, or a 72 % drop in 25 years. This phenomenon is due to:

1. poor maintenance of tracks and rolling stock.
2. a drop in commercial speed due to the increase in traffic congestion and to the poor condition of the tracks.
3. a significant reduction of the rolling stock fleet and the dismantling of a number of lines.
4. the outdated image of tramway in the mind of the public.

Such a situation is identical to that experienced by French tramway networks between 1945 and 1970, when virtually all lines disappeared (except for three lines in St-Etienne, Lille-Roubaix and Marseille) before the introduction of the modern tramway in 1983. Since that time, 14 urban areas in France have reintroduced the modern tramway or are constructing a new line.

2.5.3 - Fare system

There is only one fare on the tramway network, that is a flat fare of 25 piastres in 1998. In 1986, that fare was 10 piastres.

In 1973, the scale of fares charged by the CTA network was 15 piastres in first class and 10 piastres in second class, with a 50% reduction for army personnel.

The Heliopolis company charged per zone, i.e. 20, 30 or 35 piastres in first class, 10, 15 or 20 piastres in second class still with a 50% reduction for army personnel.

Since 1973, fare increases have been less than the increase in the cost of living and translate the marked deterioration of the service.

2.6 - The suburban railway network

2.6.1 - Description of supply

The suburban railway network consists of 7 lines with a total cumulated length of 128 kilometres. Between 1987 and 1989, the most heavily frequented lines (Helwan and El Marg) were connected with the construction of a tunnel over 4 km long under the enlarged town centre (CBD) to create the first regional metro line.

The remaining lines, which were initially much less attractive, serve rural areas beyond the perimeter of GCMA. There are only a few urban stops to the South of Giza and to the North of Shubra. A few stops have been or are being rehabilitated, as they are established on line 2 of the metro.

TABLE 2.6.1: SUPPLY INDICATORS ON THE SUBURBAN RAILWAY NETWORK

| no. | ENR suburban network | Length (km) | Return runs per day | Coaches kilometres per day |
|-----|--|-------------|---------------------|----------------------------|
| 1 | Cairo / Qalub (to Alex.) | 14 | 8 | 1,568 |
| 2 | Cairo / Shibin al Kanater (to Zaqaziq) | 18 | 17 | 4,284 |
| 3 | Cairo / Kanater al Kh. (to Menouf & Tanta) | 23 | 21 | 6,762 |
| 4 | Cairo / El Manashi (to Itay El Baroud) | 15 | 15 | 3,150 |
| 5 | Cairo / Maraziq (to Aswan and Fayoum) | 35 | 13 | 6,370 |
| 6 | El Marg / Shebin El Kanater | 8 | 27 | 3,024 |
| 7 | Ain Shams / Al Obour (to Suez) | 15 | 7 | 1,470 |
| | TOTAL | 128 km | | 26,628 |

Source: ENR.

The average capacity of each train is 700 seats over 7 coaches. Running frequencies are low. Several lines, which do not carry domestic traffic (Assuan, Alexandria) are single track and not electrified with average speeds around 40 km/h.

Supply has evolved little since the Seventies (apart from the regional metro) and suburban bus and shared taxi lines are becoming increasingly competitive.

2.6.2 - Evolution of demand

Demand was already focused in 1971 on the two lines of El Marg and Helwan before they were connected (81% of ENR market shares in 1971). On the remaining lines, the drop in demand is the consequence of the development of more comfortable modes of transport by road, which are more frequent and offer improved access in suburban areas as yet little affected by urban traffic congestion.

TABLE 2.6.2: DEMAND INDICATORS ON THE SUBURBAN RAILWAY NETWORK BETWEEN 1971 AND 1998

(Number of passengers per year)

| ENR suburban network | 1971 | 1998 | 1971/1998 |
|----------------------|-------|-------|------------------------------|
| El Marg line | 33.8 | 565.8 | Line 1 of the regional metro |
| Helwan line | 63.6 | | + 481 % |
| Other lines | 22.3 | 5.4 | - 75 % |
| TOTAL | 119.7 | 571.2 | + 377.2 % |

Source: ENR

2.6.3 - Fare system

The fare is based on the travelled distance. In 1998, it varied between 25 piastres for a distance between 7 and 23 km, and 40 piastres for a distance between 23 and 32 kilometres. This scale of fares is far more attractive than that of any other public transport modes for long distances.

2.7 - The road network and private transport

2.7.1 - Road network

The road network encompasses different types of roads according to the surrounding type of urbanisation.

In the older districts (Islamic Cairo, Bulak, Sayeda Zeinab), there are few main thoroughfares; and mostly lanes offering limited access to road transport.

In informal districts (Imbaba, Warak, Bulak el Dakrur, some areas in Shubra, etc.), the thoroughfares, most of which have been created over old irrigation channels, are equally few. These streets are fed by very narrow lanes reserved for pedestrians. There are no or very few intermediate streets.

In "planned" districts (Heliopolis, Nasr City, CBD, Mohandesseen, Doki, Mokattam), the streets are numerous and often wide. In this type of district, as in new towns, the streets preceded the construction of buildings. However, in the main activity centre, the capacity of the intermediate streets is vastly reduced by cars parked on the surface (CBD, Mohandesseen, Doki). There are many wrecks among these parked cars, since street parking is free.

Elsewhere, many districts are a mixture of these three types. The channels covered over in the Nineteenth century (King Faissal Avenue between Doki and Gizah el Ahram, Port Said street) have now become major traffic thoroughfares.

Later on, interconnecting streets between district, or transit streets were grafted onto the network. These are the famous urban motorways, often built on viaducts or in tunnels (26th de October connecting Nasr City and Heliopolis with CBD and Gizah, 15th of May between CBD, Zamalek and Mohandessen, road tunnels of al Azhar through the Islamic district). These links involved the construction of many bridges across the Nile. In addition, many other structures (bridges, underpasses) were built in order to remove traffic conflicts at the main crossroads. Informal districts were even destroyed recently in Mohandesseen in order to build an urban motorway between Giza and the Alexandria motorway through the desert (26th of July Corridor).

One of the major projects, which is now virtually complete was the construction of the ring road around Cairo which, on completion, will total 90 kilometres in length, over 2X3 lanes. It crosses the Nile twice, plus several canals and communication routes.

The geographical layout of the area (cliffs and cemetery to the East of the centre of town, the bed of the Nile in the middle and a densely built zone) concentrates, between Abbasia and CBD, the traffic flows from East Cairo as a whole (Heliopolis, Nasr City, El Marg, Matariya, etc.). In addition, CBD remains the obligatory crossing point between both banks. The completion of the ring road to the South, which is not yet effective, will offer an alternative route.

2.7.2 - Demand

The demand for individual transport modes has increased continuously over the last 30 years.

TABLE 2.7.1: DEMAND INDICATORS ON THE INDIVIDUAL TRANSPORT NETWORK BETWEEN 1971 AND 1998

| Individual transport | Unit | 1971 | 1998 | 1971/1998 |
|----------------------|--------------------------------|---------|------|-----------|
| Private cars | Trips per day (million) | 0.42 | 1.87 | +345% |
| Car ownership | Vehicles for 100 households | 7.3 (*) | 23.9 | +227 |
| Individual taxi | Trips per day (million) | 0.26 | 0.56 | +115% |
| TOTAL | | 0.68 | 2.43 | +257% |

Source: SYSTRA household surveys (1971 and 1998)

(*) Based on the 1966 census

The demand for individual transport, which was multiplied by 4.5 over 27 years, has increased much faster than the demand for public transport, with the exception of the metro. Simultaneously, the number of cars owned by households has followed an identical progression. Thus, the main car flows are registered between the wealthy districts (Heliopolis, Nasr City) and the central area consisting of CBD and Giza-Mohandesseen (see Figure no. 6). This phenomenon is the cause of vast traffic congestion problems in Cairo.

The use of private cars is closely linked to the category of income. It is further encouraged by the development of the road network in the outskirts as well as in the centre of town (many road viaducts not open to public transport).

The use of individual cars and the motorisation rate are less high along the corridor of line 1 of the metro (see Figures no. 5 and 6).

2.8 - Intermodal transport

The transfer rate between all public transport modes is relatively low compared to other urban areas of similar size. Out of the 9 million daily motorised trips registered in 1998, 19 % involved only one transfer, 4%, two transfers and 0.3% more than three transfers. The absence of fare integration results in a relatively higher travel cost whenever users take several modes of transport. Out of the trips involving a transfer, the most frequently involved modes are the shared taxi (43%), metro (23%) and bus (14%).

So far, only the metro implements a fare integration between both lines, via a sliding zone fare based on the number of stations crossed, irrespective of whether 1 or 2 lines are used.

TABLE 2.8.1: MODAL ORIGIN OF METRO USERS

| | Bus and minibuses | Shared taxi | Car and taxi | Other | Walking |
|------|-------------------|-------------|--------------|-------|---------|
| 1993 | 23% | 9% | 1% | 3% | 64% |
| 1997 | 6% | 23% | | 2% | 69% |
| 1998 | 5% | 18% | 2% | 1% | 74% |

Sources: 98 household survey (SYSTRA-DRTPC). 1997: Impact of the Cairo Metro (ENIT). 1993: INRETS-DRTPC survey

Over a few years, the shared taxi has become the main motor feeder mode for the metro, to the detriment of the bus. The shared taxi, which offers a better reaction to transport demand and can reach nearest to the metro stations (stop at the request of the customer) has succeeded in becoming fully complementary with the metro. Indeed, their target custom is quite similar (middle-class to poor categories, mostly women) whereas the bus attracts a poorer custom, predominantly masculine (see chapter 3).

2.9 - Financial aspects

As regards the surface public transport network, the continuous drop in commercial speed has resulted in an increase in operating costs whilst limiting its attraction. It follows that the operating cost of the bus per passenger per kilometre has constantly deteriorated over the last fifteen years or so.

As for the tramway network the operating cost per vehicle per kilometre of line has become exorbitant due to the weight of fixed expenditures compared to the weakness of the remaining supply.

Since the opening of the metro, the continuous increase in demand has meant that the operating cost per passenger per kilometre has remained stable.

TABLE 29.1: FINANCIAL RATIOS

| | Unit | Bus and minibus (CTA GCBC) (1998) | Metro (1998/99) |
|--|-------------|--------------------------------------|--------------------|
| Farebox revenue | Million EGP | 346 | 158 |
| Operating cost | Million EGP | 220 | 94 |
| Revenue / operating cost | % | 157 % | 168 % |
| Depreciation cost | Million EGP | 338 | 321 |
| Passengers x kilometres | Million | 8.354 | 6.840 |
| Total operating cost per passenger per kilometre | Piastres | 8 piastres | 7 piastres |

Sources: CTA, ENR and 1998 household survey (trip length per mode)

3 ANALYSIS OF TRANSPORT USES, USER TYPES AND THE ASSOCIATED FORMS OF TOWN PLANNING

3.1 - Preamble

In order to better understand the influence of transport on the urban sprawl and structure, it is necessary to analyse the connection between the transport user and the associated type of urban planning through relevant indicators.

3.2 - Mode use and income

The first analysis involves investigating the use of modes of transport in relation to the income level of the household, to understand how the selection of a mode can affect the location of the dwelling.

TABLE 3.2.1: DISTRIBUTION BETWEEN WALKING / MOTOR TRANSPORTS PER HOUSEHOLD INCOME LEVEL IN 1998

| Household income level per month | Distribution on GCMA (and on the corridor of line 1 of the metro) | Overall mobility | Share of walking | Share of motor transports |
|----------------------------------|---|------------------|------------------|---------------------------|
| Under £ 300 | 21.74% (16.24%) | 1.31 | 46% | 54% |
| £ 300 - £ 500 | 31.90% (31.29%) | 1.39 | 39% | 61% |
| £ 500 - £ 1000 | 23.09% (27.52%) | 1.54 | 31% | 69% |
| £ 1000 - £ 2000 | 6.00% (7.68%) | 1.64 | 21% | 79% |
| In excess of £ 2000 | 1.64% (2.23%) | 1.78 | 12% | 88% |
| No answer | 15.62% (15.03%) | 1.33 | 37% | 63% |
| | 100 % | 1.42 | 36% | 64% |

Source: 1998 household survey (SYSTRA-DRTPC)

1 EGP= 2.0 FRF as of 1/9/2000

The average share of walking is 36 %. The poorer categories are less mobile and walk a lot more. In addition, the length of the average travelling distance increases as the income is higher. It follows that the lower the income level, the greater the weight of the distance between the dwelling and the place of work. As a consequence the poorer sections of the population tend to live as close as possible to the employment areas to diminish the cost of transport.

It is therefore no surprise that spontaneous housing is sprouting in the vicinity of so-called "wealthy" areas such as Mohandesseen, Doki, Heliopolis, Nasr City. This phenomenon takes generally place on agricultural land (Bulak el Dakrur, Imbaba) to

the West and in Ains Shams on the edge of Heliopolis, and in semi-desert areas in Izbet Al Haggana to the East of Nasr City.

On the other hand, the wealthier categories are much more mobile and walk little. This type of population does not hesitate to travel far to their place of work.

It is also noticeable that the corridor of the regional metro line is inhabited by a slightly less poor population than in the remainder of the town, although all sections of the population are represented there.

(See Figure no. 7)

TABLE 3.2.2: USE OF MOTORISED MODES PER HOUSEHOLD INCOME CATEGORY IN GCMA IN 1998

| Household income category per month | Shared taxi | CTA bus | Metro | Car | Taxi | Bicycle or motorcycle |
|-------------------------------------|-------------|---------|-------|-----|------|-----------------------|
| Under £ 300 | 38% | 28% | 16% | 7% | 2% | 1% |
| £ 300 - £ 500 | 33% | 23% | 19% | 13% | 4% | 0% |
| £ 500 - £ 1000 | 24% | 15% | 19% | 25% | 6% | 0% |
| £ 1000 - £ 2000 | 14% | 7% | 14% | 39% | 11% | 0% |
| In excess of £ 2000 | 8% | 3% | 7% | 57% | 13% | 0% |
| No answer | 28% | 20% | 16% | 20% | 6% | 1% |

Source: 1998 household survey (SYSTRA-DRTPC)

The use of individual transport is strongly tied to the level of income. Middle-class and wealthy sections of the population which earn over £ 1000 per month and per household account for 8% of the population and mainly use a car or a metered taxi.

Middle classes earning between £ 500 and 1000 per month and per household (over 23% of the population) mainly use public transport. The metro (which only serves part of the urban area) and shared taxi are their favourite public mode of transport.

The less favoured sections of the population (under £ 500 per month) which represent more than half the population tend to use more shared taxis and the bus, as well as the metro, if it is available.

It should be noted that bicycles and motorcycles are very little used which is paradoxical given the conditions (low acceptable price, flat city). One of the reasons for not using cycles is mainly to do with safety; indeed, riding a bicycle in Cairo in the general traffic is either sheer madness or suicidal.

The metro is used by all sections of the population with very little difference from one to the other, contrary to the other modes of transport. In the metro corridor (which is directly accessed by 30 % of GCMA's population within 1 km on either side of the line), the metro is the most used mode, irrespective of the section of the population under consideration, with the exception of the wealthiest (in excess of £ 2000 per household and per month, 2% of the population) which used the individual car more (private car or taxi).

TABLE 3.2.3: USE OF TRANSPORT MODES IN THE CORRIDOR OF LINE 1
(WITHIN 1 KM ON EITHER SIDE OF THE PUBLIC TRANSPORT LINE)

| | Walking | Shared taxi | CTA bus | Metro | Car | Taxi | Bicycle or motorcycle |
|--------------------------------|---------|-------------|---------|--------|--------|--------|-----------------------|
| Line 1 corridor | 35.3% | 12.2% | 14.2% | 36.4% | 21.9% | 6.4% | 0.4% |
| Outside of the line 1 corridor | 36.2% | 33.0% | 20.6% | 11.9% | 19.4% | 5.4% | 0.5% |
| Variation | +2.5% | +170.2 % | +45.2% | -67.3% | -11.7% | -15.0% | +26.4% |
| Average | 36.0% | 28.4% | 19.1% | 17.4% | 19.9% | 5.6% | 0.5% |

Source: GIS and 1998 household survey (SYSTRA-DRTPC).

The figures in the above table show that:

Metro becomes the most used mode of transport whenever it is available (See map no. 6)

The shared taxi, the customers of which have income level near that of metro users loses substantial market shares whenever the metro is available. The bus, which is less expensive than metro remains attractive mostly with the poorer section of the population.

The metro probably plays a major role in the urban development for the middle and poorer sections of the population. The wealthier categories (2% of the population) who always use their car, even when the metro is available, are more attracted by areas with more space (roads, parking space) and better suited to the use of a private car.

3.3 - Mode use and type of area served

Complementary studies have been conducted on specific characteristic districts in Cairo with a view to assess mode use as a function of the type of housing and of the availability of the metro.

In poor districts, where the inhabitants do much walking, the figures for motorised modes are as follows:

TABLE 3.3.1: TRANSPORT MARKET SHARES IN A FEW UNDERPRIVILEGED DISTRICTS
(Daily figures)

| District names | Type of district | Service | Shared taxi | Bus | Metro | Car | Taxi | Bi- and motorcycles |
|-----------------|--|-------------------------|-------------|-----|-------|-----|------|---------------------|
| Imbaba | Informal, poor in agricultural zone in Gizah | No direct metro | 57% | 17% | 6% | 12% | 3% | 0% |
| Bulak el Dakrur | Informal, poor in agricultural zone in Gizah | No direct metro in 1998 | 58% | 19% | 2% | 8% | 5% | 1% |
| Dar Al Salam | Old poor district near the centre of town | With metro | 12% | 4% | 65% | 16% | 1% | 1% |
| Mataria | Poor district in the outskirts | With metro | 14% | 20% | 27% | 20% | 4% | 1% |
| Al Masakin | Poor district in the outskirts of Helwan | With metro | 46% | 3% | 32% | 12% | 4% | 0% |

Source: 1998 household survey SYSTRA-DRTPC

In the absence of metro, the shared taxi is the main mode of transport in this type of district where the streets are frequently narrow and not accessible to large-size vehicles.

Where the metro is available, the attraction of the bus and shared taxi drops mostly in the centre of town where the traffic congestion is worst. In addition, the central area is the employment area for the surrounding poor districts, so if the metro is available for this type of trips (Dar el Salam), its market share rapidly becomes dominating.

In the poorer districts in the outskirts, the metro share remains substantial. However, in these districts, the poor tend to work more in secondary local centres (Heliopolis, Helwan refineries) which are not served by the metro.

In the wealthier districts, which always offer a source of employment for the poorer section of the population (small jobs), the market shares of modes of transport are as follows:

TABLE 3.3.2: TRANSPORT MARKET SHARES IN A FEW WEALTHY DISTRICTS

(daily figures)

| District | Type | Observation | Shares taxi | Bus | Metro | Car | Taxi | Bi- and motorcycle |
|-----------|---|-------------------------|-------------|-----|-------|-----|------|--------------------|
| Dokki | Wealthy district in the centre of town | No direct metro in 1998 | 14% | 6% | 2% | 45% | 19% | 0% |
| Maadi | Wealthy district in the immediate outskirts | With metro | 4% | 3% | 44% | 38% | 4% | 0% |
| Nasr City | Wealthy district in the outskirts | Without metro | 13% | 9% | 0% | 48% | 9% | 0% |

Source: 1998 household survey - SYSTRA-DRTPC

In the wealthier districts, the use of the private car is still high, even when the metro is available (which is not the case for the taxi). The use of the metro is preponderant in Maadi (one of the wealthiest and most European districts in Cairo) in so far as that secondary centre of activity also attracts a middle-class and poor population.

On the origins / destinations served by the metro at both ends, and in excess of 3 km length, the market share for that mode is often above 80%. Very few Far Eastern towns with similar densities and equipped with metro networks can claim such penetration rates for the metro on the transport market (Tokyo).

3.4 - Urban development and cost experienced by the transport user

The fare range applied in GCMA per mode of transport is as follows:

TABLE 3.4.1: COMPARISON BETWEEN FARE RANGE PER MODE

| Transport modes | Full fare (single ticket) for travel exceeding 10 km | Pass | Average cost per travel (*) |
|----------------------|--|----------------|-----------------------------|
| Shared taxi, minibus | 40 p | No pass | - |
| Bus | 25 p | £ 15 (1 month) | 29p |
| Metro | 50 p | £ 40 (3 month) | 25 p |
| Suburban train | 25 p | No pass | - |

(*) assuming 2 travels per work day

The poorer classes are sensitive to the fare cost, which explains the large market share of walking in this type of population.

As regards occasional trips, and in the case of persons who cannot afford to purchase a pass, the bus is the most affordable mode of transport (and the slowest) on small distances.

As regards regular travel (for work or study), the pass is more economical per trip. For this type of travel, the metro is the less costly mode of transport in Cairo and the speediest on long as well as short distances.

The train is the less costly mode of transport on short and long distances irrespective of the type of travel. This mode is penalised by its inadequate supply.

The shared taxi which is less expensive than the metro for occasional travels is comparatively much more expensive for regular travels (no pass).

Since the site of the dwelling is influenced by the place of work of its inhabitants, it is unlikely that the service of a district in the outskirts by the shared taxi will affect the urban development aimed to middle and poor classes.

On the other hand, urban development will be all the more influenced by a public transport service offering an attractive fares and high speed for regular travels. The regional train in suburban areas (very fast, inexpensive) followed by the metro in urban areas (fast and inexpensive) and the bus in urban and suburban areas

(inexpensive and less fast) are better suited to encourage the suburban development aimed to middle and poor classes.

3.5 - Modes of transport and gender

Transport use varies enormously depending on the sex of the user.

TABLE 3.5.1: MOBILITY PER SEX

| | Daily mobility | Share of motor transports | Share of walking |
|---------|----------------|---------------------------|------------------|
| Men | 1.70 | 68% | 32% |
| Women | 1.12 | 57% | 43% |
| Average | 1.42 | 64% | 36% |

Source: 1998 household survey (SYSTRA – DRTPC)

Women are much less active and much less mobile than men, which accounts partly for the low overall mobility recorded in Cairo. When women travel, they walk more than men, and on shorter distances (for purchases and sundry errands).

TABLE 3.5.2: MOTOR MODE MARKET SHARES PER SEX

| Mode | Shared taxi | CTA bus | Metro | Other public transport modes | Car | Taxi | Bi- and motorcycles |
|---------|-------------|---------|-------|------------------------------|-------|------|---------------------|
| Men | 27.4% | 19.9% | 16.9% | 7.9% | 22.8% | 4.3% | 0.7% |
| Women | 30.2% | 17.5% | 18.2% | 11.4% | 14.3% | 8.3% | 0.1% |
| Average | 28.4% | 19.1% | 17.4% | 9.6% | 19.9% | 5.6% | 0.5% |

Whenever women use a motor transport, they tend to use the metro more than the men do (it offers cars reserved for women) and the shared or metered taxi (which only offer seats. The bus (uncomfortable and with much promiscuity between passengers) and the car (chauvinist object?) are less used by women than by men.

Whenever they have a choice between modes, women still use more the metro and shared taxi, and the metered taxi for the wealthier ones.

The new migrants arriving in Cairo, most of whom are men from a rural and poor section of the population, tend to inhabit spontaneous districts often established in agricultural areas (lesser change of environment) in the outskirts of the urban area.

Wealthier sections of the population, where women are more active, are more interested by the non promiscuity in transport, and tend to be more attracted by housing served by metro, shared or metered taxi (the latter for the wealthier). The very wealthy go for housing more accessible by private car and with space for parking.

3.6 - Conclusion

This review points to the following aspects:

1. The poorer sections of the population are more sensitive to the fare level applied in public transport. They tend therefore to live near the centres of activity where they find work in the absence of fast and inexpensive modes of transport (train, bus in the outskirts).
2. As regards the middle classes, most of whom cannot afford a private car, they tend to live more near public transport infrastructures (metro, shared taxi on shorter distances) to reach the centres of activity where they work. Comfort (absence of promiscuity for women) and travelling speed of the public transport modes become major factors. The metro and shared taxi are the most popular modes.
3. The wealthier middle classes who also use individual modes are still attracted by the proximity of efficient and comfortable public transport infrastructures (metro).
4. The wealthier are interested in infrastructures aimed for the private car (roads, parking space) and in the quality of their house. They rarely use the metro, even when it is available. However, this type of population attracts a working class population (domestic staff, small jobs) which requires at the very least surface public transport. It is noticeable that, as a rule, the wealthier districts lead to the creation of spontaneous poor district in their vicinity.

The metro, when it is available, is the mode of transport most used by all social classes, except for the wealthier one.

Given its high cost for long shuttling travels (no monthly pass) the shared taxi does little to encourage housing in the outskirts.

4 INFLUENCE OF THE TRANSPORT POLICY ON THE DEVELOPMENT OF THE URBAN AREA

4.1 - Historic background

Cairo developed itself on a cross roads between major goods transport water ways, viz.:

1. The Nile which links the territories to the South of Egypt (Sudan, Ethiopia and Central East Africa) to the delta and the Mediterranean to the North.
2. The Ismailya canal between the Red Sea and the Indian Ocean on one side, and the Nile and the Mediterranean on the other (before the construction of the Suez canal).

Cairo's spatial development was also influenced by such natural barriers as:

1. The Nile, which remained a natural barrier for a long time before several bridges were built between Cairo and Gizah.
2. The Mokattam and Tourah cliffs to the East of Cairo.

As a result, the development of Cairo, which was also hampered by the presence of agricultural areas to the East and North did not evolve along a concentric pattern but followed a North - South line.



4.1.1 - Forms of urban development

The development of the urban area took several forms:

Town planning, generally in desert or semi-desert areas, targeted at middle and wealthy classes.

1. Informal, spontaneous development, mostly illegal since occupying agricultural areas, on the edge of built-up areas. This is generated by poor classes. Contrary to the desert areas, these areas have water and are situated near essential facilities.
2. Vertical densification of previously built-up areas and filling in of empty spaces.

4.1.2 - Past influence of the tramway and railway

The urbanisation was initially driven by the tramway and railway which, at that time, were the only modern and rapid modes of transport.

The company of tramways was established in 1895.

The first large scale town planning operation goes back to the early Nineteen Hundreds and was initiated by Baron Empain. That was Heliopolis which was created in 1906 on a semi-desert area 10 kilometres to the East of CBD (extended city centre). This new town integrated, from the design stage, a tramway network (5 lines) which connected it to CBD. The development of Heliopolis was a success from its very beginning and remains to this day an example of architectural heritage.

The districts of Shoubra and Rod el Farag to the North of CBD also owe their development to the new tramway lines opened in 1902 and 1905. Later on, other tramway lines were built and extended (Pyramid Avenue to Gizah).

The railway network also played a major part in the development of Cairo. The lines of Suez, Alexandria and Upper Egypt, and later of Helwan evolved to carry suburban railway services. Urbanisation grew denser near the stations, in particular between Helwan (old town), Maadi and CBD, between Matarya and CBD along the Suez line and, to a lesser extent, in Shubra el Keima (Alexandria line) and the South of Gizah on the Upper Egypt line.

The tramway reached its peak in 1973, when it registered its highest ridership. The last tramway line was built in 1988 to serve the new town of 15th of May. As for the train, the two lines which carried 80% of intercity passengers were linked to create the first regional metro line. The other lines were not renovated but part of

the second metro line uses available ground space along these infrastructures in Giza to the South and Shubra to the North.

4.2 - The town planning policy considered in 1970

4.2.1 - Proposed town planning

The first master plan was prepared in 1953, and included in particular the new districts of Nasr City, Al Salam and Mokkatam to the Northeast and to the South of Heliopolis, respectively. This plan underestimated the population increase and was based on a population forecast of 5.5 million in 2000. The problems encountered in transport and sewerage, as a consequence of the substantial population increase led to the preparation of a second master plan in 1970. The aims were:

1. to put an end to the spreading of Cairo, the outside limit of which was to be marked by a circular motorway (the present ring road) by 1990,
2. to accommodate the remainder of the urban expansion in self-sufficient satellite towns (housing, employment, administrative centres) established at a distance from Cairo (15th of May, 6th de October, El Obour, 10th de Ramadan and Al Amal).

The 1982 master plan integrated and completed the 1970 edition with:

1. a more ambitious public transport network (regional railway lines, extension of the tramway network to Giza),
2. the construction of more new towns (New Cairo, extension of 15th of May, Al Sheik Zayeb to the West) capable of absorbing the rapid expansion of Cairo,
3. the will to organise the evolution of Cairo towards a multi-nuclear town, in which CBD would no longer be the sole centre of activity, in order to reduce travel distances and the associated economic cost.

These new towns planned in desert areas were intended to:

1. put an end to the absorption of agricultural land by spontaneous urbanisation,
2. make in exchange available and affordable housings in the desert to sections of the population with low or intermediate income levels.

The associated transport projects included:

1. a limitation in the number of junctions planned in the agricultural section of the future ring road,
2. the slowing down of the construction of the ring road in its agricultural section, so as not to encourage spontaneous settlements,
3. the construction of a regional railway network to the new towns integrating the existing line 1 of the metro,
4. the extension of the tramway network on the West bank (Giza)
5. the creation of segregated bus lanes.

There was no plan to build the second metro line projected in the 1973 transport plan.

The highly centralised Cairo urban area was to evolve towards a multipolar structure. The future town centres were planned:

1. Between Heliopolis and the airport, this centre was to accommodate a major services centre,
2. In such major districts as Shubra, Gizah pyramid, Helwan, 15th of May and Maadi where manufacturing centres were planned.

This master plan revised the figures for the population increase and forecast 16 million inhabitants in 2000. It warned the authorities against the uncontrolled development of Cairo into the agricultural zones calling it a “nightmare scenario”.

The 1982 master plan

Source: GOPP-IAURIF

4.2.2 - Other political and economic factors affecting urban development

Transport and town planning play major roles in urban development. In order to complete the review, a number of government measures which affected the development of Cairo are listed below. These are, mainly:

- the creation of major industrial centres in the Fifties (Nasser era) to the North and to the South of the town (Helwan) with construction of worker housing.
- the Creation of Nasr City and development of Mohandesseen in the Fifties as a result of a marked political will. In both cases, the State acted as owner and subsidised part of the building material, equipment and servicing of the land.
- In the Sixties, the political disruptions due to heavy military expenditure caused an intermission in town planning operations.
- The rent freeze in 1961 in the CBD area in order to limit the installation of service companies and the depopulation of the centre of town, effectively encouraged new constructions along the edge of that area.
- The early Seventies saw a failed attempt to redevelop and to rehabilitate old and poor districts in the centre of town (problems with compulsory purchase, 1973 war).
- From 1976, introduction of economic liberalism, substantial emigration to the Gulf Countries, explosion in construction and increase in real estate prices. The State no longer financed the construction of council housing. The private sector concentrated on the construction of villas and blocks of flats in urban areas sometimes causing a flight of the poorer section of the population (Owners paid substantial compensation to get rid of tenants). The State let market forces shape the capital.
- Increase in the urban density in Giza, to cope with the urban pressure, authorising the destruction of the villas to be replaced by office blocks.
- In 1981, President Mubarak came to power and transferred government offices, some administrations and ministries to Heliopolis. The army completed a few property development operations in Heliopolis (housing).
- 1992: earthquake and relocation of the poorer population in the satellite district of El Amal in the desert.
- 1997: end of the rent freeze in the centre of town.
- The State took part in the new town projects by building communication roads, managing the land division and servicing the resulting plots. Private property developers no longer hesitated to launch marketing

campaigns to sell high quality estates (models, dream architecture, swimming pool).

4.3 - Effective development of Cairo between 1970 and 2000

4.3.1 - Transport parameters

In effect, the population increase was substantial but less than expected; in 2000, the population is estimated to average 14 million inhabitants instead of the 16 forecast in Greater Cairo by the 1982 master plan.

By comparison with the master plan proposals, the main transport infrastructures planned and built since 1970 include:

1. the first regional metro line,
2. the ring road which was completed a few years early as regards the section crossing the agricultural sector,
3. the motorway between the centre of town and Helwan-15th of May,
4. the construction of tramway lines in 15th of May and Nasr city.

The transport infrastructures included in the master plan and which were not built are:

1. the second regional metro line between the centre of town and the new towns at both ends,
2. the extension of the tramway network to Giza,
3. the creation of express train links to the satellite towns,
4. infrastructures for buses.

The main infrastructures not included in the master plan, and built are:

1. the second line of urban metro (although this was included in the transport plan of 1973 (SOFRETU) and 1989 (JICA),
2. the 26th July motorway corridor between the agricultural sector, the centre of Mohandesseen and the 6th de October new town and the Alexandria motorway,
3. the El Azar motorway tunnels (2x2 km) between CBD and the Salah Salem road to Nasr City.
4. the dismantling and abandonment of certain tramway lines and of all trolley-bus lines.
5. the explosion in the shared taxi supply.

Simultaneously, the urban development was less than forecast since the population increase between 1982 and 2000 totalled 5 million inhabitants instead of the 7 million initially forecast.

4.3.2 - Urban sprawl

The evolution of the urban area between 1970 and 2000 took place in the form of:
(See Figure no. 8)

4.3.2.1 - Spontaneous development

1. on the agricultural land to the west of Gizah, mainly inside the perimeter delineated by the ring road,
2. on the agricultural land to the South of Gizah and outside of the ring road (along the Upper Egypt road and the Saqqarat road). That spontaneous development also involved a wealthy population with car (recent creation of villas with swimming pools in the agricultural sector),
3. in the agricultural areas to the North of Shubra, Ains Shams mostly inside the perimeter of the ring road.

In 1996, the 67 spontaneous zones in Greater Cairo covered 27% of the urban area and accommodated over 6 million inhabitants, i.e. over 40% of the population (Source: Galila El Kadi, B3 shop)

In conclusion, the spontaneous development was more substantial than expected and not always limited within the ring road. Many spontaneous constructions are currently sprouting outside of the ring road to the South and West of Giza and to the North of El Marg.

4.3.2.2 - Planned development over the Cairo urban area

The development took place:

1. in Nasr City which has become a major district in Cairo.
2. in Al Salam to the North - East of Heliopolis (middle class).
3. in Mokkatam to the East of CBD.
4. in 15th of May to the South - East of Helwan.
5. in the Sheraton district East of Heliopolis.

The planned development within the urban area was most intense in the East of Cairo.

4.3.2.3 - New town development

The development of new towns has been considerably delayed in comparison with the forecasts. For example, only 400,000 inhabitants were registered in 6th de October whereas the 1982 forecast was in the region of 2.8 million inhabitants in the new towns in 2000. Moreover, the population initially targeted (middle and poor classes) did not materialise. The area has been settled by wealthy middle classes with cars who have started building there quality villas or blocks of flats. The many buildings destined to middle and poorer classes have remained vacant. It does seem nevertheless that property development has been on the increase again in 6th de October and New Cairo over the last two years.

To conclude, Cairo has expanded less rapidly than was expected. The absorption of agricultural areas has continued more steadily than expected at the expense of the new towns planned in the periphery.

It should be borne in mind that the State stopped financing housing estates back in 1976. The economic liberalisation has encouraged the development of luxury districts (limited capacity) and that of shared taxi networks, to the detriment of housing estates and of the densification of the bus network.

4.3.3 - Urban structure and densification

4.3.3.1 - Urban densification

This happened:

1. along the corridor of the first regional metro line, outside of the town centre (Helwan, Maadi-Bazatin, 15th of May, El Marg).
2. North of CBD along the Eastern bank of the Nile (business centres, luxury hotels).
3. in Giza Mohandessen and Doki (villas transformed into office blocks).
4. between Heliopolis and Nasr City (on ex-army land).
5. to the Northeast of Heliopolis (tolerated spontaneous districts, such as Ain Shams).

The construction of new road bridges between Giza and Cairo has encouraged the development of Zamalek and Mohandesseen on the West bank. This has meant that the development was reserved for the wealthier section of the population. It began with many villas with garden. Later, during the Seventies and Eighties, the marked urban pressure and the closeness to CBD less than two kilometres away have encouraged property development. Most of the villas have now disappeared to be replaced by high rise buildings. Confronted to this pressure, government increased the urban density ratio by four in this area. As a result, the centre of Mohandessen has become an extension of CBD occupied by housing, shops and service activities. In this district, individual and public road transport are highly prominent and increase the traffic congestion in the centre of town (substantial East / West transit flows responsible for the traffic congestion).

Cairo has become denser faster than expected and in areas that were not always intended for urbanisation. The population in the town centre has diminished steadily, as jobs were being created there.

4.3.3.2 - Urban structure

The 1970 and 1982 master plans recommended an evolution of the Cairo urban area towards a multipolar metropolis, with several centres of activity offering jobs and services.

Thirty years on, the weight of CBD has become even greater in so far as the surrounding districts, such as Zamalek and Mohandesseen have also become major business districts. This trend has been further encouraged by the rent freeze in CBD

since 1961 (and repealed since that date), which was aimed to limit the concentration of service activities in the town centre, as a result, they developed along its perimeter. Nowadays, the new definition of CBD tends to include the old CBD, Zamalek and the East side of Mohandessen. The affluent villas of the Sixties and Seventies have been destroyed to be replaced by high rise buildings occupied by several multinational companies. To the North of CBD, on the East bank of the Nile, luxury hotels or business centres have been built to replace old and poor districts.

Simultaneously, Heliopolis and Nasr City have become secondary centres of activity. Several administrative centres have been relocated from the town centre to Nasr City (government bodies, ministries, statistics agency, conference centre, etc.) under the Mubarak government in power from 1981. Maadi also reinforced its activity centre.

On the other hand, the activity centre planned near the international airport failed to come into being even though a few luxury hotels were built. So far, the new towns have failed to develop a "centre", even though jobs were created or transferred to Sheik Zayeb, around 6th of October plus a university established to encourage the development of 6th of October. For the time being, the large majority of the active population still prefers to live in the Cairo urban area and to travel in shared taxi or company buses via the new motorway corridor of 26th July to the new town; quite apart from the cost of transport, there are strong links with Cairo (relatives, mosques, services, etc.).

4.3.3.2.1 - Labour market areas

The last 1996 census (See Figure no. 12) shows that the area consisting of CBD, Mohandeseen and Dokki remains the main activity centre. The number of jobs has increased steadily in the town centre to the detriment of the population which emigrated towards the outskirts. Since the Seventies, other service centres have appeared. Other industrial employment areas have developed to the North of CBD as well as in Helwan and Tibbin at the South end of line 1 of the metro.

The metro lines serve a major fraction of the employment areas in Greater Cairo (see Figure no. 12).

4.3.3.2.2 - Students

Out of the four universities in Greater Cairo, three are served by the first two metro lines. They are Ain Shams university (154,000 students) and Helwan university (97 000 students) on line 1 and Cairo university (140 000 students) on line 2. The

Islamic Al Azar university (80 000 students) should be served by the new metro lines.

Elsewhere, the schools are established near housing areas.

4.3.3.2.3 - Population figures and internal flows

The variation in population within the different districts of Cairo are the consequence of internal migrations, of the difference between deaths and birth figures and of external migrations.

Between 1976 and 1986, the centre of the urban area lost a fraction of its population which moved to the outskirts. This population, which came from fairly wealthy districts migrated to quieter areas in Nasr City, 15th of May to the East of Helwan, Maadi and Gizah.

(See Figure no. 10)

Simultaneously, external migrations from rural areas and from the older parts of the centre of town settled in the informal districts of Imbaba, Shubra el Kheima, Ains Shams to the North of Heliopolis and East of Nasr City.

The drop in population in the centre of town is the result of:

1. the transformation of dwellings into offices.
2. a drop in the quality of life due to the traffic increase (noise, safety, pollution, space) in the centre of town.
3. the drop in the population of such poor districts as Islamic Cairo and Bulak probably due to the increase in the cost of living resulting in a reduction in the number of persons per household (general phenomenon throughout the poorer district with a shortage of building land).
4. the rent freeze in 1961 which has discouraged certain owners from letting their houses / flats, and the government policy to promote the construction of blocks of flats before 1976.

On the whole, the densification of the population has followed a relatively concentric pattern around CBD. However, more distant areas North of Heliopolis (El Marg, Salam) and East of Helwan also have become more densely populated. These peripheral areas lie where the old suburban railway terminals used to be (Helwan and Al Marg).

The same phenomenon occurred and developed between 1986 and 1996 in the centre of town, overflowing onto the West bank of the Nile (Mohandesseen). The

South of Maadi is gaining new inhabitants and the population is becoming denser at the ends of the first regional metro line.

(See map 10)

Nasr City is steadily getting more densely populated. Middle-class and wealthy inhabitants continue to migrate to that new town where many dwellings are being built and which is easily accessible by car (construction of a road viaduct between Nars City and CBD).

Old districts in the centre of town, and even spontaneous districts with no building land left as in Imbaba are losing their population. The drop in fertility and household size added to the relative increase in the standard of living seem to account for this tendency.

The urban development is all the more distant from Cairo as the impact of the fare cost is low on the household budget. The poorer sections of the population establish themselves within walking distance of their place of work, the wealthier ones, with cars, sometimes quite a long way away.

4.3.4 - Urban development and accessibility to the town centre

On inspection, the centre of the map illustrating the accessibility to public transport (74% of motor travels) shows a striking similarity between the urban contours of Cairo and the isochronous curves from CBD.

(See Figure no. 13 integrating the metro)

Since Cairo is a highly centralised town, its development was closely linked to the accessibility to its centre. It is clear that the curves showing the accessibility by public transport, which are not concentric, are markedly affected by the metro network, which offers commercial speeds 3 to 4 times above those of the road based public transport modes at peak hours.

In respect to individual modes (26% of motor travels), the isochronous curves are more concentric and more favourable in the Eastern districts (Heliopolis, Nasr city) which are connected to the centre of town by motorway viaducts not accessible to public transport.

When comparing these accessibility curves to the urban development, it is noticeable that:

- the poor districts have developed nearest to the town centre on agricultural land to the West of Giza-Mohandesseen.

- the development of Cairo has grown densest in the areas within ninety minutes of the town centre (line 1 corridor + North of Cairo).
- the so-called wealthy districts have grown denser near CBD (Mohandesseen, Doki, Zamalek) before progressively becoming services districts.
- the new wealthy districts developed in more pleasant districts in Nasr City, Mokattan and in the East and South outskirts of Heliopolis still on the basis of the ease of access by road.

The more recent development of Heliopolis and Nasr City as secondary centres encouraged the emergence of wealthy or poor suburbs even further East from Cairo:

- in Ains Shams for the poorer ones (on the outskirts of Heliopolis).
- in Al Salam (5 km from Heliopolis) for the middle classes.
- and, currently, in al Shourouk and al Abour for the wealthiest with a car who live 15 km from Heliopolis.
- on ex-army land made available for luxury development between Heliopolis and Nasr City.
- to the East of Nasr City (middle classes plus a spontaneous poor area).

4.4 - Influence of the transport policy on the urban spreading

The analyses in the previous chapters indicate clearly that transport did affect the urban development of Cairo. Each mode of transport had a particular effect on the resulting type of urban development.

4.4.1 - Tramway network

The development of the tramway network from the beginning of the century which was aimed at a wealthy population as yet without cars, encouraged the emergence of wealthy districts during the first half of the twentieth century (Heliopolis) and up to the Seventies. The first class was reserved for the residents of wealthy districts and the second class accessible to the poorer users who came to work in the wealthy districts.

From the Sixties - Seventies, the tramway was replaced by the car in the more affluent sections of the population and lost its attraction because of ageing and lessened performances (speed, regularity, failure to renew the infrastructures and the rolling stock).

Although new tramway lines were created after the Seventies in new districts of Cairo, their impact on urban development probably was negligible (Nasr City, 15th of May, Sheraton district). Tramways have been hampered by their outmoded image (this is not a modern tramway) and low commercial speed.

4.4.2 - The first regional metro line

The first regional metro line crossing Cairo along its greatest length was fitted in the main travel corridor already existing in Cairo in 1989. The metro was built through the most densely populated areas, not with the aim of accompanying the development of a new district (as was the case with the tramway in Heliopolis), but in order to improve transport conditions for as many users as possible.

(See Figure no. 11)

To begin with, the metro was targeted at a middle class and well-off population. The authorities have placed a limit on fare increases, so that the metro is now the most democratic mode of transport. Its attraction is all the greater as traffic congestion is chronic in the centre of town. Its success does however make it more uncomfortable (saturation at peak hours) and less attractive for the wealthiest users.

The metro, which offers easy access to the centre of town has clearly encouraged the filling in of any vacant land within its zone of influence, even in agricultural areas at its ends. Nowadays, this influence is further increased by the complementary role played by the shared taxi which feeds it from the outlying districts (15th of May, Tibbin) and sometimes from the agricultural sectors (North of El Marg).

(See Map no. 3)

4.4.3 - Bus network

As the years go by, the bus network has been extended, although this was often to the detriment of the frequency. It is operational throughout Cairo. Given the saturation of the automobile traffic, the network has become less efficient in the urban area. It is increasingly abandoned, even by middle classes, in favour of the shared taxi (more flexible and more comfortable) or of the metro (faster).

The construction of Al Salam, one of the only planned new districts targeted at a middle-class or poor section of the population to have been built, was followed by comprehensive bus and shared taxi services (See Figures no. 2 and 3) which are effective on this type of run, as yet not saturated. Without that transport supply, this town, which is tied to Heliopolis and to the airport zone, and the population of which owns few cars, would probably have failed.

Along the North section of the corridor of line 1, and to the centre of town, the bus supply has remained relatively substantial owing to the saturation of the metro over that stretch. By providing relief for the metro, the bus also increases the metro's influence on the increased urban density and spreading at both its ends (See Map no. 2).

The extension of the bus network, with an attractive scale of fares to the agricultural areas (Warak to the North of Imbaba, South of Giza, Qaliub, North of Cairo and El Marg) probably encourages the densification and spreading of the agricultural villages at the outskirts of Cairo which will probably be absorbed by the urban area of Cairo.

4.4.4 - Shared taxi network

The shared taxi network, which virtually did not exist twenty years ago, benefited fully from the liberalisation of transport. This network managed to become fully complementary with the metro, sometimes by borderline methods (stops outside of permitted areas, non compliance with the highway code, etc.). In addition, it became very popular in districts inhabited by a middle class or wealthy population (Nasr City, Gizah, al Ahram, Doki) (See Figure no. 6), where the bus supply was inadequate. It does increase the traffic congestion as a result of the space it uses per number of passengers carried (between the bus and the private car) and of its tendency not to comply to the highway code. The latest figures show that the wealthy central districts (Zamalek, Dokki, Mohandesseen) tend to see their population migrate towards other wealthy districts in the outskirts with a better quality of life (more space, less noise).

This mode follows the transport demand on a day by day basis. It is not unusual to see shared taxis driving along 2.5 m wide lanes to get to the spontaneous districts that sprout up in the agricultural areas. It follows that this network does improve the standard of living in these districts whilst encouraging their development even though walking remains the main mode of transport in this type of district.

Further out in the suburbs, the creation of wealthy districts (Al Shorouk, 15th of May) generated local employment (caretaker, cleaning lady, small shops). The shared taxis have spontaneously taken charge of this type of customers the fare of whom is often partly paid by the employer. It can therefore be said that the shared taxi network also encouraged the launching and prosperity of the wealthy districts in the outskirts (less than 10 km out).

In even more remote new towns (6th of October, 10th of Ramadan, Al Badr, etc.), the shared taxi remains penalised by its high fares with the result that it was not instrumental in inciting middle-class and poor sections of the population to settle in these areas which had initially been intended for them.

4.4.5 - Road infrastructures

The road infrastructures have developed substantially within the centre of Cairo (viaduct, tunnel motorways, several multi-level junctions). This development which is closely related to the increase in the number of private cars, failed to limit the traffic congestion between CBD and the districts in the eastern outskirts (Nasr City, Heliopolis) and to the West (Giza). In the outskirts, this evolution translated in the construction of the ring road and of urban motorways in particular to the new towns.

Needless to say, the road infrastructures have a substantial impact on the urban spreading. However, the opening of motorways to the new towns failed to have the expected consequences.

On the edge of the desert, the new towns which were initially intended to accommodate 2.8 million inhabitants from middle and poor sections of the population in order to stem the uncontrolled spreading on agricultural land, failed to develop as expected. Numerous blocks of flats and groups of buildings were built and failed to find buyers, thereby slowing down the development programmes. Only suburban districts within 10 km of a centre of activity have expanded as planned (Mokattam, Al Salam, 15th of May, Al Ahram) but through car owning classes, with the exception of Al Salam.

So far, the remoter new towns (Al Shorouk, 10th of Ramadan...) have attracted a wealthy and car owning population, but not the middle classes. The planned blocks of flats and urban centres have been replaced by condominiums, sometimes with garden and swimming pools.

In the new town of 6th of October, the creation of a new university and the development of an employment area have so far failed to induce potential inhabitants to leave Cairo where all the necessary services are available (facilities, services, administration, relatives, etc.).

In the agricultural outskirts, Cairo has continued expanding both inside and outside of the ring road, especially to the South of Giza. Access to Maadi, right opposite the Nile, is now possible, even on foot, since the ring-road bridge over the river has been built. These road accesses, although they were needed, have encouraged spontaneous settlements.

4.4.6 - Suburban railways

As was the case for the tramway, the railway lines have encouraged the development of Cairo during the last century. The two main lines, which have been reworked into the first regional metro line have further encouraged the development of Cairo along the Helwan - El Marg corridor.

The other lines mainly crossing rural areas, with few stops in urban areas and, furthermore, with poor running frequencies, have had little influence on the making of Cairo's urban structure beyond the Seventies.

The projected renovation and / or construction of new railway lines between the centre of town, the secondary centres and the future new towns have not been put into effect for it was feared that it would encourage the emergence of "dormitory towns" as was the case in the Paris suburbs during the Seventies, and, mainly, because of a lack of political determination.

The construction of an express railway line more attractively priced than shared taxis would probably have speeded up the development of the new towns targeted at the less favoured sections of the population.

4.4.7 - The urban metro line

It is too early as yet to assess the impact of the second metro line on urban development. This will probably be limited since the line serves districts already densely populated with very few empty plots. On the other hand, it is likely to be greater at both ends (North of Shubra where there are many vacant plots left, and Mounib to the South). Already in 1998, a major fraction of the passengers reached the North terminal by means of the shared taxi, which proves that the impact of the metro is already reaching beyond its immediate catchment area via intermodality with the shared taxi and, to a lesser extent, with the bus.

4.5 - Influence of the transport policy on Cairo's urban structure

Cairo has been a highly centralised town. The 1972 and 1982 master plans recommended a multipolar urban area via the creation and development of several secondary centres.

In effect, CBD continued expanding mostly on the West bank of the Nile (Mohandessen and Zamalek). Throughout CBD, the population figures have dropped steadily in favour of jobs. The attraction of Cairo's town centre is steadily

increasing (See Figure no. 4). Certain secondary centres have nevertheless expanded, mainly in Heliopolis and Nasr City and, to a lesser extent, in Helwan, Maadi and Shubra.

4.5.1 - Tramway network

In the early Nineteen Hundreds, the radial tramway network encouraged the development of CBD (wealthy) by creating efficient connections between the residential areas in Heliopolis and CBD. Since the Seventies, the ridership of the tramway network has steadily diminished and it has had little effect on the urban reorganisation of Cairo.

4.5.2 - Regional metro line

The first regional metro line has made the centre (CBD) more accessible from the areas it serves (See Figure no. 13) with the consequence that the need for new centres of activity along the corridor of line 1 has not really been felt. Only Maadi and Helwan (old towns) have retained and expanded their town centre.

The increased density of the urban fabric along the wider corridor of the first line has strengthened the customer catchment area of CBD and necessarily increased its role. That zone accommodates a middle class population contrary to the earlier customer catchment area centred around the Heliopolis tramway. The smart shops and cafés which existed in CBD during the Fifties then lost their attraction to the benefit of less upmarket shops, following the evolution of the population in the districts connected by line 1 of the metro.

It is a fact that the regional metro line did encourage the reorganisation of the centre of town given the type of population transported on the metro.

4.5.3 - Bus network

The bus network operating throughout the Cairo area was the mode of transport used by over 70% of the population in the Seventies. This is no longer the case nowadays, as it carries poorer sections of the population with longer travelling times. It does however offer transverse connections between districts which are not available on the metro network, and links poor districts and wealthier ones. Given its low scale of fares, its influence is greater in the poorer districts. The relative reduction in the bus supply per geographic unit probably encouraged the concentration of the population in spontaneous poor districts in the immediate vicinity (walking distance) of the wealthy districts. It is nevertheless difficult to precisely assess its impact on the urban structure.

4.5.4 - Shared taxi network

The development of the shared taxi network followed an exponential curve, taking advantage of the deficit in the bus supply and of the failure to build the planned railway infrastructures.

The network probably helped consolidate Greater Cairo because of the comprehensive and varied service it offers in the urban as well as suburban zone (See Figures 3 and 6). It doubtlessly reinforced the consolidation of the Western outskirts of CBD on the West bank of the Nile (Dokki, Mohandessen) since it holds

a major share of public transport in this fairly wealthy district with relatively few bus services.

On the other hand, it does contribute to the deterioration of the environment (congestion, noise, safety) in the centre of town which is currently causing the wealthier sections of the population to move to other quieter and less polluted urban and periurban districts.

Outside of the town centre and of the metro corridors, it gives the middle classes (living away from the metro origins and destinations) the possibility of going anywhere they wish, in tolerable conditions and whilst compensating the bus shortage. It is quite likely that the shared taxi has been instrumental in maintaining middle-class sections of the population in their district of origin.

4.5.5 - Road infrastructures

One of the characteristic parameters in Cairo, and which has generated huge congestion problems, is the development of a services district in Mohandesseen / Dokki and Zamalek, which is not served by the metro, and attracts wealthy car owning populations from wealthy districts sometimes on the other side of Cairo (Heliopolis, Nasr City).

The construction of road viaducts and of new bridges over the Nile can no longer absorb the huge traffic congestion within these districts and in CBD. (See Figure no. 6. private vehicles). As a result, the living conditions have deteriorated along this East - West line due to the endless travelling times and their consequences on the environment. The middle and wealthier classes seem to start migrating away from the centre (spontaneous villas on agricultural land in Gizah since the opening up of the ring road, wealthy, spontaneous development Gizah, el Ahram, Eastern Nasr City, Al shorouk, 15th of May). These migrations are causing the traffic situation to deteriorate even further. The Al Azar tunnels due to be opened to traffic between CBD and the Eastern districts should not remedy this imbalance but attract even more cars to the town centre.

Simultaneously, it seems that the local authorities are increasingly keen to create a new services area near the airport. The latest update of the master plan (See Figure no. 9) plans another activity centre near Mokkatam. One of the purposes of the projected third metro line between Gizah, Mohandesseen, Imbaba, CBD and Heliopolis, Nasr City is to remedy this major issue in Cairo.

4.5.6 - Suburban railway

It is unlikely that the suburban railway had much influence on the urban structure of Cairo after the Seventies in so far as it has a low ridership.

4.5.7 - Second urban metro line

The second urban metro line is more comfortable and less saturated than the first one. It also is equipped with air conditioning in stations, and the vehicles are ventilated. It was opened too recently for its impact to be assessed. It is however likely that it will attract the wealthier section of the population because of its comfort, and of its location (through wealthy districts). It is therefore likely that it will limit the migration of the wealthy population to the smart suburbs and will improve access to the centre of town for the population in South Gizah (Dokki) and Shubra, without solving the traffic congestion between Heliopolis, Nasr City and the centre of town.

It should be noted that the first pedestrian streets in Cairo (outside of the souk) have very recently been created in CBD along a North - South axis, which does not affect the East - West traffic. Is that a result of the impact of line 2 of the metro? or the first signs of collective awareness given the car saturation and the lack of initiatives to organise street parking?

4.5.8 - Summary of the transport / urban development dynamic since the Seventies

The first decade between 1970 and 1980 was noticeable for the construction of several bridges between both banks of the Nile, the first signs of the decline of the tramway and the deterioration of the travelling conditions for surface transport as a consequence of the increasing mobility and number of cars.

The government policy was focused more on the construction of housing estates (Nasr City, Salam) and the protection of tenants with the continued rent freeze in the centre of town.

Cairo developed along several lines:

- increasingly dense population on the West bank and emergence of a "wild" service activity centre in Mohandessen (destruction of villas) simultaneously with the opening of the road bridges.
- increased density and extension of the spontaneous districts near the wealthy ones to the West and North of Giza (Imabab, Bulak el dakrur).

- concentration of CBD causing the migration of the population towards the outskirts along patterns which follow the curves of accessibility to the centre:
 - the wealthy depart for Nasr City, Maadi and Giza pyramid given the easy access by road (bus and private car).
 - the middle class and poorer go to Shubra (bus) and along the railway corridors of El Marg and Helwan.
- Increased density and emergence of spontaneous districts near the wealthy ones (Bulak in Gizah, North of Heliopolis in Ains Shams, Mataria and, to a lesser extent East of Nasr City).

The last two decades (1980-2000) have been noticeable for the decline of the tramway, the construction of the first and then the second metro line, the opening up of the public transport market to private operators (shared taxi), the development of road accesses to CBD (especially from the East of Cairo), the construction of roads to the future new towns and that of the ring road. The increased mobility associated to the increased use of the private car has caused a further deterioration in the performances of the surface networks. Finally, the fare policy tends to encourage the use of public transport more among poorer classes.

The government policy was liberalised after 1976 and encouraged private initiative (property developers and shared taxi networks) by increasing the housing density in the district where the property pressure made it necessary.

Over the same period of time, the development of Cairo involved:

- the continued development of the town centre as a result of the extension of its catchment area by the metro (North - South) and the urban motorways (East - West).
- the continued development of the service area in Mohandesseen, simultaneously with the improvement of the East - West motorway connections.
- the extension of the spontaneous districts to the West of Cairo and on either side of Giza Pyramid (Bulak, Imbaba, Warak, Mounib) near activity centres.
- concentration of CBD causing more inhabitants to migrate towards the outskirts along patterns which follow the curves of accessibility to the centre:
 - the wealthier go to Nasr City, Maadi, 15th of May and Giza Al Ahram given the travelling time under one hour (Shared taxi and private car).

- the middle and poorer classes go to Shubra (bus) and along the corridor of the regional metro line.
- emergence of new planned districts in Salam (middle class), 15th of May (well-to-do population), Mokkatam (well-to-do population) in the non immediate vicinity (5 to 10 km) of town centres.
- more recent development of the town centres of Nasr City and Heliopolis as secondary centres encouraged by the poor access to the centre of town by private car from the wealthy districts to the East and west of CBD, and not accessible by metro.
- belated development of the new towns encouraged by the construction of road infrastructures (private cars) to the detriment of rail links. The numerous group housing blocks targeted at middle and poor classes have been replaced by luxury housing, in lesser numbers and accessible for car owners only.

In conclusion, depending on the level of income, the cost of transport plays a major role in the urban development of Cairo by dictating the distance between the dwelling and the centre of activity. The poorer sections of the population live near the centres of activity, and the wealthier in the more remote outskirts.

The very small minority of wealthier, car owning classes tend to privilege the travelling comfort rather than the cost of travelling. They stay away from the metro which is saturated and they consider to be uncomfortable, even though it is often faster.

It is worth noting that 10% of the wealthier population uses 54% of the space dedicated to transport. Although the wealthier population probably plays a major role in the development of the local economy, it does penalise the travelling conditions of all social categories without access to the metro.

It is less painful to be stuck for two hours in a car with air conditioning than in an overcrowded bus by 45°C in the shade. It is preferable to take the metro and to limit travels by car to the benefit of surface public transport. Singapore, which is confronted to the same problems as Cairo in regard to space availability, could serve as a model for the future development there.

TABLE 4.5.1: LINK BETWEEN THE LEVEL OF INCOME AND THE TYPE OF HOUSING IN 1998

| Level of income of the household per month | Distribution over GCMA | Overall mobility | Share of walking | Class of the population | Type of housing or of district | Preferred modes for regular travels |
|--|------------------------|------------------|------------------|-------------------------|--|--|
| Under £ 300 | 22% | 1.31 | 46% | Very poor | Spontaneous, informal, near to activity centres or wealthy districts | Walking. bus and metro* short distance. train* short and long distance |
| £ 300 - £ 500 | 32 % | 1.39 | 39% | Poor | Spontaneous, poor, old, fairly near to the activity centres | Walking. bus and metro* short distance, train* |
| £ 500 – £ 1000 | 23 % | 1.54 | 31% | Middle class | Working class districts, planned districts within 10 km of the activity centre | Bus short and medium distances if comfortable, metro* and train* short and medium distances, shared taxi short distances |
| £ 1000 – £ 2000 | 6 % | 1.64 | 21% | Well-off | Planned, good quality districts with environment favourable to the use of private cars | Metro*, shared taxi, private car |
| In excess of £ 2000 | 2 % | 1.78 | 12% | Wealthy | Luxury districts or villas, sometimes distant or spontaneous (distant new towns or villas in agricultural areas) | Private car, metered taxi |
| No answer | 15 % | - | - | - | - | - |

Source: 1998 household survey (SYSTRA-DRTPC) (*): if available under existing transport conditions

4.6 - Cairo without the metro

The development of public transport in Cairo could have taken quite a different direction if the policy in favour of the metro had not been implemented. Who would have benefited from the Egyptian capital invested in the underground metro? (mostly line 2). What would have been the impact of the development of surface transport in an urban area characteristic for its very high urban density?

The two existing metro lines cater for a major fraction of the motor transport demand (20%) (See Figure no. 6). If these lines had not been built, it is quite likely that the road network as it stands nowadays would not have been capable to cope with this 20% surplus in traffic.

This would have resulted in one of several scenarios:

4.6.1 - Non intervention (pessimistic scenario)

- 1) The town centre becomes less accessible from the outskirts currently served by the metro and the traffic congestion is extended to the whole of Cairo.
- 2) In an attempt to deal with the most urgent problems first, local authorities would probably have built larger star-shaped road accesses, although with a lesser capacity than the metro (60,000 passengers per hour and per direction in the metro correspond to an urban motorway with 30 lanes in each direction).
- 3) Accessibility curves from the centre would have been concentric (See Figure no. 13), with the consequence that urban development would have followed a concentric pattern in the urban plots nearest to the centre, i.e., with an increased density in the population in the Port Said street corridor to the North, the more sustained extension of the town over the nearest agricultural land in Giza and Shubra, the more rapid development of Nasr City (South sector) and of the South and East sectors of Mokkatam.
- 4) The shared taxi network would have developed even faster causing increased traffic congestion, and the abandonment of the public bus network under the pressure of the taxi lobby.
- 5) On the other hand, the saturation of Cairo and of its nearest outskirts would have slowed down the concentration of population in the Helwan and El Marg corridor. Maadi and Helwan would have developed more easily into independent secondary centres.
- 6) Since the traffic congestion would have affected the whole of Cairo very early on, the authorities would have built a ring road earlier than planned, nearer to the centre of town and interconnecting the many access roads.

- 7) Urban development would therefore have been speeded up, still following a concentric pattern over the agricultural land on the outside of the ring road and along the access roads.
- 8) Given the increased mobility, the travelling time to the centre would have increased dramatically and crossing the town would have become very difficult despite the many tunnels.
- 9) In a first stage, the complete saturation of the street network in the town centre would have led all the middle class and wealthy population to move to scattered, less densely populated and covering a wider area in the Eastern suburbs of Cairo.
- 10) The centre of town would have accommodated an impoverished population as is the case in the surrounding poor districts.
- 11) A new Cairo, reserved for the wealthier population, and a service area would have developed rapidly in the vicinity of the international facilities. The government bodies, ministries, administrative centres and part of the universities would have been transferred to the East of Greater Cairo, as they were to Heliopolis under Mubarrak.
- 12) The old districts of Giza and Heliopolis, distant from the new centre and near poor districts, are taken over by a less wealthy, middle class population.
- 13) Cairo is split between the poor and densely populated town centre and the Eastern districts, fairly wealthy and scattered.
- 14) Spontaneous districts develop near the wealthy ones to meet the demand in unqualified labour in this type of district.
- 15) The development of Cairo is slower than forecast owing to the relocation of many activities to more attractive towns such as Alexandria, Port Said, or even outside of Egypt.

4.6.2 - Planning (optimistic scenario)

- 1) The town centre becomes less accessible from the outskirts currently served by the metro, and traffic congestion spreads to the whole of Cairo.
- 2) The authorities relocate administrative bodies and create a major service area near Nasr City.
- 3) The development of housing is evenly distributed around both town centres through public and private property development initiatives aimed at all classes of the population in the Eastern outskirts of the town.
- 4) The tramway network is renovated to create a modern, large capacity tramway, fully isolated from the general traffic. It connects the triangle created by Heliopolis - CBD - Nasr City. Giza (Mohandessen, Zamalek) remains a wealthy, reasonably populated district.
- 5) The tramway network is associated to a network of comfortable buses and articulated buses on segregated lanes. This is created to the detriment of the general traffic.
- 6) The wealthier, car-owning sections of the population, who object to using public transport, move to new, sparsely populated, luxury towns to the East of Cairo.
- 7) Private shared taxis are authorised in dense urban areas provided that the vehicles offer 40 seats to optimise road space in favour of the surface transport with the best capacity (segregated lanes). Their routes are controlled by the Transport authority and, above all, limited to suburban districts.
- 8) Street parking is tightly controlled by charging in the town centres to limit access by private cars.
- 9) The agricultural sector is opened to spontaneous development to meet the excessively large migration of a poor population. These agricultural areas lie within the ring road near the existing railway lines along the Nile (the outside of the ring road is converted into a green belt). The spontaneous settlements are authorised on previously serviced plots (primary and secondary roads).
- 10) All urban railway lines are renovated at the lowest possible cost and new stops are created.
- 11) Since Cairo is spreading too far, the authorities decide to open new towns planned in the master plan and to connect them in a first stage via comprehensive express bus services (low subsidised fares) before creating fast surface railway infrastructures if the level of demand calls for it.
- 12) Given the magnitude of the travel flows these railway lines naturally evolve into regional metro lines as was the case for the first metro line in Cairo.
- 13) In the long term, the organisation of Cairo follows different routes but ends up roughly similar to what had been described in the 1982 master plan.

There are many other possible scenarii. Some can be much more favourable to the private car resulting in broadly scattered outskirts settled by car-owners. Such outskirts, which occupy vast surfaces, and demand many costly new facilities would develop to the detriment of infrastructures targeted at the poorer sections of the population. This could be the source of serious social unrest, encouraged by uncontrolled movements.

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References and Data sources

Population censuses of 1976 – 1986 – 1996 (CAPMAS)

Household surveys carried out in 1971 (SOFRETU-DRTPC) – 1989 (JICA) – 1999 (SYSTRA-DRTPC)

Master plans prepared by the Ministry of Housing (GOPP) jointly with IAURIF (Institut d'Aménagement et d'Urbanisme d'Ile de France).

Transport plans studies carried out in 1973 (SOFRETU). 1989 (JICA) and 2000 (SYSTRA)

The data on supply, fares and operating costs have been communicated by each operator: ENR, METRO, CTA, CGBC, MOU, some of the data on the shared taxi network originate from the governing authorities of Cairo and Giza.

"L'aménagement du grand Caire". March 85 (Cahiers de l'IAURIF)

"Le grand Caire, dix ans après" (cahiers de l'IAURIF no. 104 (1995). Marcel Belliot)

Cairo : Updating Master plan May 1999. following mission I by AURIF

IUTP provisional 2000 data base

Characteristics of Phase 1 of Cairo Regional Metro line (INRETS/DRTPC. September 1990)

The development and growth of private sector public transport in Cairo (TPA. Hawary consulting and JMP consultants of London)

Management of Greater Cairo transit system (Dr Aly Huzayyin. CITTU'90)

Impacts of the Cairo metro (1999. ENIT. University of Westminster)

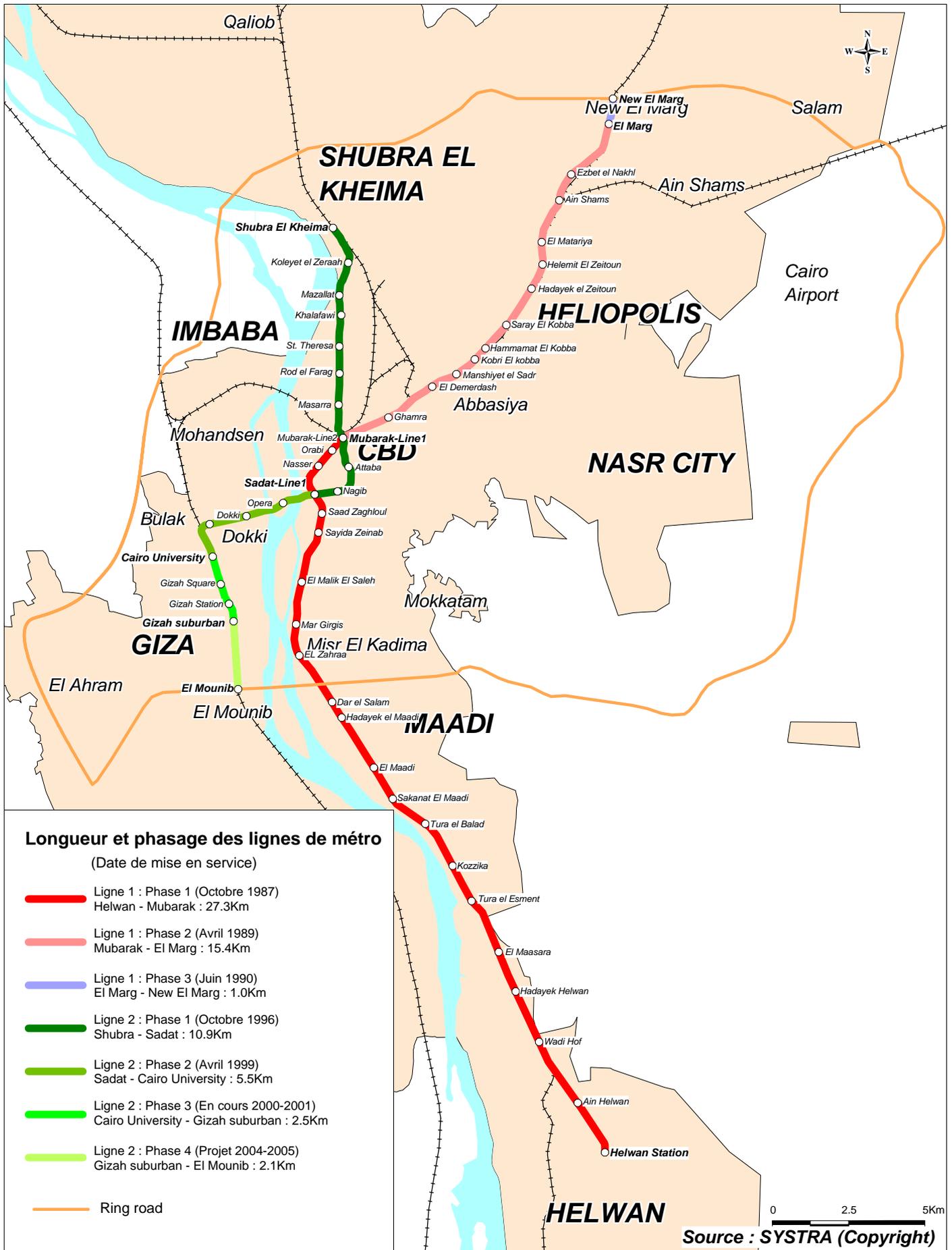
"Accessibilité et mobilité au Caire: le challenge du transport public" (Célame Barge 1999. CEDEJ-CNRS)

"1850-1950: un siècle d'aménagement au Caire" (Mercedes Volait. 1983)

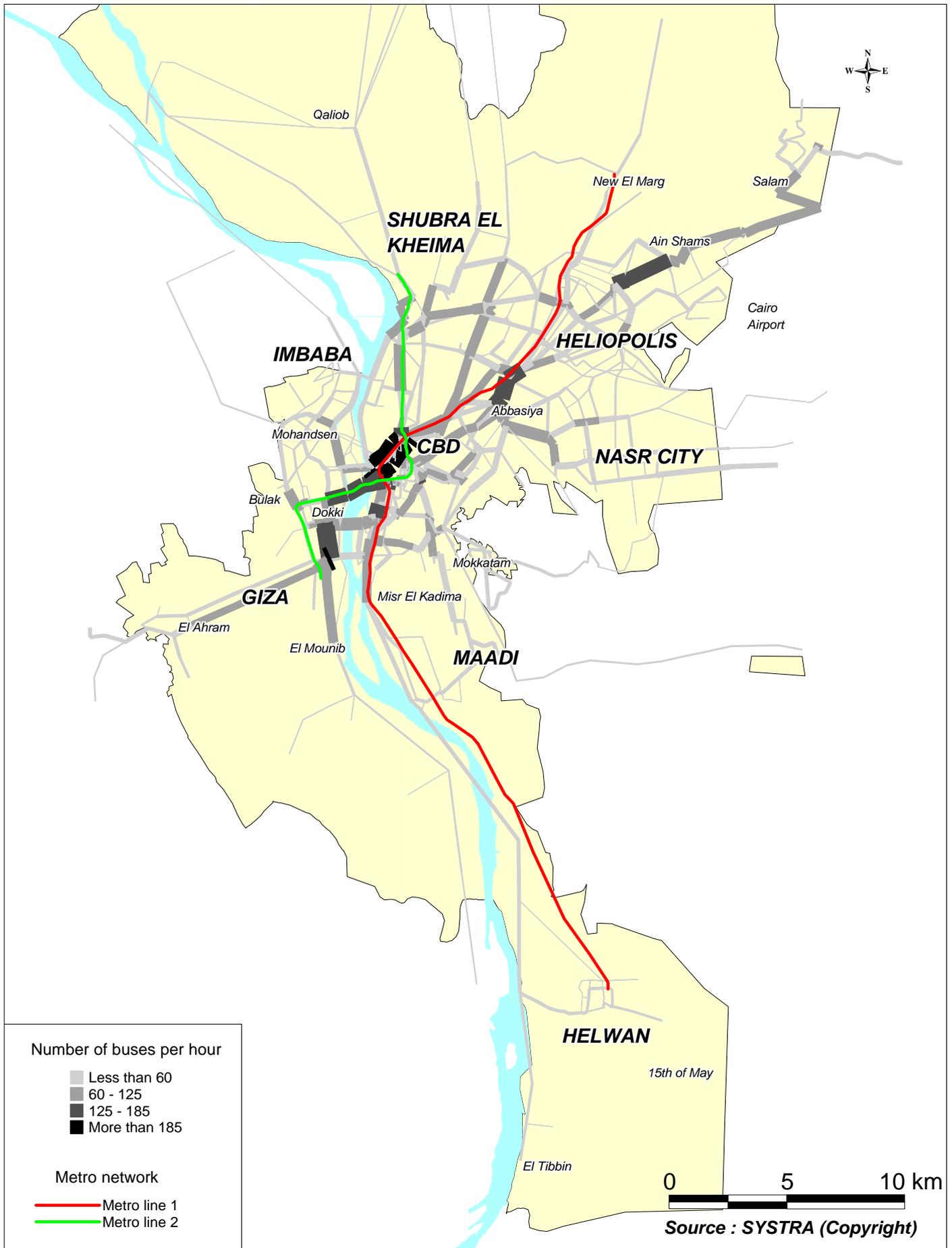
"Le Caire: Mobilités résidentielles et fonctionnelles à la lumière des politiques urbaines" (Galila El Kadi. Atelier B3. 2000)

Available tools (SYSTRA):

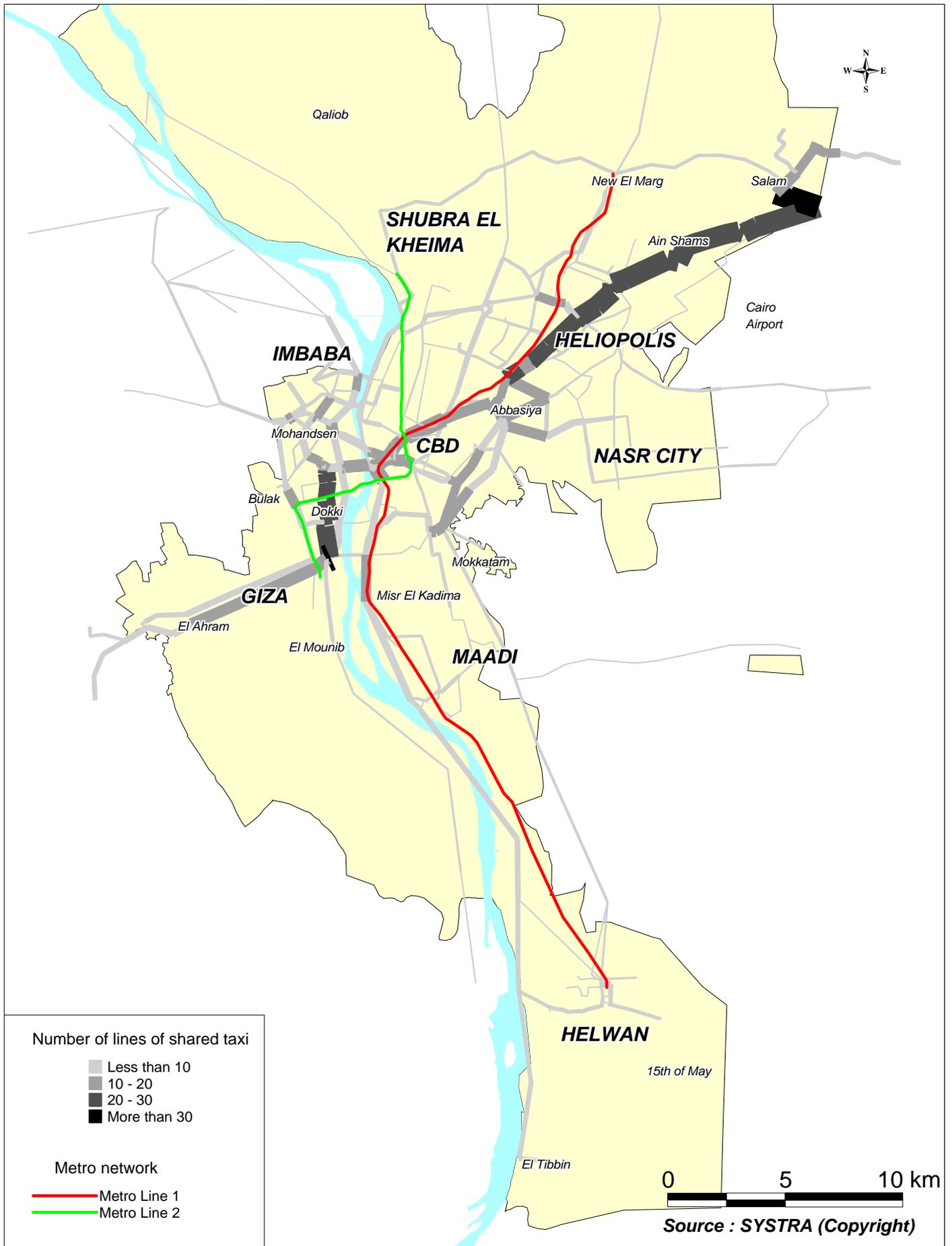
- Strategic multimodal model - decision making aid (TRIPS: 50 zones).
- Detailed traffic forecast multimodal model (TRIPS: 450 zones).
- Computer data base integrating the results of the last census and of the 1999 household survey (ACCESS).
- Geographic information system (Système d'Information Géographique - SIG) (MAPINFO) linked to the above tools (450 zones).



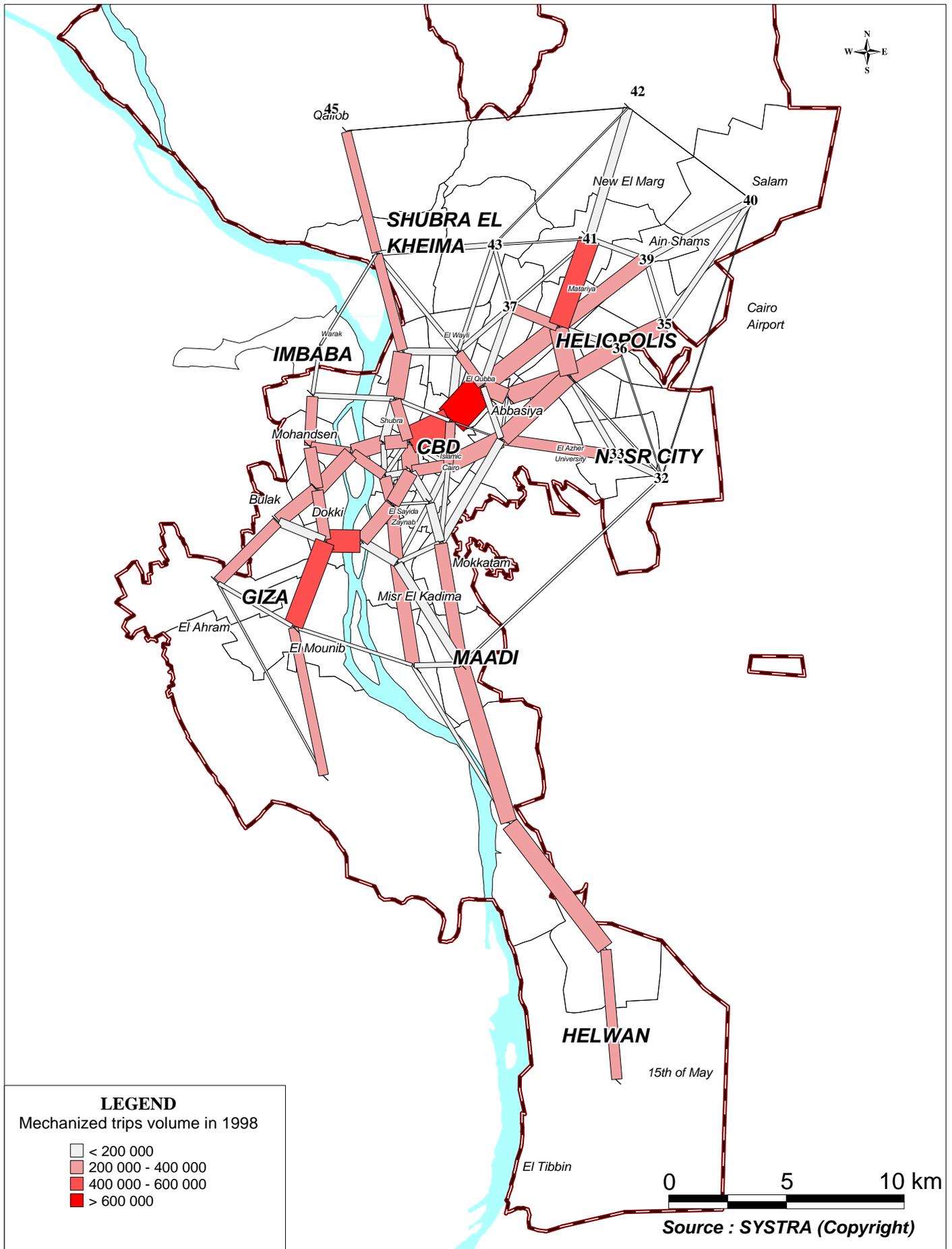
WORLD BANK REVIEW : THE CASE OF CAIRO
Phasing of the metro line sections (Lines 1 and 2)
Planche 1



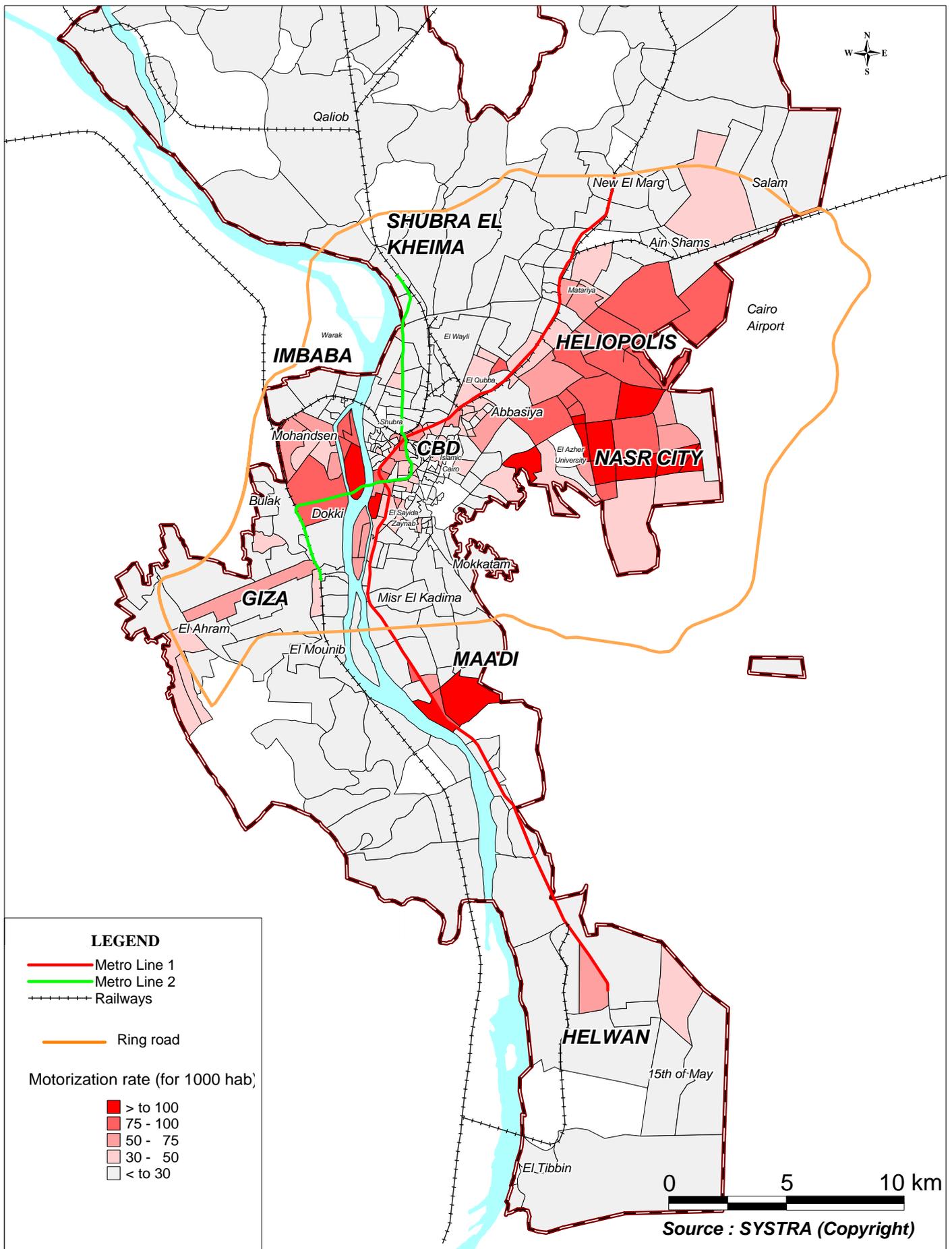
WORLD BANK REVIEW : THE CASE OF CAIRO
Bus supply (CTA and GCBC)
Planche 2



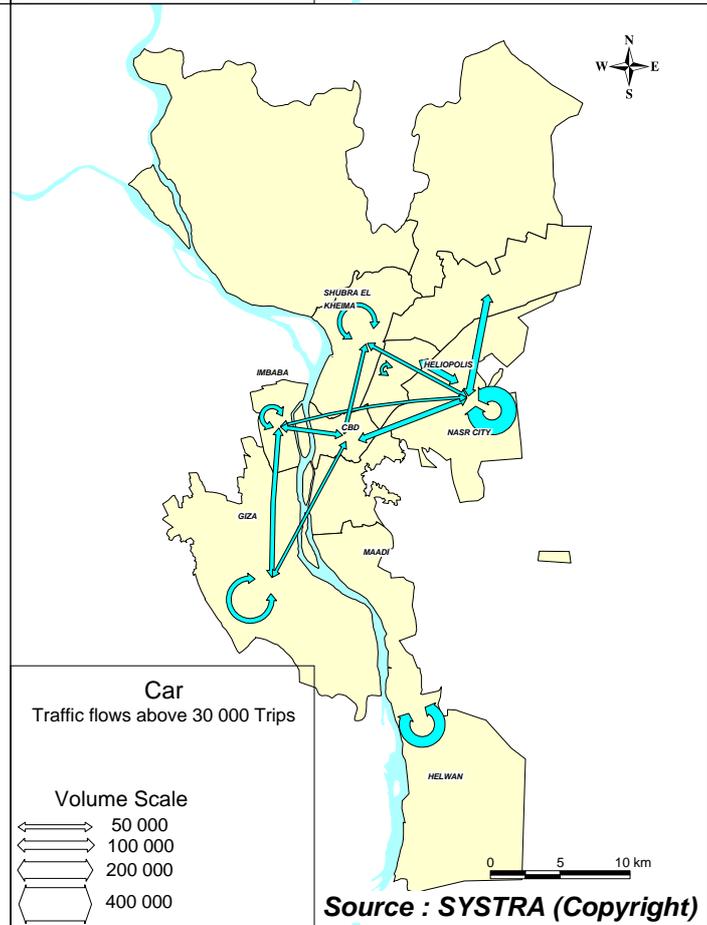
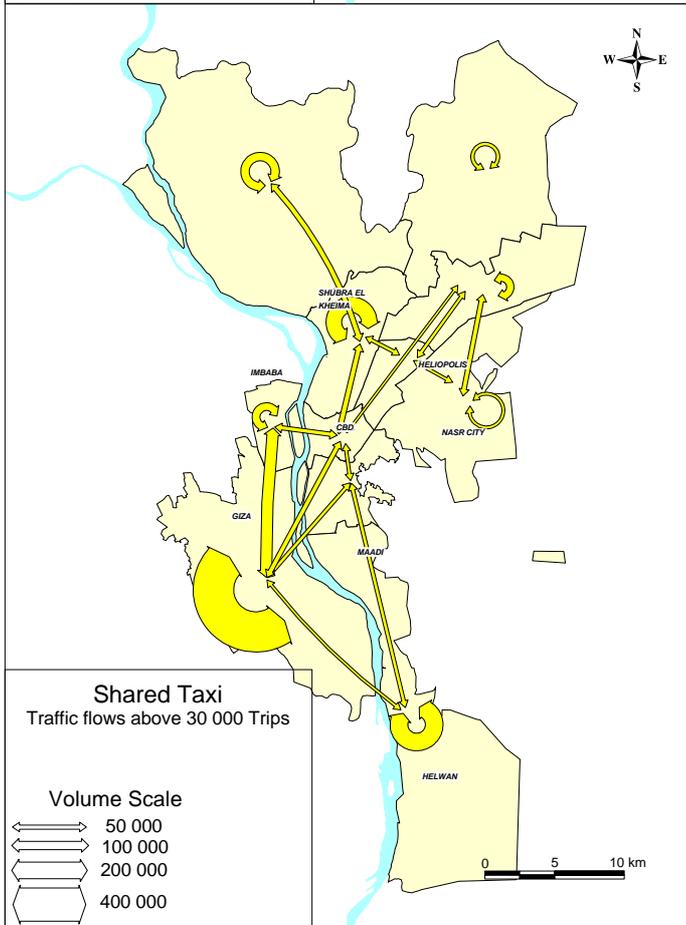
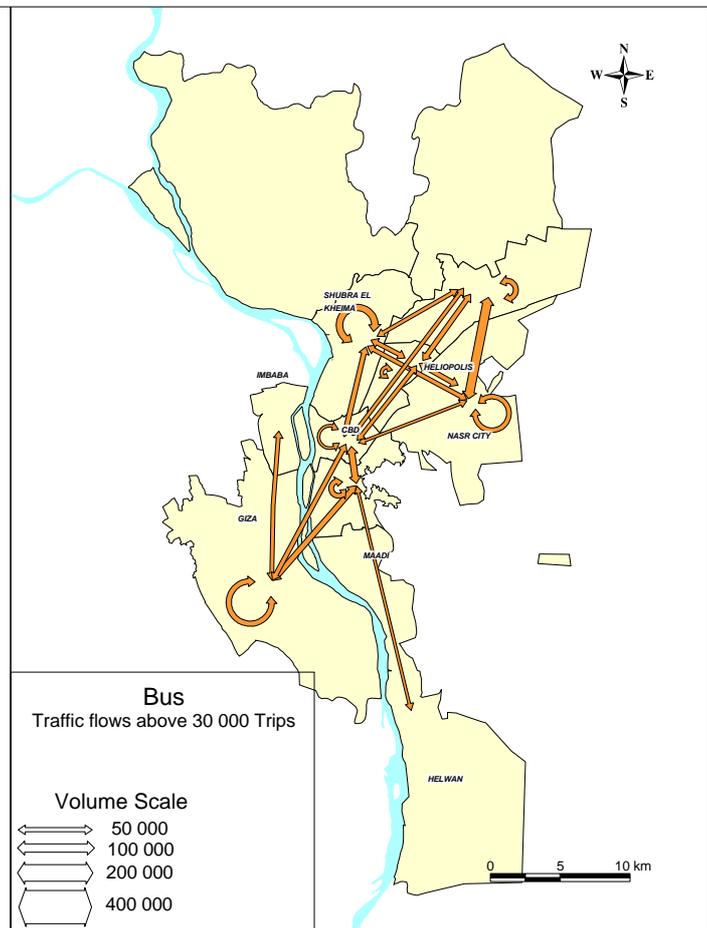
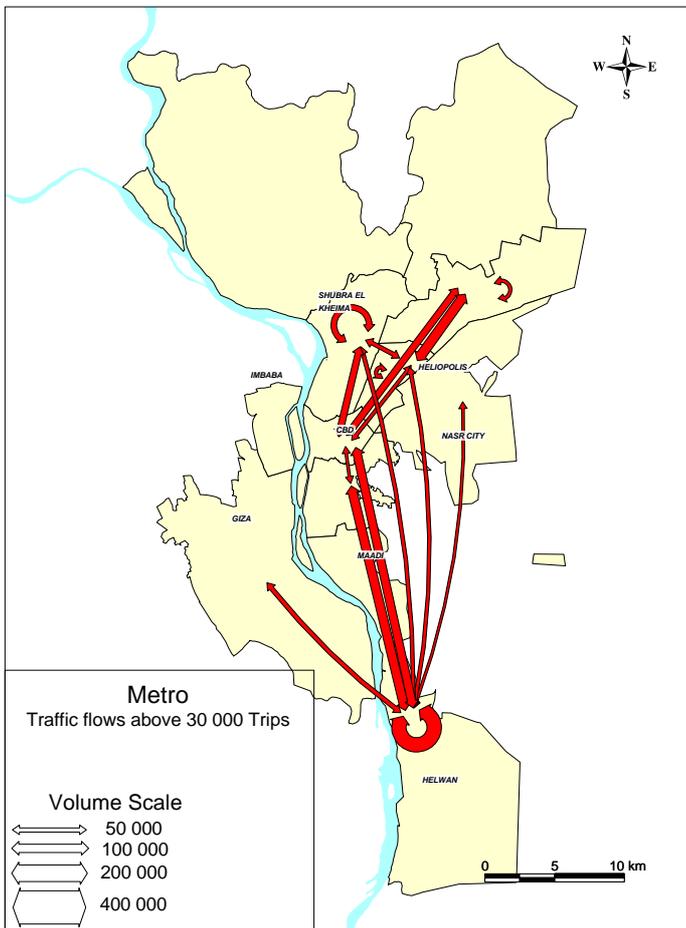
WORLD BANK REVIEW : THE CASE OF CAIRO
Shared Taxi supply
Planche 3



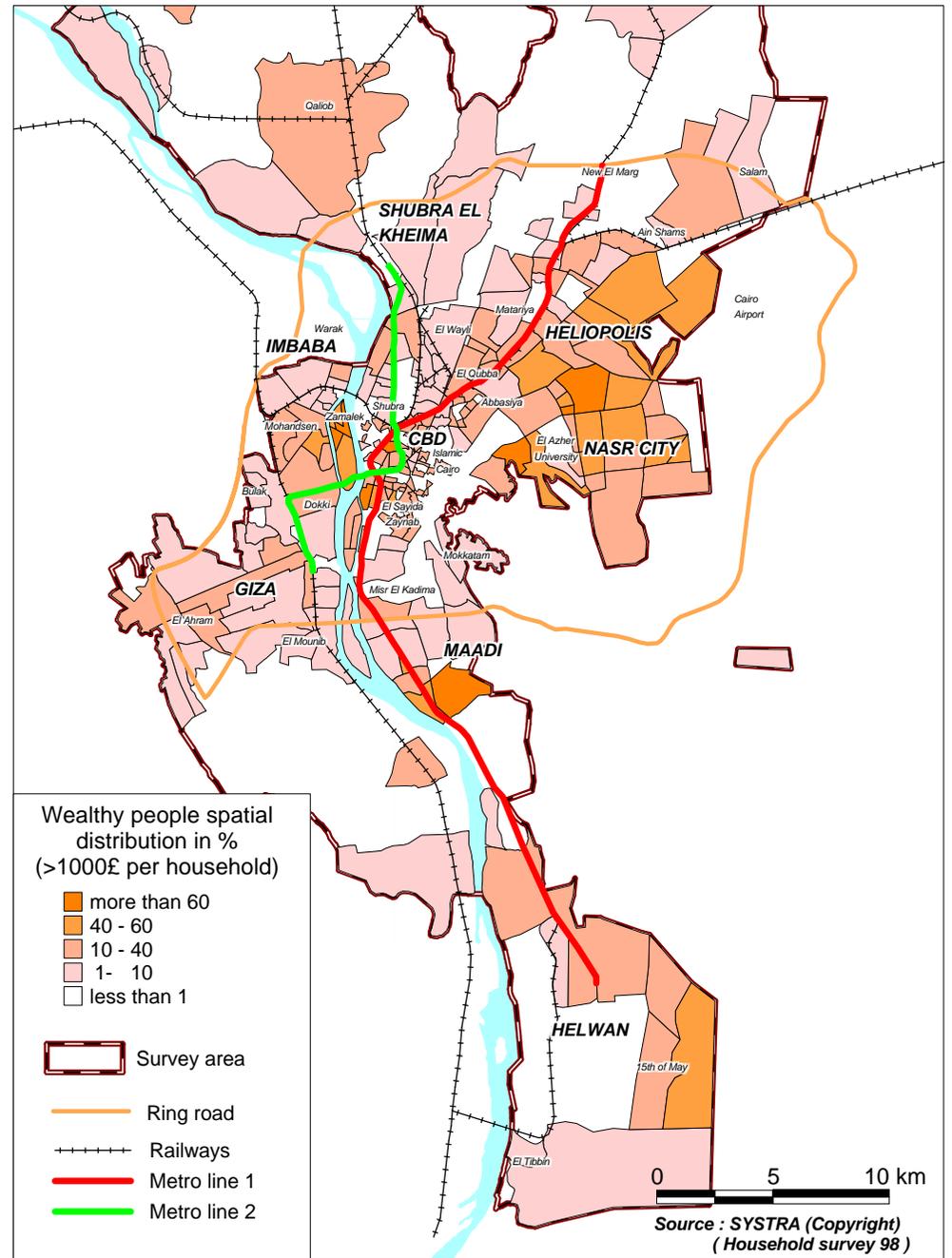
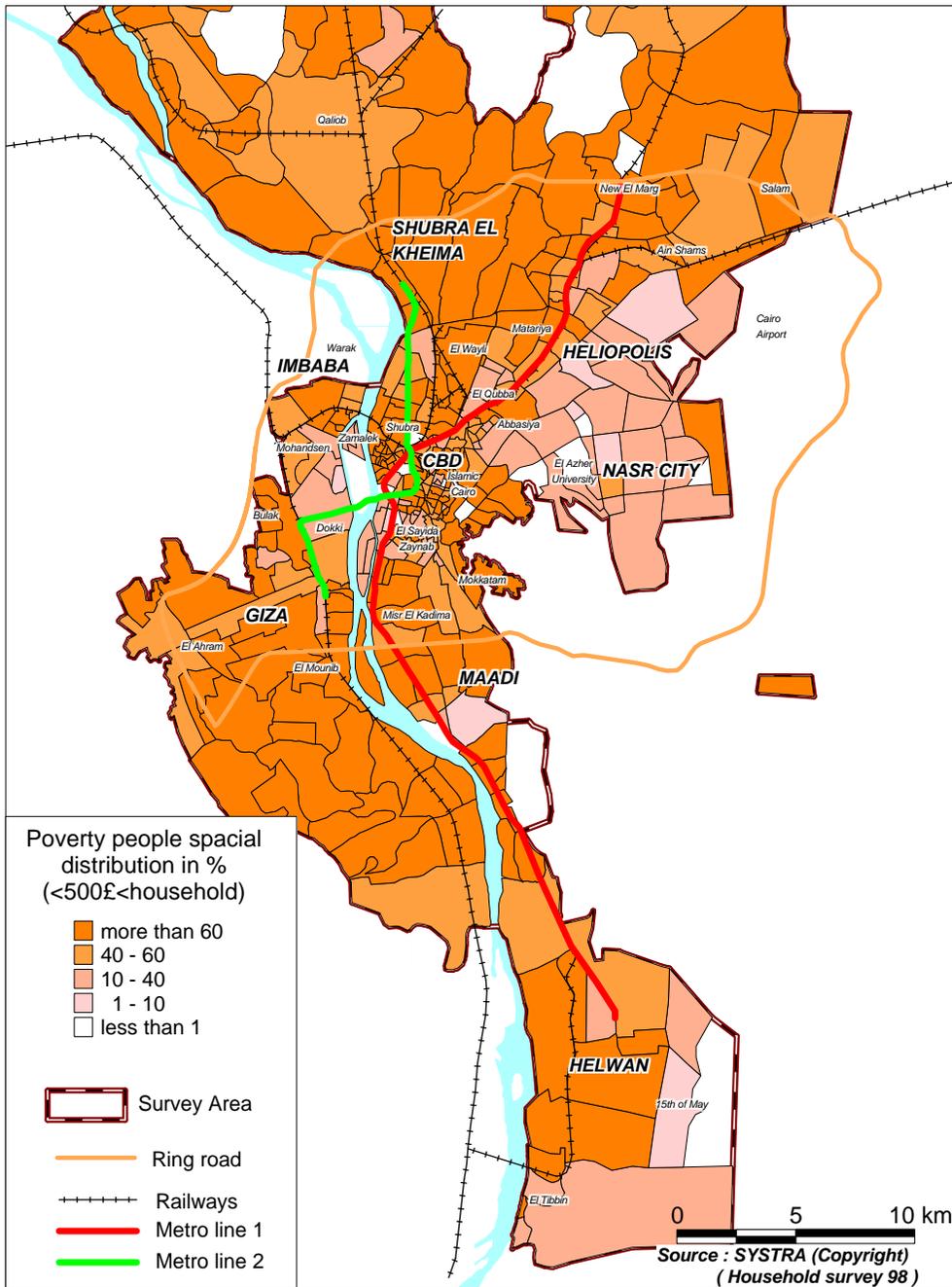
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Daily motorized trips flows in 1998
Planche 4



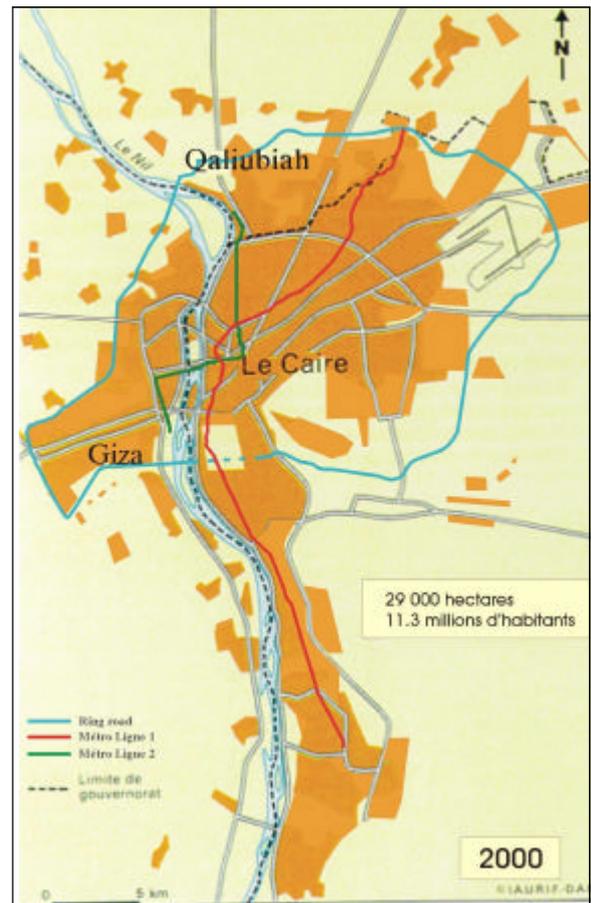
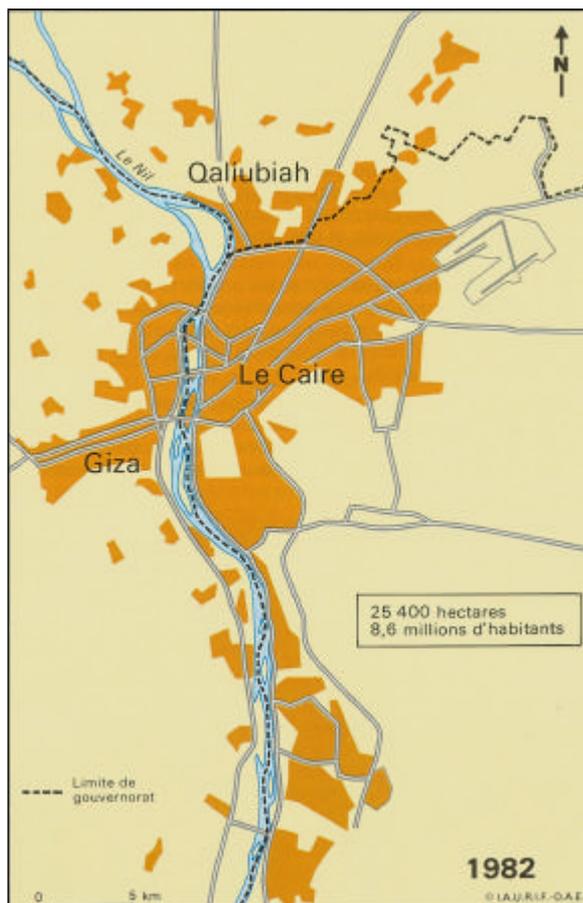
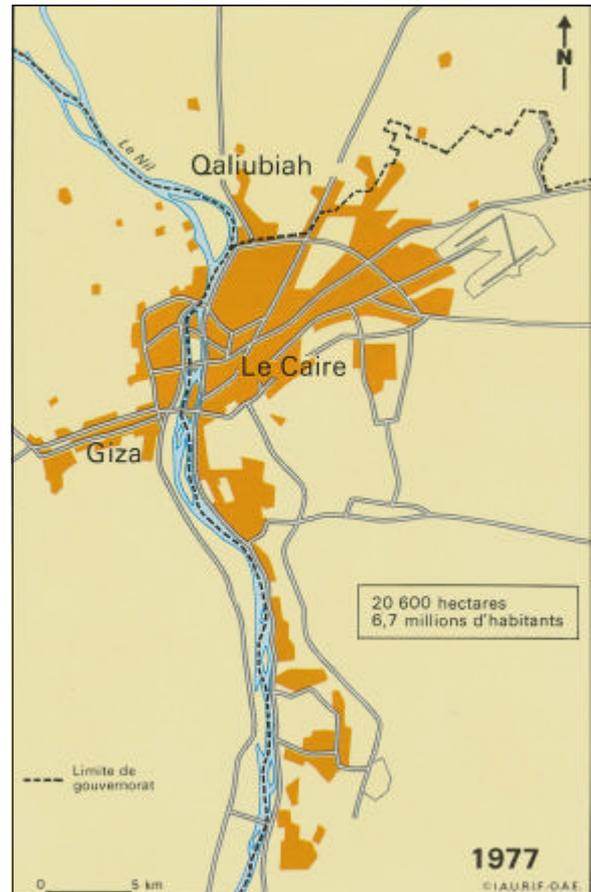
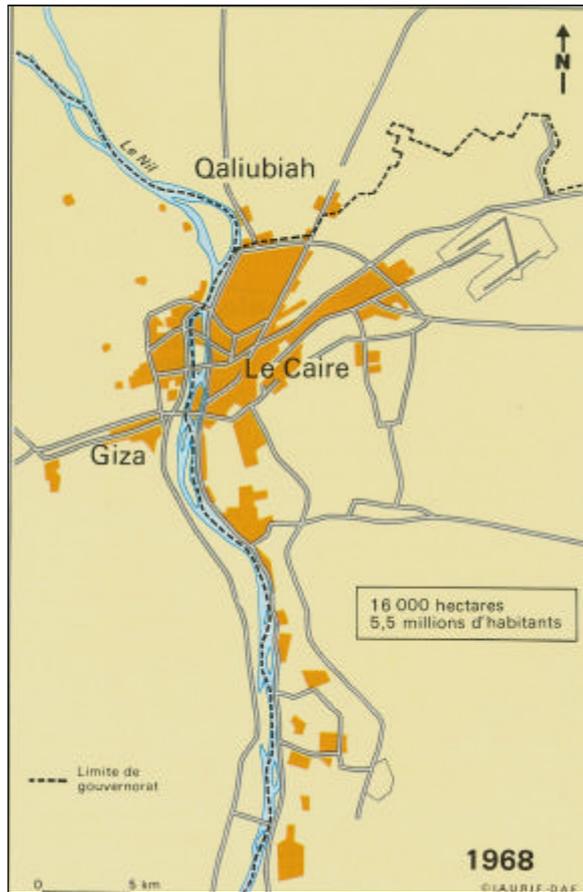
WORLD BANK REVIEW : THE CASE OF CAIRO
Motorization rate per shiakas
Planche 5



Source : SYSTRA (Copyright)



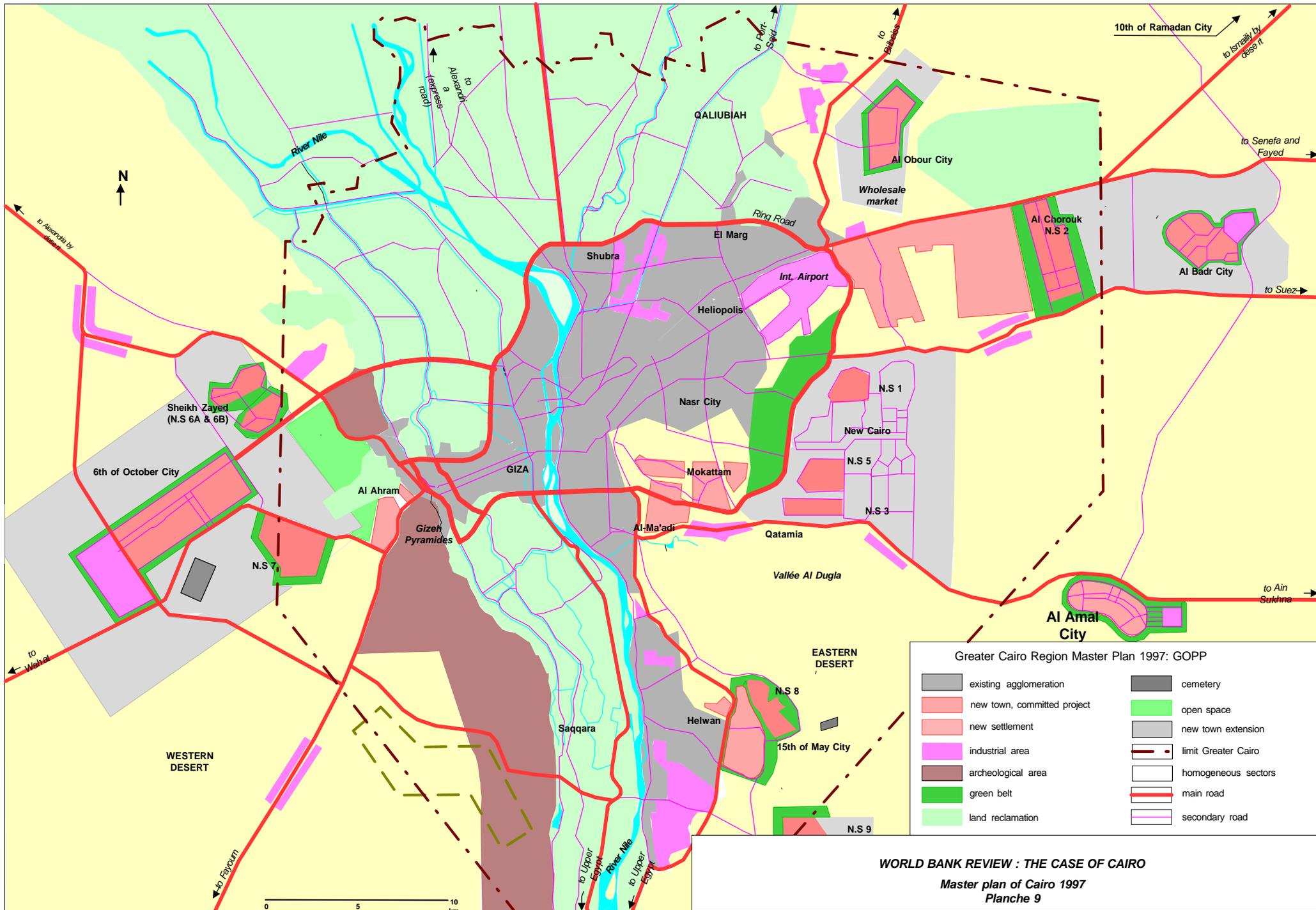
WORLD BANK REVIEW : THE CASE OF CAIRO
 Poverty and wealthy people spatial distribution
 Planche 7



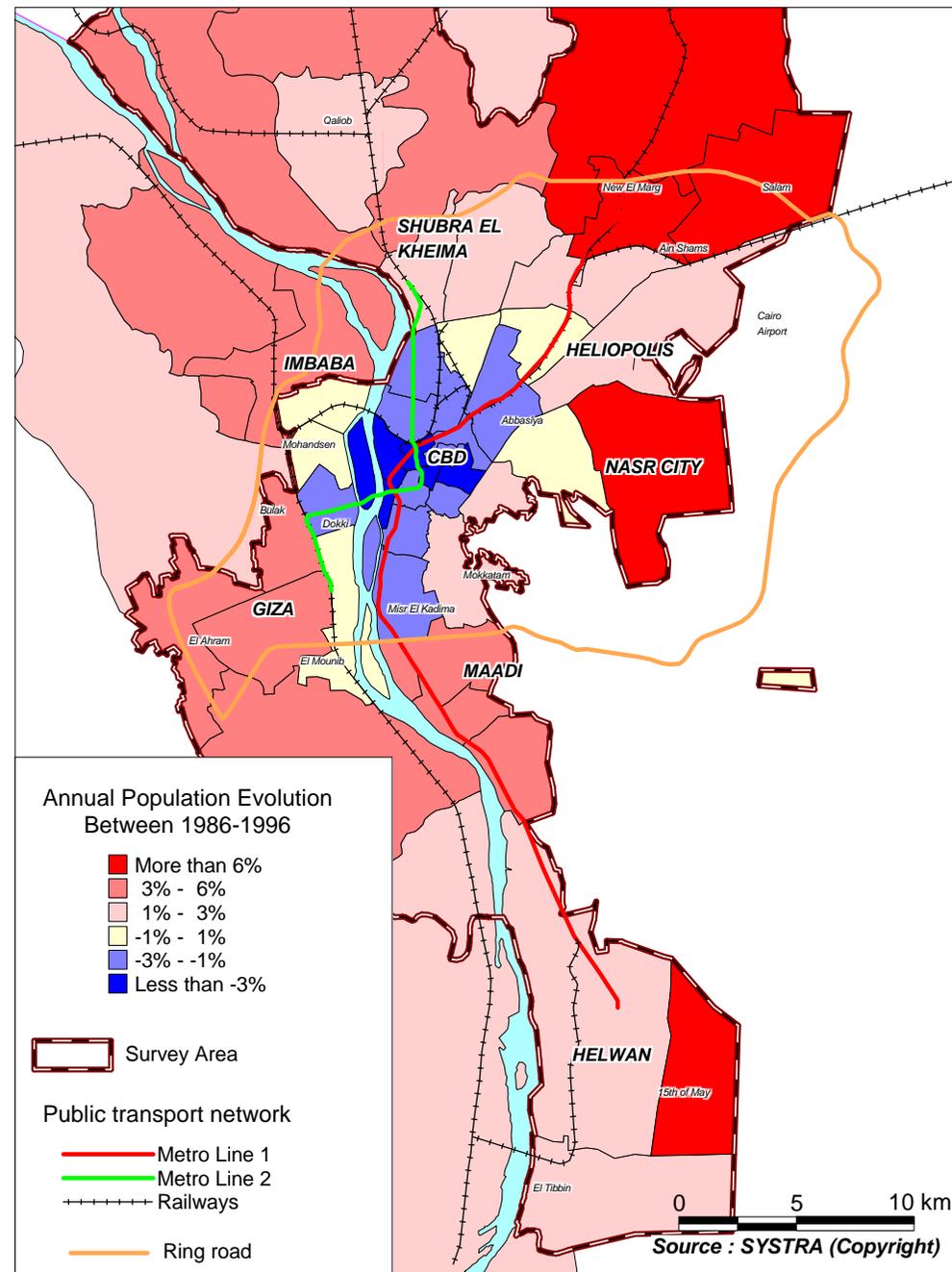
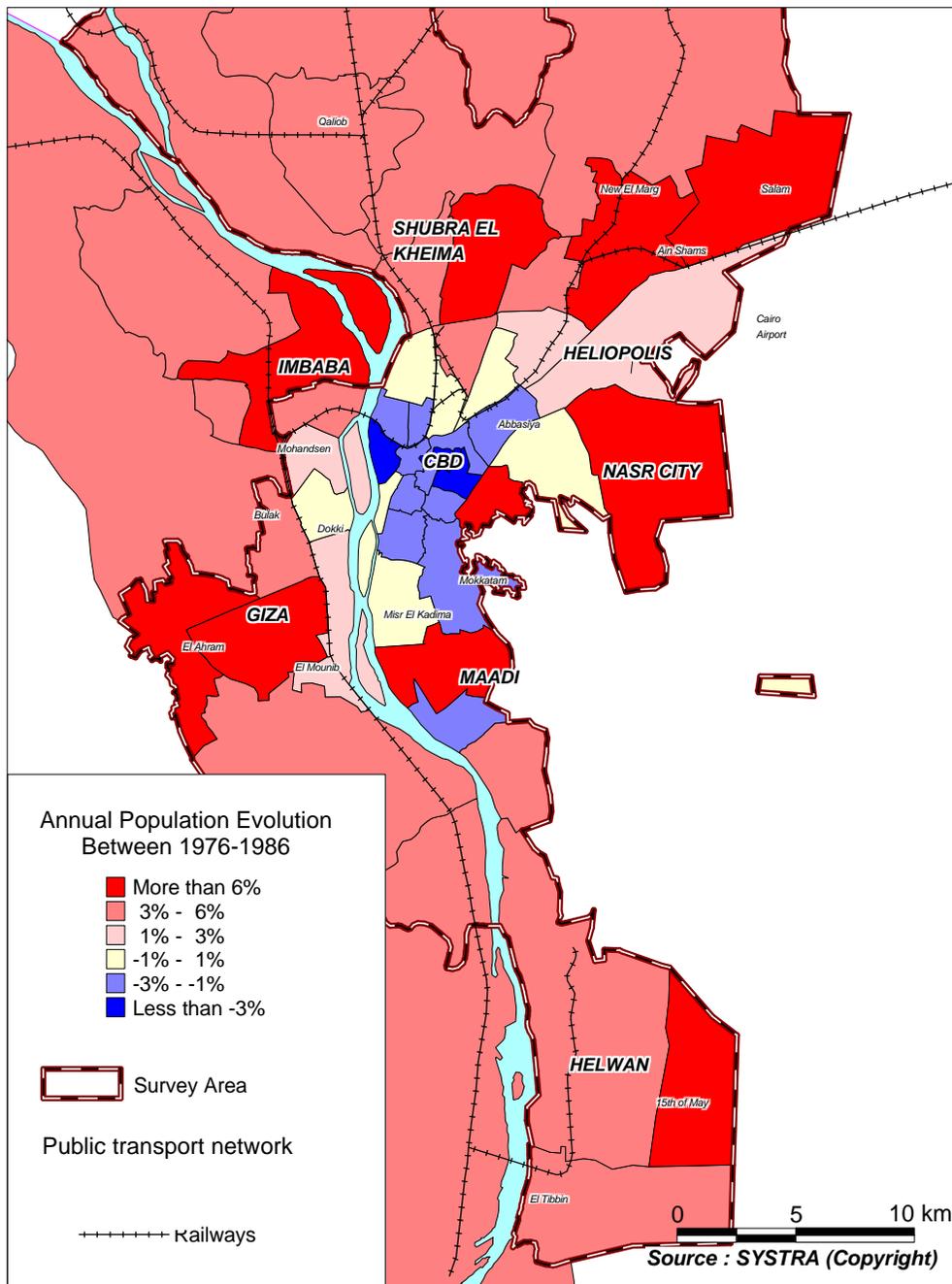
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Cairo urban spreading since 1968

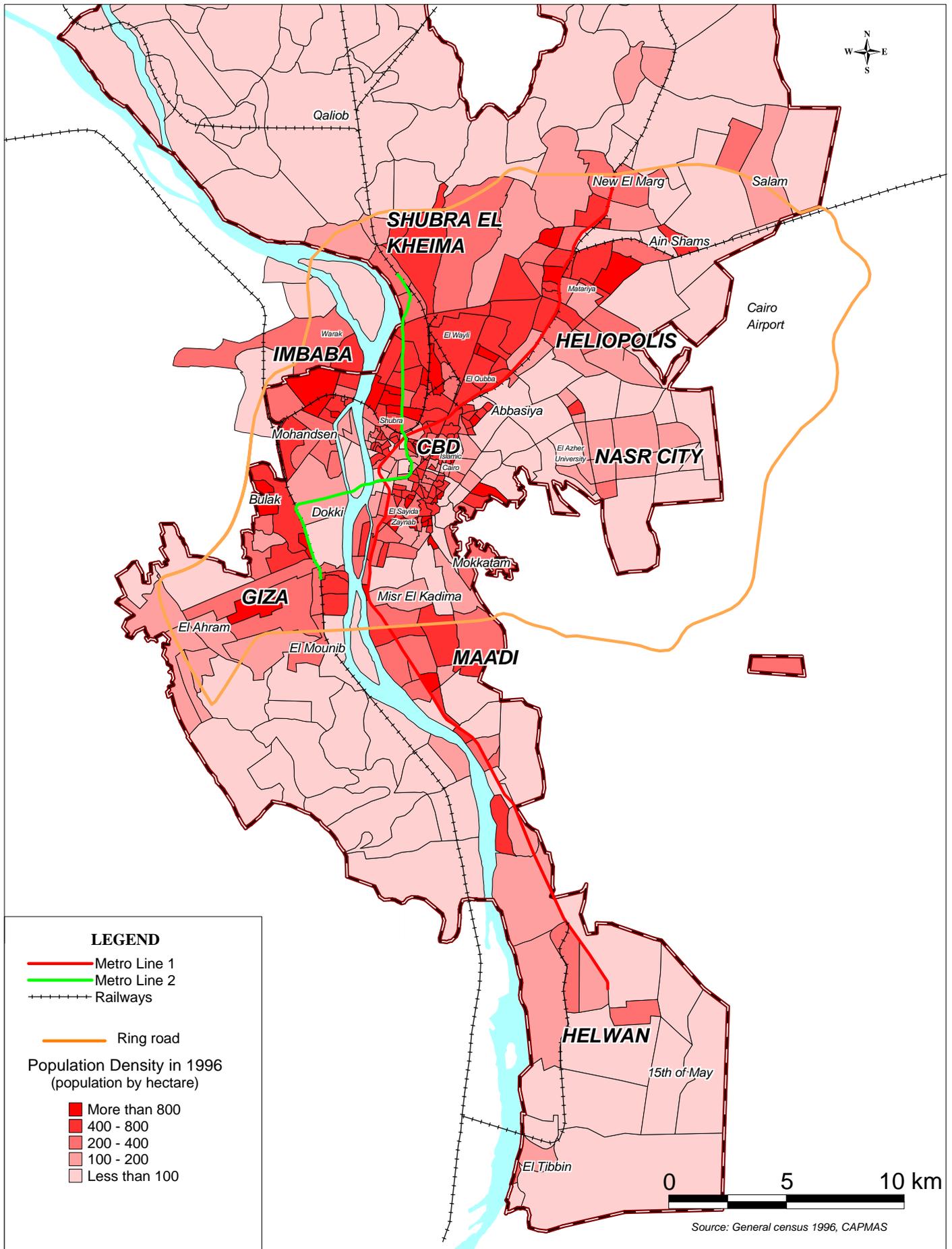
Planche 8



WORLD BANK REVIEW : THE CASE OF CAIRO
Master plan of Cairo 1997
Planche 9

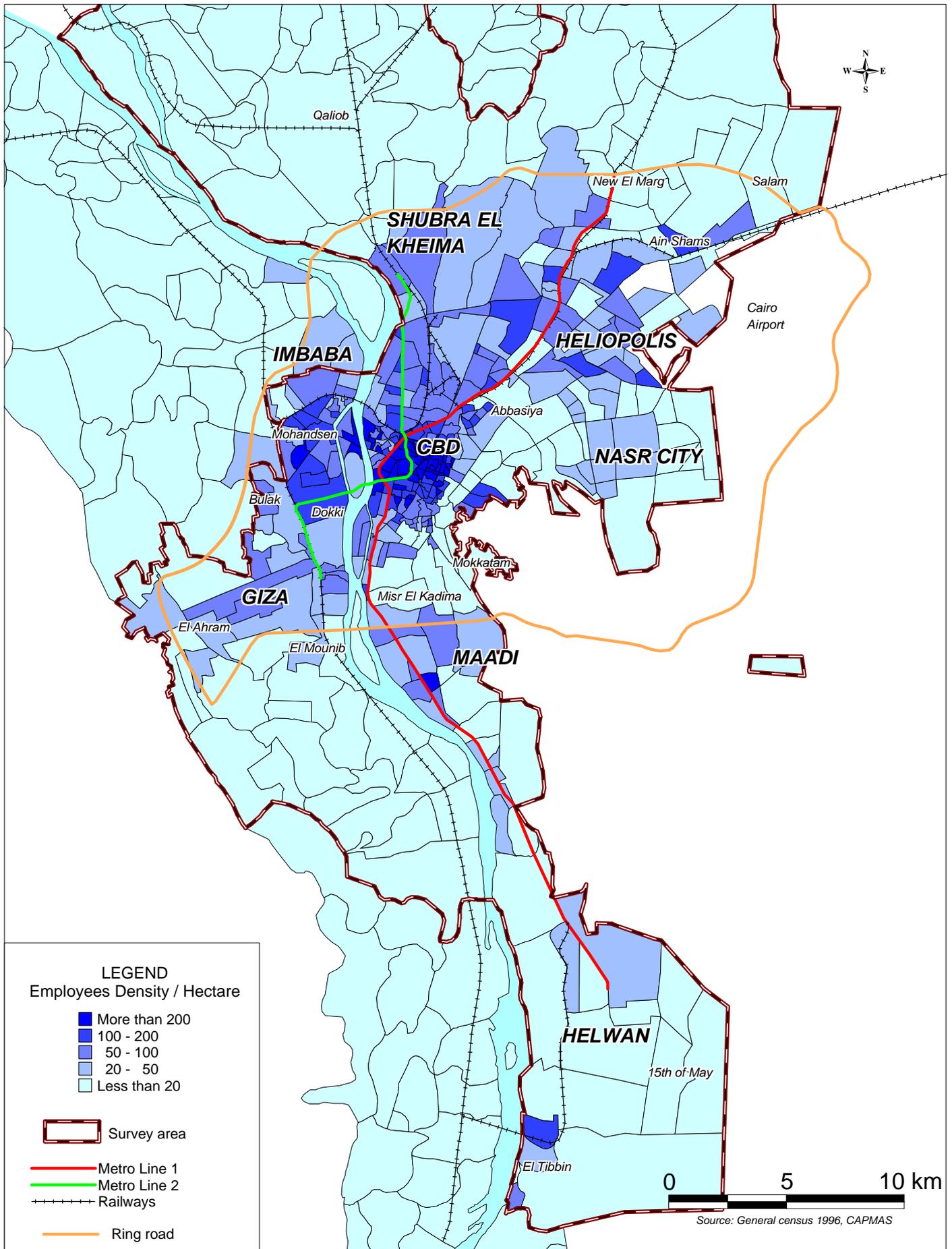


WORLD BANK REVIEW : THE CASE OF CAIRO
 Annual population evolution between
 1976-1986 and 1986-1996
 Planche 10

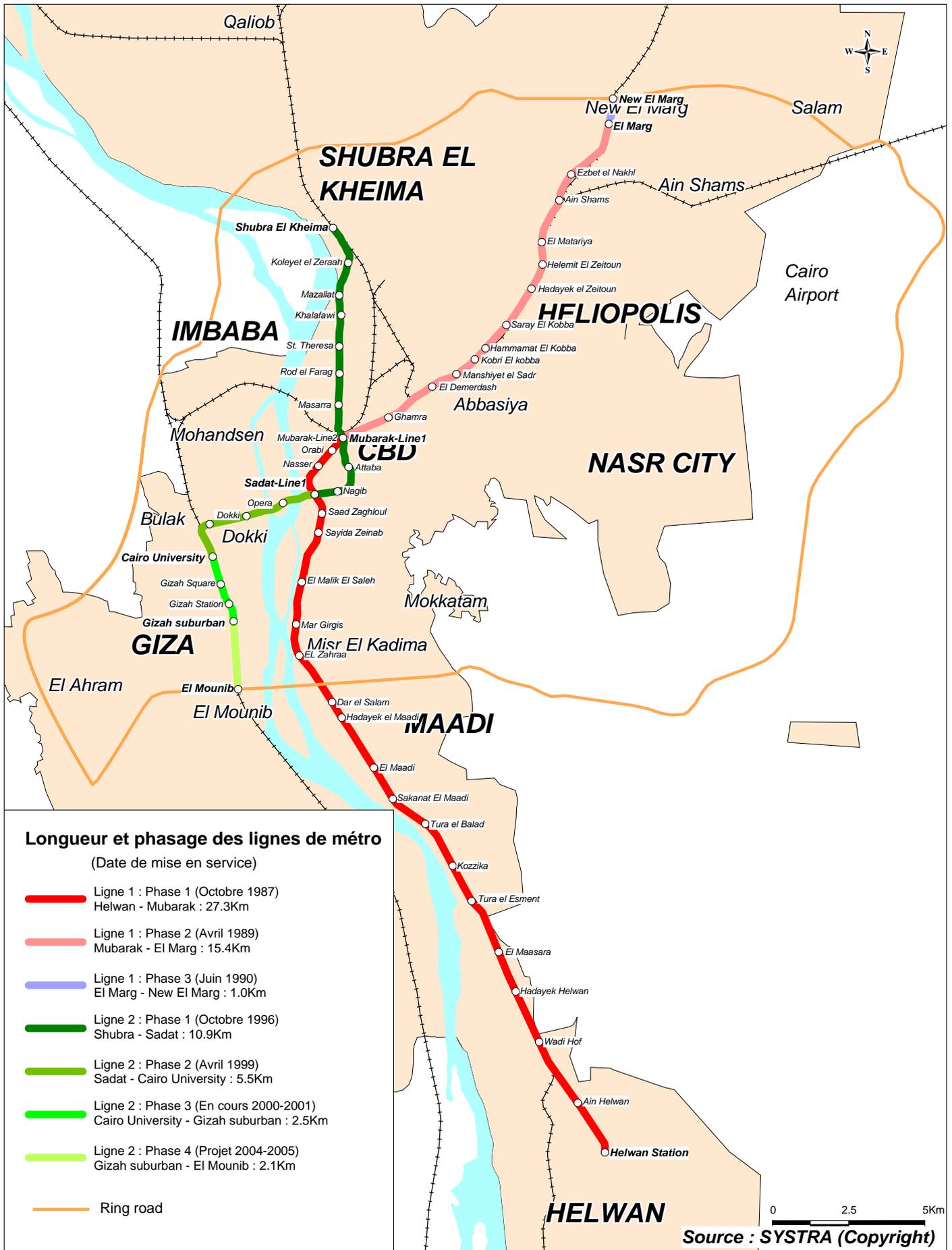


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*Density of population in 1996
Planche 11*



WORLD BANK REVIEW : THE CASE OF CAIRO
Employment (non governmental) density by shiakhas
Planche 12



WORLD BANK REVIEW : THE CASE OF CAIRO
Phasing of the metro line sections (Lines 1 and 2)
Planche 1