

## تحليل خطط النقل العام لحلحلة مشكلة الاختناقات المرورية في البلدان النامية

دراسة حال منطقة القاهرة الكبرى

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### المستخلص:

الاختناقات المرورية والنقل العام يعتبران من اهم المشاكل المعاصرة تأثيرا على المدن خصوصا في البلدان حديثة التحضر. هذا الموضوع له تأثير كبير ليس على تخطيط المدن فحسب، بل انه يؤثر على العديد من الجوانب بضمنها رفاهية الساكنين خصوصا منخفضي الدخل. الحكومات عادة ما تحاول حلحلة هذه المشكلة من خلال مجموعة من المبادرات والبرامج، من أهمها هو تعزيز النقل العام لتقليل الاعتماد على النقل الخاص ضمن المدينة. هذا البحث قام بتحليل تأثير/علاقة المبادرات الحكومية لتعزيز النقل العام على حلحلة مشكلة الاختناقات المرورية في الدول النامية وتأثيرها رفاهية العيش وعناصر التنمية الحضرية كمشاريع الإسكان منخفض الكلفة وغيرها من خلال دراسة حال منطقة القاهرة الكبرى في مصر. البحث ركز بالذات على برنامجين حكوميين لتطوير خدمات النقل العام ضمن المنطقة وهما برنامج النقل العام في القاهرة الكبرى المعد من قبل سلطة النقل الحكومية وبرنامج مشروع مترو الأنفاق ما بين تسعينات القرن الماضي وبدايات العقد الماضي. وجد البحث بانه بالرغم من هذه الخطط والمشاريع أسهمت ولحد ما في معالجة مشاكل زيادة الاعتماد على النقل الخاص (الخصوصي والاجرة)، الا انها لم تؤدي الى النتائج المتوقعة للتخفيف من مشاكل الزخم المروري في المنطقة لأسباب متعددة منها سوء الأداء، الفساد الإداري والسياسي، النمو السكاني المتسارع وزيادة الكثافة السكانية والتي تضاعفت خلال المدة بين التسعينات من القرن الماضي وبدايات الالفية الجديدة.

## Analyzing Public Transportation Plans to Addressing Traffic Congestions in Developing Countries

### The Case Study of the Greater Cairo Region

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### Key Words:

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### Abstract:

Traffic congestions is one of the main problems for many cities especially in newly urbanizing countries worldwide. The issue of traffic congestions has major impact not only on the planning of the city, but also on many aspects such as residence overall well-being. Governments often try to address this issue through a number of initiatives, most important of which is promoting public transport in order to reduce the dependency on private cars in the city. This research analyzed state-led public transportation initiatives impact on addressing traffic congestion in developing countries through a case study of the Greater Cairo Region in Egypt. The research specifically focused on two state-led public transportation programs, namely the Great Cairo Transport Authority (CTA) program to improve the existing public transport services in GCR and the GCR underground metro program during the 1990s to early 2010s. The research found that although these programs were successful in limiting the increase of privately owned cars and taxies in GCR, they did not decrease traffic congestions due to a number of issues including malpractice, political and administrative corruption, and rapid population growth and increased population densities that almost doubled in the period from early 1990s to early 2010s

## 1. Introduction

Traffic congestions is one of the biggest problems in many modern cities worldwide (UN Habitat, 2009, UN Habitat, 2012). The issue could be attributed to a number of factors, most important of which are; the dramatically increasing number of vehicles especially private cars, rapid urbanization/expansion of the city resulting in longer commute, incapability to expand/develop the traffic network so to keep-up with the demand, and many more factors. The resulting traffic congestions not only increases the time/cost of commute, but it also environmentally unsustainable; it plays a vital role by increasing greenhouse gases and pollution worldwide especially that most cars use unsustainable fuel sources such as gasoline (UN Habitat, 2009). While the issue of traffic congestions is minor in relatively small cities, it is a severe issue when dealing with mega cities such as Moscow, Hong Kong, Mexico or Los Angeles (World Atlas, 2016). The issue of traffic congestions is increasingly affecting more cities as they expand and become megacities. However, as the expansion is accelerating in some of the cities in the newly urbanizing countries, government have many challenges such as traffic congestions and need to take fast actions to address/limit the effects of this issue affecting residents' lives by promoting public transportation and/or other solutions. One of those rapidly expanding megacities is the Greater Cairo city Region (GCR) in Egypt (UN Habitat, 2012). Despite the importance of this subject as it effects many aspects including residents' well-being, there is a gap in the academic literature about this subject as it is generally under-researched for many developing countries and Arab world countries. Therefore, this research will analyze/explore state-based public transportation incentives impact on addressing traffic congestions GCR the 1990s to early 2010s as a case study of megacities in developing countries and Arab world.

## 2. Research Methods/Structure

Based on (Bryman, 2008, Bryman, 2012), this research will use mixed of both qualitative and quantitative methods. Additionally, it will use case study approach as it is the best method to provide an in depth analysis of the issue (Yin, 2003). The research will firstly give a brief background about the subject. Then, it will brief discuss the history and development of the selected case study of the Greater Cairo Region and its main characteristics as one of the most densely populated mega cities in the Arab World. The research will then review/analyze quantitative data to better understand the history and magnitude of the transportation issues in the city specifically traffic congestion in relation to public transportation. Next, the research will analyze/evaluate two of state-led incentives to reduce

traffic congestions in the city, the Great Cairo Transport Authority (CTA) to improve the existing public transport services, and the French company project, called 'SOFRETU', to plan/construct Cairo underground metro. The research will use data gathered from two unstructured qualitative interviews with key informants to verify the findings, get in depth understanding of the causes of the issue, and then discuss the data. Finally, the research will highlight some key points about the impact of those state-led public transportation projects on traffic congestions in GCR in the conclusions.

### 3. Background

The city of Cairo, so-called "The City of a Thousand Minarets" during the old days for its preponderance of Islamic architecture. It is one of the Nile delta cities and the capital of Egypt. It is located at the junction between Upper and Lower Egypt to the south of the Mediterranean Sea and west of the Red sea and the Suez Canal. The city was found in the year 969 A.D. that makes it 1049 years old. The Greater Cairo Region (GCR) is comprised of old Cairo, Shubra El-Kheima, Giza and some surrounding settlements (Sutton and Fahmi, 2008). According to (Central Agency for Public Mobilisation and Statistics, 2011) its population exceeds 7.3 million spreading over an area of just over 453 square kilometers. Additionally, there are more than 10 million inhabitants living in areas just outside the city. This makes it by far the most densely populated areas in Egypt, 56% of Egyptian urban population are living in GCR (UN Habitat, 2014). It also makes it the largest metropolitan area in Africa and the Arab world, and the seventeenth-largest urban areas worldwide (Demographia, 2016).

As with many mega cities in newly urbanizing world, Cairo suffers from many issues associated with rapid urbanization and population growth. Additionally, as deserts area account for about 94% of Egypt's total area (U.N.P.F.E., 2008), most Egyptian population is concentrated in only few cities along the Nile River specifically within the Nile Delta region. This give Cairo and other Egyptian cities a unique characteristic as they are like densely populated islands surrounded by deserts. A recent study by the Central Agency for Public Mobilization and Statistics in Egypt, estimates that 98.2% of the Egyptian population live in about 7.8% of the total area. Twenty-two percent of those live in the Greater Cairo Region (GCR) alone. Despite having an overall population density of about 73 person per square kilometer in Egypt, the actual population density in GCR specifically Cairo rise to more than 925 person per square kilometer. This makes GCR the densest areas and cities in the Arab world and one of the top densest in the entire world (Central Agency for Public Mobilisation and Statistics, 2011, UN Habitat, 2014).

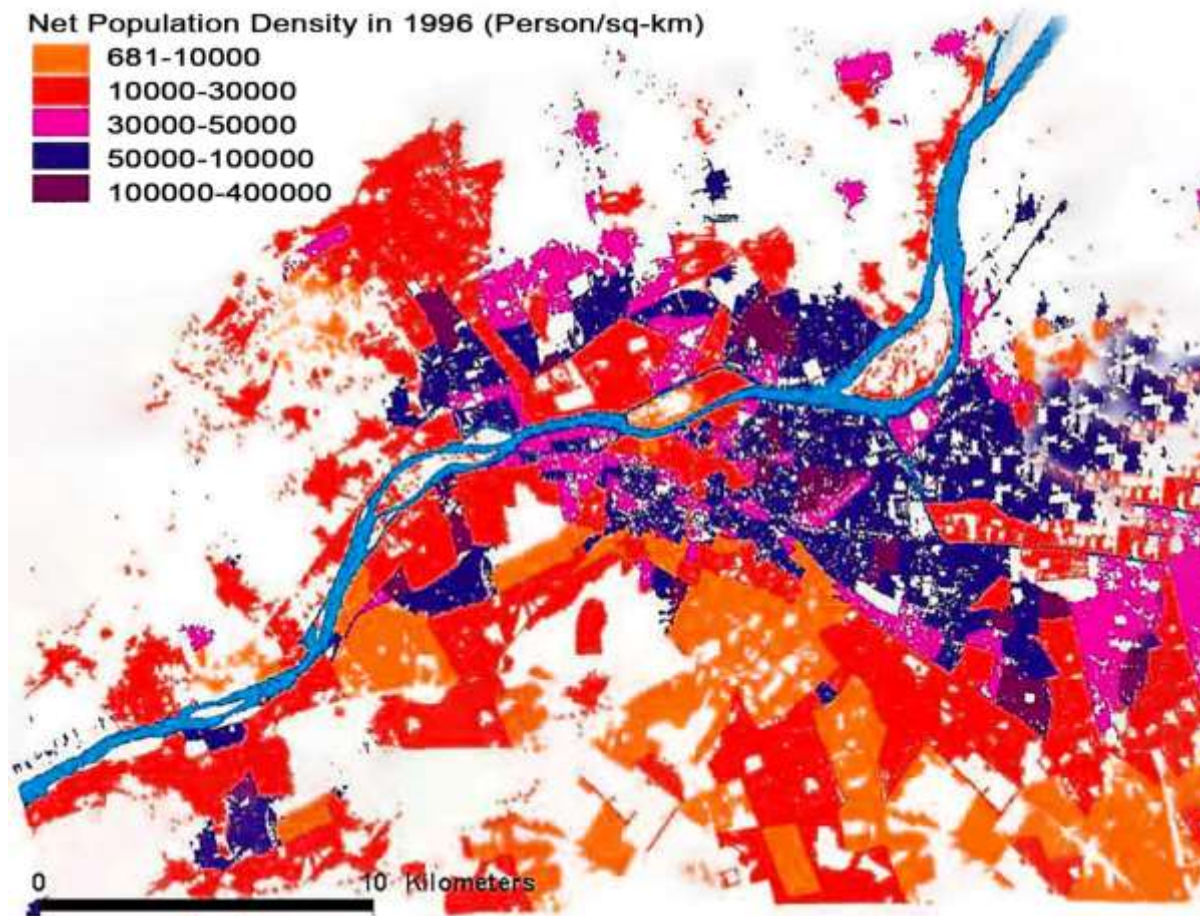


Figure 1: Net Residential Densities in 1996

Source: (Sims et al., 2003)

#### 4. The Traffic Congestions Problem of Cairo

Cairo is currently suffering from a number of serious issues in the planning, economic, social, services, environment, and health contexts. Among the most important issues, and probably the easiest to observe, is the severe traffic congestions especially in the city central area and old Cairo. The problem of traffic congestions is not new in Cairo; rather it is a relatively an old issue that gradually developed into a problem affecting the entire city. According to (Cook, 1984, Araby, 2002) this is a consequent of a number of interrelated factors including rapid population and urban growth, urbanization with bad urban management, existing residual deficiencies in transportation planning system, and the lack of fully developed transportation network especially in the old city. The transportation system planning/design was generally based on the use of privately owned cars and public transportation through buses; however, it was not designed to handle the rapidly increasing number of cars of today. With the limitations/challenges associated with transportation system

development mentioned above, the transportation system was unable to cop up with the large numbers of commuters of modern life especially in the old city of Cairo where streets are narrow, the urban fabric is denser, and the demand for transportation is larger.

According to El-Daghestany (1984), the number of cars in GCR nearly doubled within a period of three years from 1980 to 1983 only (See figure 2). The number of cars continued to increase since then to exceed 3.9 million vehicles in 2006 and then 5.8 million vehicles in 2010 ((CAPMAS), 2011, El-Daghestany, 1984), see figure 4 and 5. According to a study by Araby (2002), despite many state-led incentives to address the traffic issues in GCR such as the Great Cairo Ring Road and Bridges, the average car speed in GCR remained below 8.1 km/hour and even lower in the old metropolis downtown center. The overcrowded city center, the issues derived from the high dependency on private cars and the resulting pollution and noise, started pushing high and upper-middle class people to move to the suburbs of the city leaving the low and lower-middle class in the city center. The accumulating traffic issues resulted in sever traffic congestions in GCR especially in the city of Cairo.

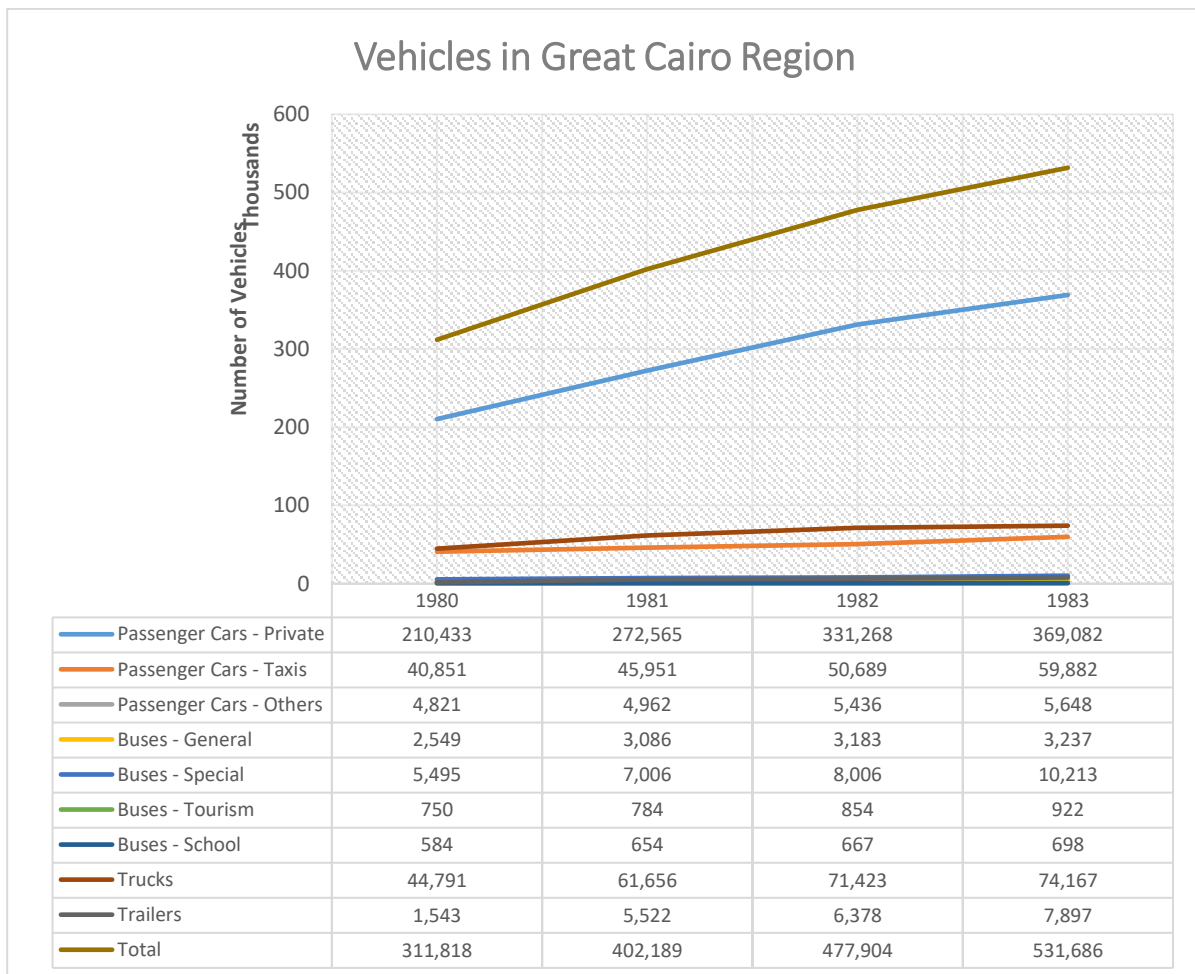


Figure 2: Vehicles in Great Cairo Region

Statistics from (El-Daghestany, 1984)

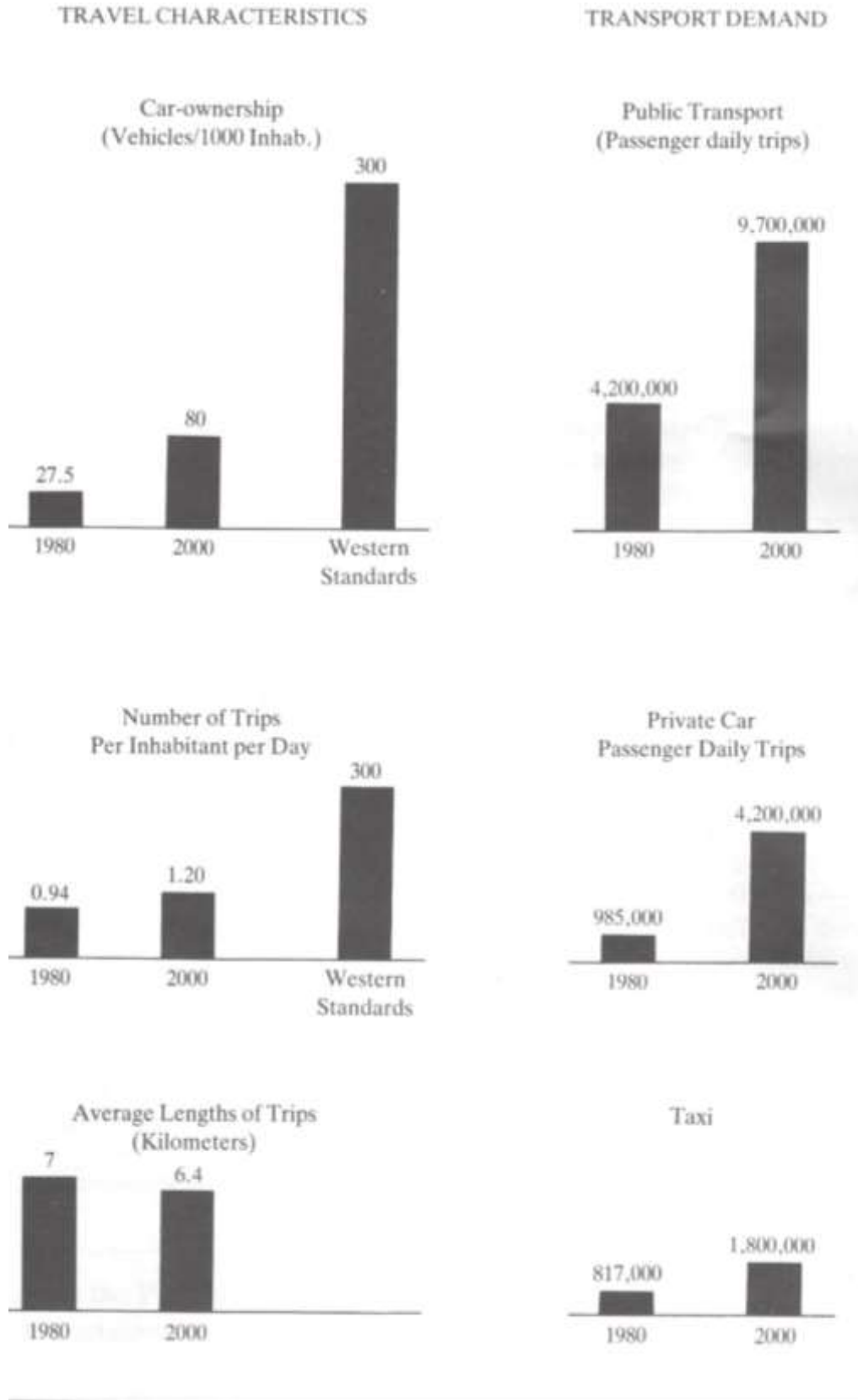
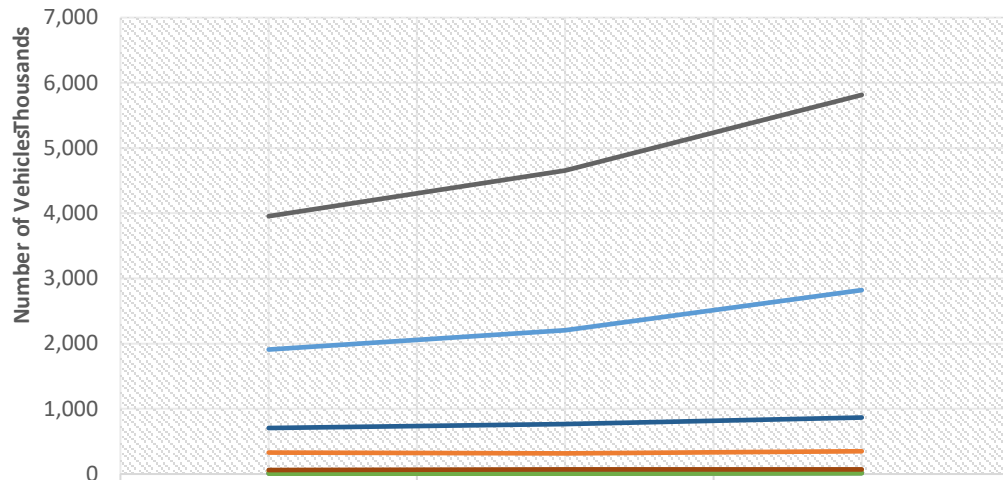


Figure 3: Characteristics and estimated transport Demand in 1980 and 2000 in GCR Source: (El-Daghestany, 1984)

### Vehicles numbers in Egypt between 2006 and 2010



|                          | 2006             | 2008             | 2010             |
|--------------------------|------------------|------------------|------------------|
| Passenger Cars - Private | 1,909,149        | 2,206,823        | 2,820,242        |
| Passenger Cars - Taxis   | 328,273          | 316,293          | 349,087          |
| Buses - General          | 16,097           | 0                | 18,638           |
| Buses - Special          | 26,594           | 28,452           | 34,858           |
| Buses - Tourism          | 11,125           | 15,101           | 16,210           |
| Buses - School           | 5,844            | 7,069            | 10,430           |
| Trucks                   | 705,521          | 767,849          | 866,301          |
| Trailers                 | 60,995           | 70,932           | 70,933           |
| <b>Total</b>             | <b>3,953,811</b> | <b>4,656,636</b> | <b>5,814,385</b> |

Figure 4: Vehicles increase in Egypt between 2006 and 2010

Based on ((CAPMAS), 2011)

### 5. State-Led Incentives to Addressing the Traffic Congestions Problem

As seen in figures 2, 3 and 4, there was a dramatic increase in the number of vehicles in GCR. Although this increase in vehicle numbers applies to all categories, the largest increase was in the numbers of privately owned cars (Passenger Private Cars) and Taxis. Realizing the bad consequences/impact of the sever traffic congestions in Cairo, the government planned and initiated two simultaneous programmes to addressing the issue of traffic congestions in Cairo and the GCR overall. The first program was implemented through Great Cairo Transport Authority (CTA) to improve the existing public transport services in GCR. The second program was implemented through a French consultancy firm called ‘SOFRETU’ to plan/construct Cairo underground metro project.

For the first program, the Great Cairo Transport Authority (CTA) laid down a set of objectives/goals in order to increase the usage of Public Transportation in GCR:

- i. Promote/increase CTA's tram and bus stock through purchasing new units and providing the necessary maintenance facilities.

- ii. Enhancing the quality of service and speed through exchanging all old units over seven years old with new ones, providing training to bus drivers, re-planning the bus schedule, and improving the tram fleet.
- iii. Improving waterbus transport system and linked systems.
- iv. Reducing tram, bus and waterbus fares and offering all-day tickets.
- v. Allowing private investments in the public transport system.

The underground metro project, on the other hand, was originally proposed in 1954 by 'SOFRETU' as a way for tackling the traffic congestion problem, but it was not approved by the local authority. The project was proposed again in 1971, this time it was approved by the government after making minor changes (Cairo Metro, 2012a). The final project consisted of four stages/phases (see figure 5):

- i. Phase 1: 41km long metro line connecting Helwan and Al-Marg through old Cairo. It was initiated in 1982 and finished in 1987.
- ii. Phase 2: 29km long metro line connecting Shubra Al-Khaima industrial district with Tahrer Square passing through Cairo and under the Nile. The construction started in 1989 and it was finished in 1997.
- iii. Phase 3: 30km long metro line connecting Bulaq and Imbaba to the west of the Nile with Tahir Square and Cairo International Airport on the east of the Nile. The construction started in 2007 but it did not finish according to the schedule in 2011.
- iv. The government only approved phase 4 in 2010. It is 17.2km in length and should link the 6<sup>th</sup> of October City with Hay Al-Haram passing also through Cairo. The construction of this phase should start in 2011 and be finished by 2019. However, it was delayed for a number of reasons mostly financial.

The main goal of both programs was to promote/enhance public transportation for low and mid-income class, thus decreasing the number of privately owned cars and taxis, consequently traffic congestions in GCR ((CAPMAS), 2011, Cairo Metro, 2012a, El-Daghestany, 1984). The underground metro project was considered to be better investment because it should transport people faster with no need of surface transport network. Cook (1984), in his study about transportation in GCR, estimated that the underground metro could carry up to 60,000 passengers per hour in both directions. This is considered much better than any other means of transportation including tram and private cars which could carry only about 20,000 and 2,500 passengers per hour respectively.



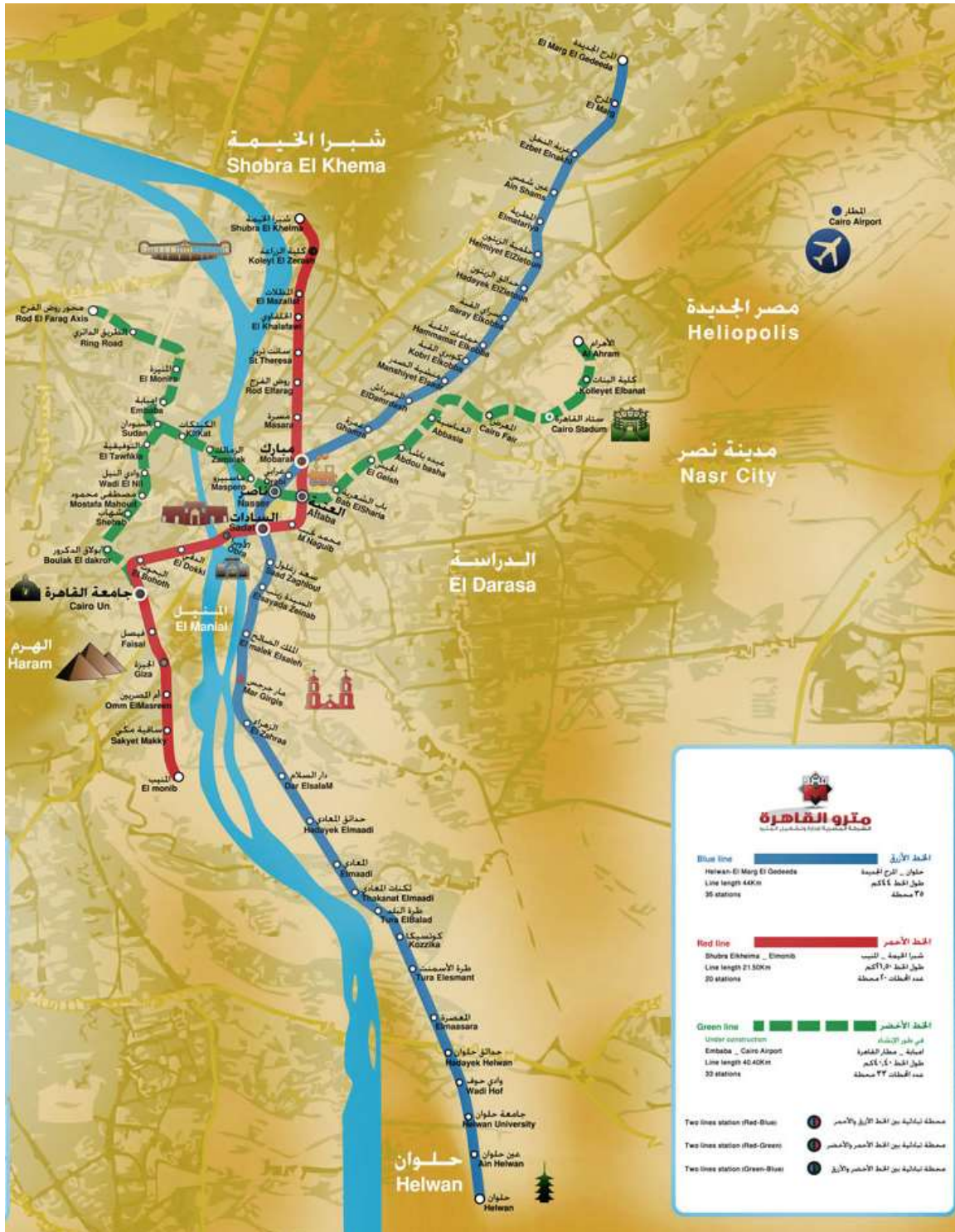


Figure 5: Cairo Metro Map

Source: (Cairo Metro, 2012a)

## 6. Discussion

There is conflicting data about the success of GCR's public transportation programs in reducing traffic congestions and the number of private cars in GCR. According to the Egyptian Ministry of Transport (EMT) and Cairo Metro (Cairo Metro, 2012a, Ministry of Transport, 2012), the two programs successfully reduced the number of vehicles (especially private cars) in Greater Cairo Region. However, looking at the number of vehicles between 1980 and 2010 estimated by the Central Agency for Public Mobilisation and Statistics (figures 2 and 4), it is possible to see that the number of vehicles kept increasing despite EMT's claims. It could be said, however, that the two programs were successful (to some extent) in limiting this increase, but did not decrease the number of private cars. The underground metro project was successful in handling nearly 800m passengers per annum by 2008 (see figure 6); however, this number was expected to be much higher (about 1100m passengers per annum according to Cairo Metro (2012b)). Buses, on the other hand, were able to handle higher number of passengers due to being more flexible and widely spread, thus covering a much larger area than the underground metro can. More importantly, buses were more affordable compared to the underground metro, making them the desired option for the majority of the community who are generally low-income.

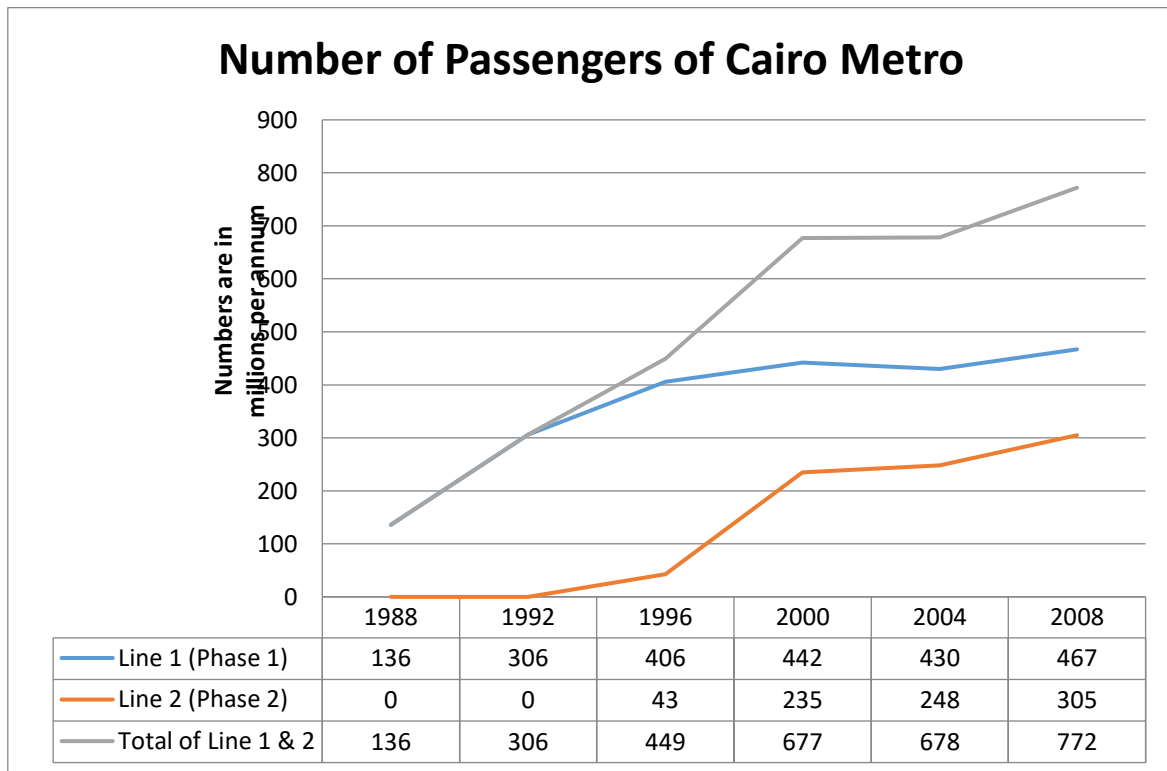


Figure 6: Number of Passengers of Cairo Metro

based on (Cairo Metro, 2012b)

Based on the qualitative interview with two key informants about transport planning in GCR, the number one issue that limited the success of the underground metro in GCR is the high fare rates. Despite the underground metro project being originally planned to attract most of the public transport in GCR via faster commute and nearly zero land on the ground, the majority of public commuters are low-income and middle-income people living in GCR. Higher underground metro fares means the majority of everyday commuters in GCR will prefer other means of transportation such as buses and trams.

On the other hand, bus and tram services were more successful in attracting more commuters especially from low and mid income class. However, they were not able to cop up with the large demand for affordable public transport especially that they were planned to be only supportive systems to the Cairo underground metro project. Additionally, increasing the number of units could potentially help serving more commuters, but only within a limited range before the all congested infrastructure and streets network limit its effectiveness. For instance, there are about seven bridges in Cairo connecting the streets network on the eastern bank of the Nile River with the streets network on the western bank, of those seven bridges, buses are only allowed to share two with other vehicles. Moreover, there is an absence of bus exclusive lanes in GCR, which increases the time of commute, fuel usage, and pollution generated by buses, thus, reducing its effectiveness and streets efficiency.

For all this, it is possible to say that both programs were successful to some extent in limiting the increasing dependency on private cars in GCR, but they did not help in tackling the traffic congestion problem in GCR. Both programs need to be modified and supported by other secondary programs such as reducing metro fares and introducing bus exclusive lanes in GCR streets network.

## **7. Conclusions**

Traffic congestions is one of the most important issues facing many cities around the world. Not only does it have major impact on city planning and urban fabric, additionally, it can have major impact on many aspects including health, pollution, style of living and residents' overall well-being. Governments often try to address the issue of traffic congestions in cities by implementing various plans to limit its effects on the city and its residents. Promoting public transportation is often seen as an excellent way to counter the increasing traffic congestions in many cities around the world especially mega cities. However, in order for public transportation to be successful in doing so, it needs careful planning and anticipation of future impact on the city planning and community while considering all relevant aspects including economic, political and social. The planning of

transportation system is a difficult task that needs extra attention especially when dealing with rapidly growing cities in newly urbanizing developing countries.

In the case of the Greater Cairo Region, it is possible to observe a number of issues with the state-led initiatives to addressing traffic congestions. The two public transportation programs, namely the Great Cairo Transport Authority (CTA) program to improve the existing public transport services in GCR and the GCR underground metro program, did not help that much in addressing the traffic congestions problem in GCR. While both programs were successful in limiting the increase of private cars/taxis in GCR to an extent, they did not fulfil their objective in reducing the dependency on private cars/taxis due to a number of issues. Most important of those issues are:

- Programs' misalignment/inconsistency of the targeted people (low-income) with the actual users during and after programs' implementation. This particularly important to Cairo underground metro program as the actual metro fares were considered unaffordable for ordinary low-income people in GCR.
- The absence of a reliable and effective monitoring/evaluation system, made it difficult to analyse then direct/mange the planning of these programs. Despite the government being the strongest party behind both governmental interventions/programs, there is some conflict of responsibilities/boundaries between different governmental organisations. This could be easily observed through the conflicting statistical data/reports between Egyptian Ministry of Transport (EMT) and Central Agency for Public Mobilisation and Statistics. This could be due to a number of reasons, most important of which is the absence of responsibilities planning and centralized monitoring, in addition to other reasons such as political factors and administrative corruption.
- The inability of the government to see the overall picture due to the high levels of informal settlers, leaving important stakeholders out of the decision making process such as the people, lack of experience and more. This resulted in incomplete plans that only achieved parts of the programs objectives as seen in the case of bus services without exclusive bus lanes.

Despite governmental interventions to promote public transport in GCR, the issue of traffic congestions remains as one of the most important issues affecting the lives of millions of GCR residents. The continuation of this issue in GCR raises many questions about government ability to address this problem as well as other problems in GCR and the true reasons behind this. Is it only a matter of authority inexperience? How does politics and corruption influence the issue? This, however, could be a subject of another research in the future.

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