

**NEW URBAN COMMUNITIES: PAST EXPERIENCES AND THE
FUTURE OF CITIES**

**THE
DOCUMENT
COMPANY
XEROX**

PHOTOCOPYING COMPLIMENTS OF XEROX "The Document Company"

EFFECT OF ACCESSIBILITY ON THE DEVELOPMENT OF NEW CITIES IN EGYPT: A SYSTEM FRAMEWORK

Professor Dr. Abdel Gawad Bahgat¹

Dr. Khaled A. Abbas²

ABSTRACT

Egypt's population is more than 60 million. Over 97% of the population is concentrated in the Delta region and the Nile valley, which constitute only 4% of Egypt's land area. This reflects a striking feature of the distribution of population in Egypt, namely the concentration of a large proportion of the urban population in a small area and the overwhelming dominance of the capital city Cairo. Since mid seventies the Egyptian government has embarked on a spatial planning policy based on development into the desert areas away from the Nile and the main cities of the Delta. A national strategy for developing satellite towns and medium-sized cities has been produced. Some of the new developments, notably Tenth of Ramadan, Sadat and Six of October cities, are developed as productive societies to stand alone in the desert and away from the Delta and Nile valley.

The main objective of this research is to gain a general insight into the development process of new cities in Egypt and, in particular, into the role played by transport. Efforts to develop an integrated framework that considers the main factors contributing to the development process is pursued. This framework is used to show the effect of transport accessibility in comparison to other infrastructure provisions (water and waste water projects, electricity and communications projects) on the development of new cities in Egypt. Development is defined in terms of industrial and population development. The intention of this research is to use historical data to develop statistical models to verify the causal relationships displayed in this framework.

1. INTRODUCTION

Egypt, with its Suez Canal, is at the world's crossroads between east and west, Africa and Asia. It is situated at a dominant location in northeast Africa. The position of Egypt is central of the Arab nation. The Mediterranean sea forms its northern boundaries and the Red Sea its eastern frontiers. Neighbouring Egypt are Sudan to the south and Libya to the west. The total area of Egypt, including territorial waters and deserts, is about 1002000 km². Egypt presents a unique combination of many conditions prevalent in the developing world. It is a land of contrasts, with its topography dominated by the River Nile, that cuts its way through bare desert, see Figure 1.

Egypt's population is more than 60 million. Over 97% of the population is concentrated in the Delta region and the Nile valley, which constitute only 4% of Egypt's land area. Egypt is an under-populated country with a problem of over-population. This reflects a striking feature of the distribution of population in Egypt, namely the concentration of a large proportion of the urban population in a small area and the overwhelming dominance of the capital city Cairo.

¹Director of the Egyptian National Institute of Transport (ENIT) and Professor of Transportation and Highway Engineering - Al-Azhar University

²Lecturer at the Transportation Planning Department - Egyptian National Institute of Transport (ENIT)

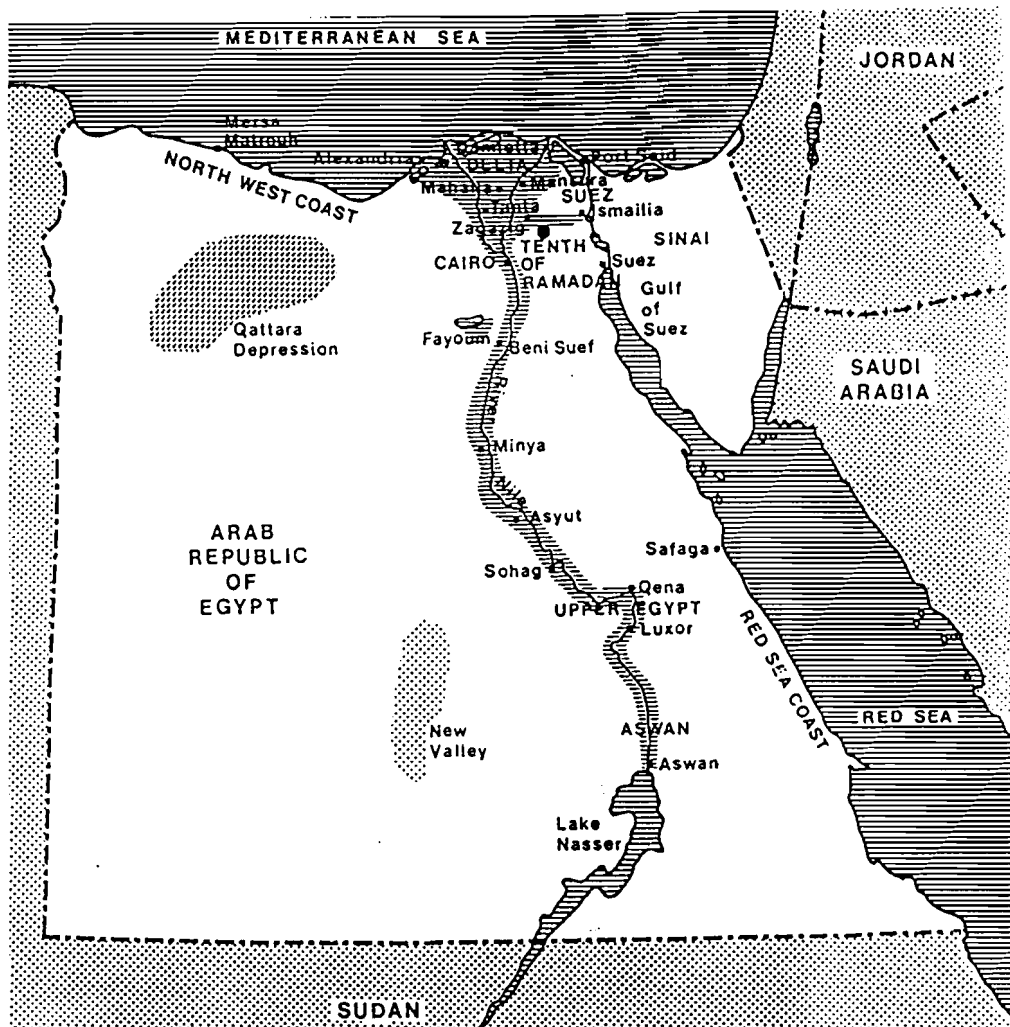


Figure 1: Egypt Dominated by the River Nile

In many countries of the world, decentralisation has been the main strategy, in terms of national territorial planning, to cope with the pressures on the major cities as more dwellers move to the cities in anticipation of a better life. Land, people and the Nile remain the main sources of Egypt's natural wealth. Since mid seventies the Egyptian government has embarked on a spatial planning policy based on development into the desert areas away from the Nile and the main cities of the Delta. A national strategy for developing satellite towns and medium-sized cities has been produced. Some of the new developments, like El-Eboor and Fifteenth of May, are intended mainly as satellite towns, close to the capital city, Cairo, to relieve some of the pressures of overpopulation. Others, notably Tenth of Ramadan, Sadat and Six of October cities, are developed as productive societies to stand alone in the desert and away from the Delta and Nile valley, see Figure 2.

The main objective of this research is to gain a general insight into the development process of new cities in Egypt and, in particular, into the role played by transport. Investment in transport affects, and is affected by, investments in other sectors. Efforts to develop an integrated framework that considers the main factors contributing to the development process ought to be pursued. This framework would be used to show the effect of transport accessibility in comparison to other infrastructure provisions (water and waste water projects, electricity and communications projects) on the development of new cities in Egypt. Development is defined in terms of industrial and population development. The intention of this research is to use historical data to develop statistical models to verify the causal relationships displayed in this framework.

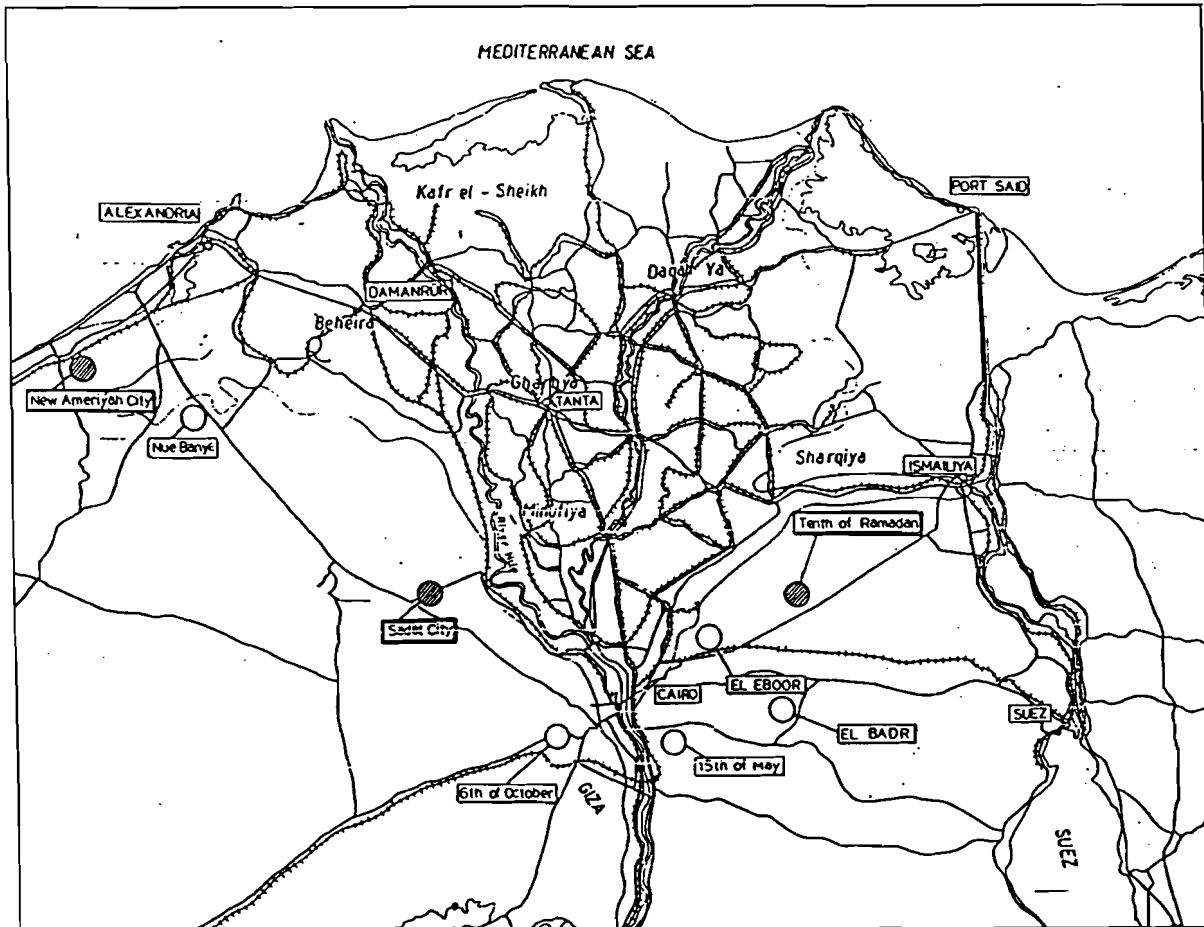


Figure 2: Location of New Cities and Satellite Towns in Egypt

2. GOALS OF CONSTRUCTING NEW CITIES IN EGYPT

Drawn from various sources, see (1), (2), (3) & (4), some of the aims of building new cities in Egypt are given below.

- To enable resettlement to take place in centres, which hopefully are attractive in many ways to the population, thereby creating a new socio-economic map of the urban areas in Egypt through the distribution of population and economic activities.

- To reduce the high density of population in the Delta region in Egypt by extending urbanisation outside the Delta to the desert, thus absorbing a large share of the expected increase in population, and changing the migratory movements to the new cities, rather than to Cairo.
- To relieve, in part at least, some of the existing and expected stresses on the services in the populated areas, like housing, water and power supply, sanitation, communications, transport facilities, etc.
- To develop desert areas, which would otherwise be unused, thus making more effective use of the country's land and human resources.
- To protect the scarce and precious agriculturally fertile land of the Nile Delta against encroachment and conversion to urban uses.
- To stimulate the private sector and its contribution to investment.
- To expand the state's economic base by attracting new industrial enterprises
- To increase regional and national incomes, as new cities are considered to be productive societies that add to the domestic production.
- To create employment opportunities, thereby reducing national rates of unemployment and underemployment.
- To reduce imports (by import substitution) and increase exports, thus increasing net foreign exchange earnings.
- To reduce the reliance on foreign aid, consequentially having more freedom to make independent political decisions.
- To enhance the strategic national security of the country by uniformly distributing the population over the total land area.

3. FIRST GENERATION OF NEW CITIES IN EGYPT

Tenth of Ramadan, Six of October and Sadat cities are three important new cities, constructed to fulfill the strategic development plans aimed to develop and populate desert areas around the periphery of the Nile Delta region, in what has been referred to as the capital crescent region. The self-contained cities are intended to be self-sufficient, with an independent economic base, and to act as development poles that positively affect the regions where they are located through distributive effects. These effects are expected to form a series of spatial interactions such as provision of elements of production, marketing the production, absorption of the work force, etc.

Development of a city is associated with the ease of access to resources, consumer markets and labour. Accessibility is a prerequisite for starting a new city in the desert. Accessibility depends on good regional connections, as well as on a sound urban road network.

Tenth of Ramadan is located in a strategic position that provides it with advantages to become an eminent centre for industry, distribution and communication. Regionally, Tenth of Ramadan lies to the east between the Greater Cairo region, the Suez Canal region and the East Delta region. It is near Cairo, the capital city, Ismailia, Port Said, and Suez, which constitute the Suez Canal crescent of cities, and it is also near Bilbeis, which is one of the heavily populated areas in the East Delta region, see Figure 3. Tenth of Ramadan new city is situated on the Cairo-Ismailia desert road about 55 kilometres from the centre of Cairo, 60 kilometres from Ismailia, and 30 kilometres from Bilbeis, see Figure 4.

Construction of Tenth of Ramadan started in 1978, and is scheduled to be fully completed within four stages, see (1) & (2). The city is allocated a total area of 398 km², of which 56 km² is dedicated for urban development. The master plan of Tenth of Ramadan city is displayed in Figure 5. The main economic base is industry, with three types of industries (heavy, medium and light).

Sadat city is located to the north-west between Cairo and Alexandria, the main Egyptian port on the Mediterranean. Lying on the western periphery of the Delta region, Sadat city is meant to act as a focus for the western part of the Delta region, which has a very high population density that can provide the city with all its work force requirements, see Figure 6. For the population of this area, the attractivity and economic stimulus of Sadat city would be in providing industrial working opportunities, and also in offering better services. Sadat city is situated on the dual carriageway desert road that connects Cairo to Alexandria, see Figure 7.

The city is half way between Cairo and Alexandria, approximately 95 kilometres from each. This location provides Sadat city with a degree of independence, as it is far enough from each of Cairo and Alexandria to discourage daily commuting. On the other hand, the relative proximity, and the good connections, to both Cairo and Alexandria provide Sadat city with advantages in terms of accessibility, both to local markets, which are mainly in Cairo and Alexandria, and to raw materials stocks, which if locally produced, are mainly supplied from Cairo and, if imported, are mainly supplied through the port of Alexandria. Construction of Sadat city started in 1979, and is scheduled to be fully completed within five stages, see (3). The city is allocated a total area of 625 km², of which 48 km² is dedicated for urban development. The main economic base is industry, with three types of industries (heavy, medium and light).

Six of October is located to the west of Cairo at an approximate distance of 38 kilometres. The main road entrance to the city is branched from the Cairo-Alexandria desert road after 25 kilometres, see Figure 8. The city is also connected to Fayoum desert road and to the Oasis desert road. The city is mainly constructed to redistribute and relieve the population pressure in Greater Cairo with a special emphasis on Giza. It is meant to protect the precious agricultural land near Giza and prevent it from being absorbed into other types of land use. The city is allocated a total area of 360 km², of which 52 km² is dedicated for urban development, see (4).

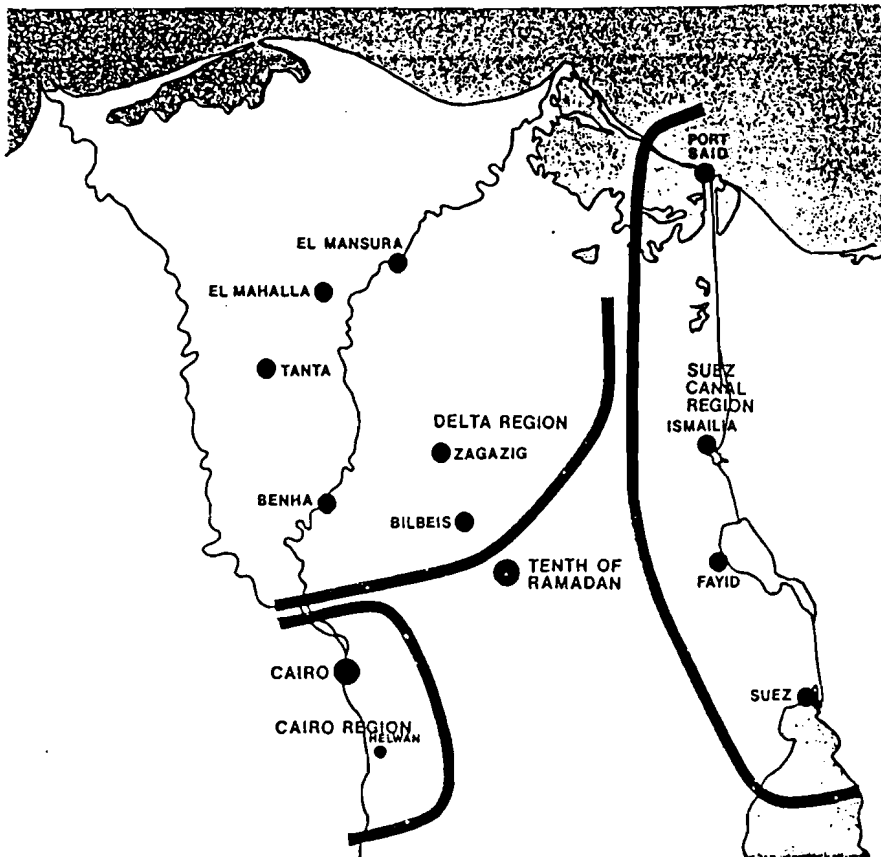


Figure 3: Location of Tenth of Ramadan New City in Relation to Surrounding Regions

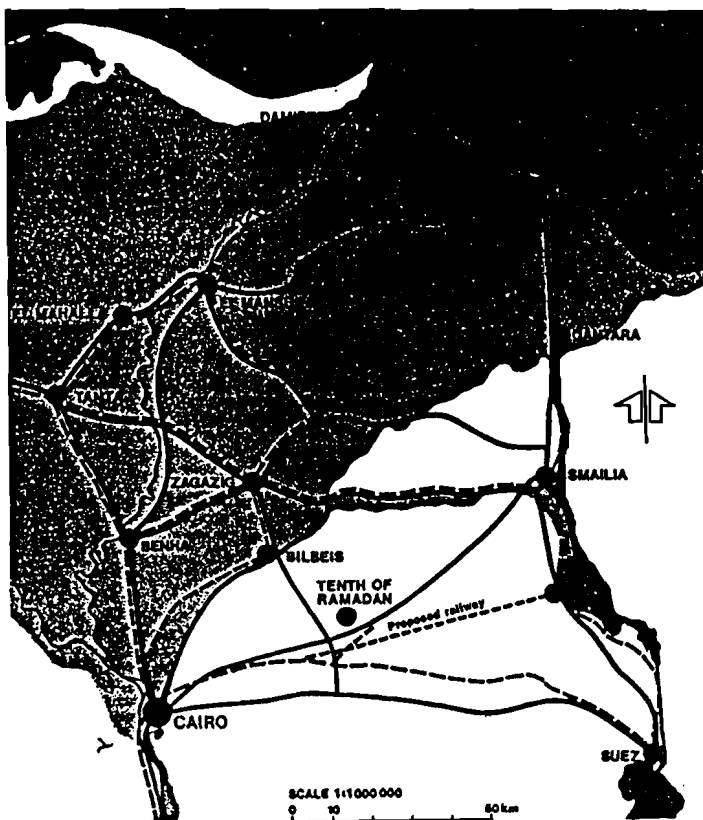


Figure 4: Location of Tenth of Ramadan New City in Relation to Regional Road Network

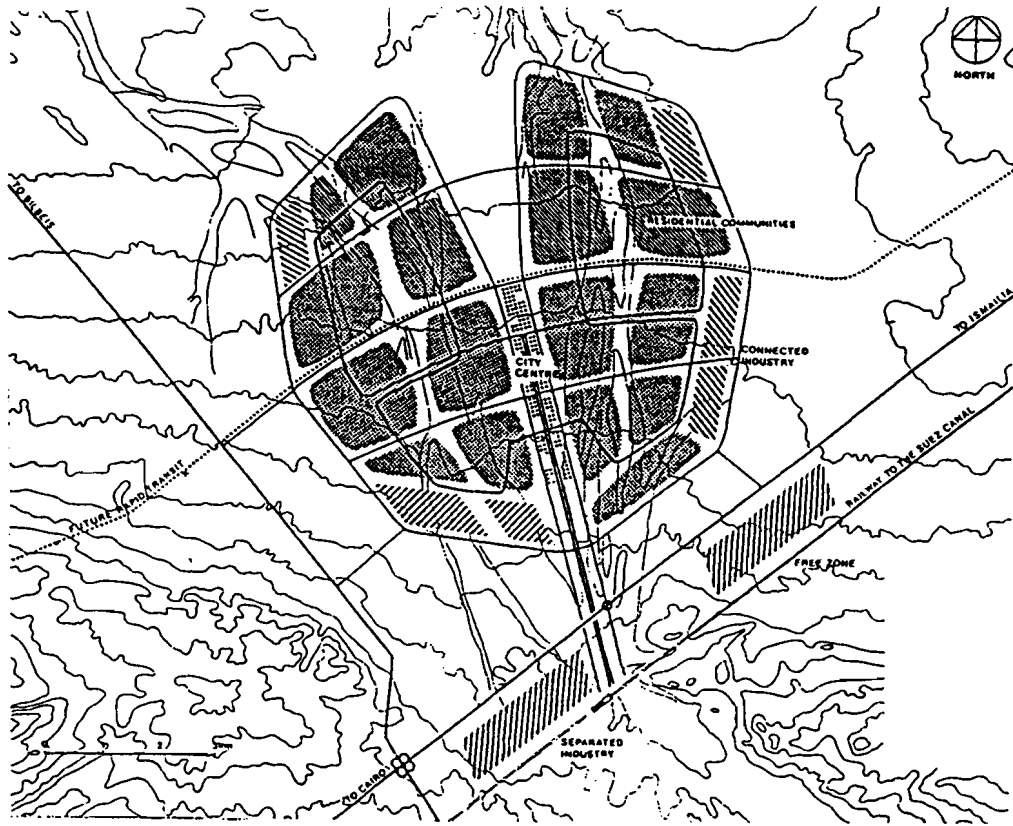


Figure 5: Master Plan of Tenth of Ramadan New City

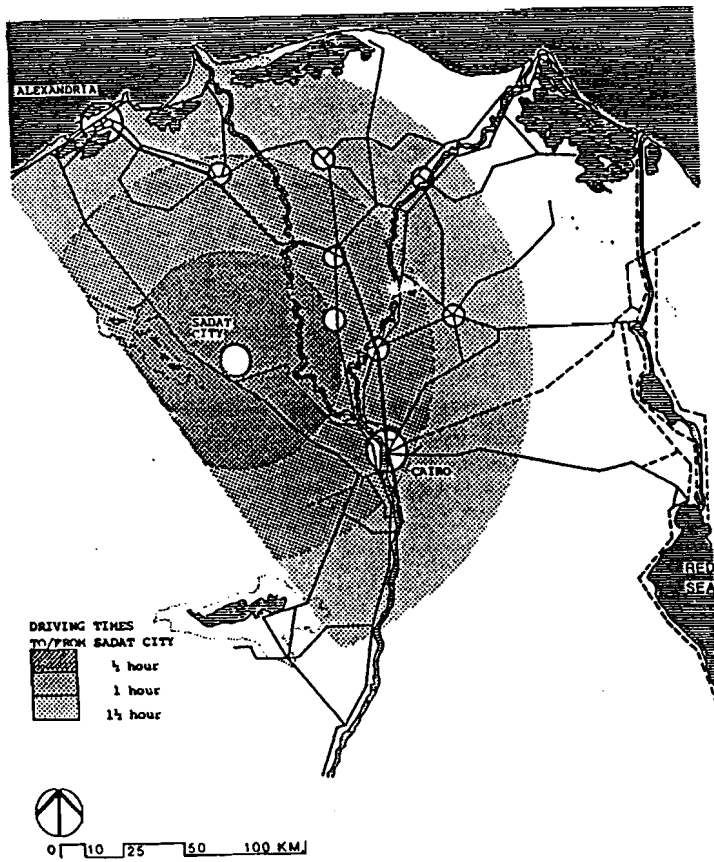


Figure 6: Location of Sadat New City in Relation to Surrounding Regions

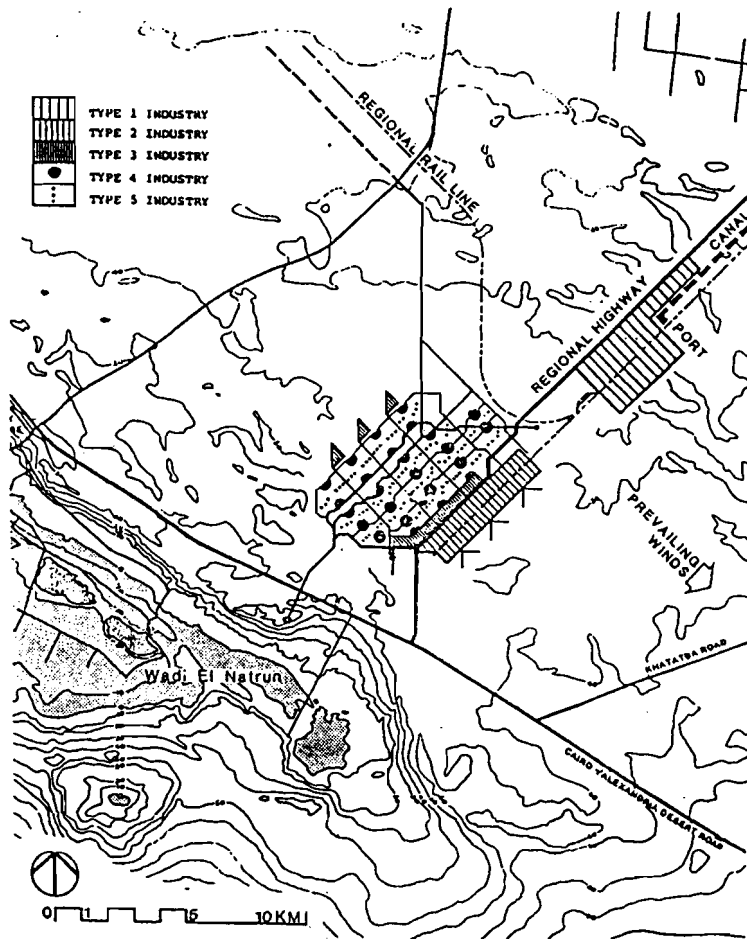


Figure 7: Location of Sadat New City in Relation to Regional Road Network

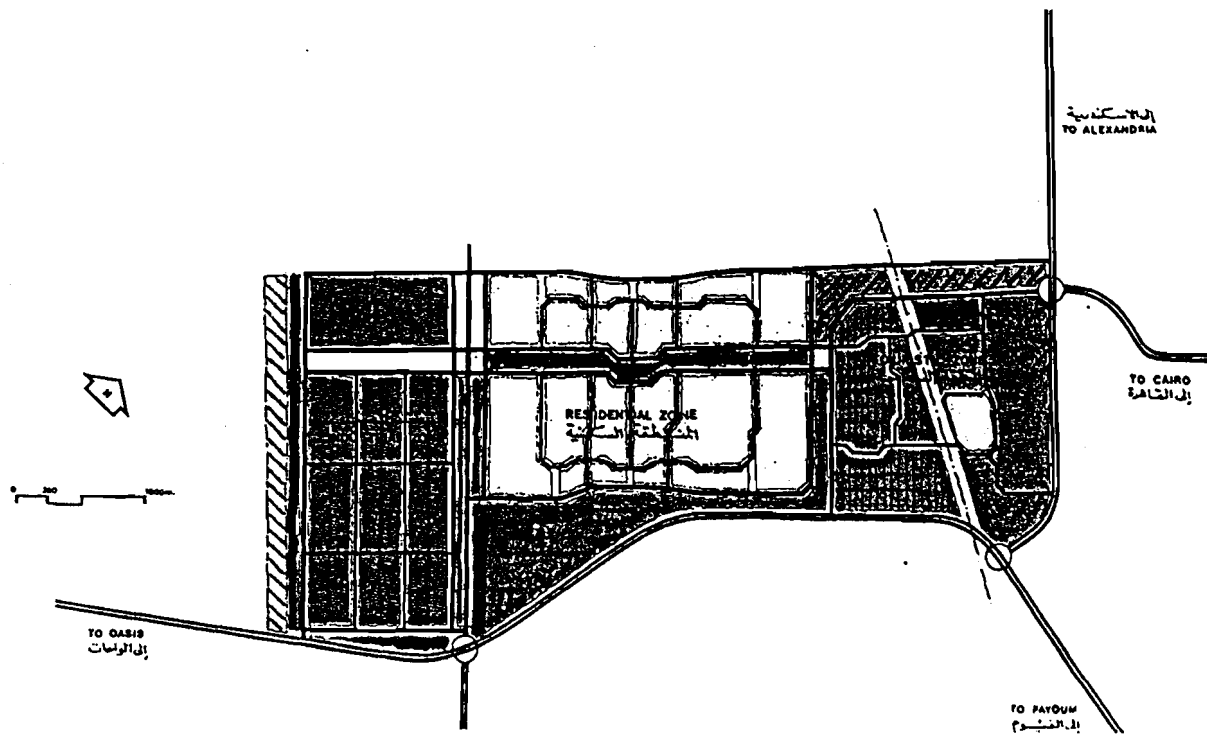


Figure 8: Master Plan of Six of October New City

4. PLANNING OF NEW CITIES DEVELOPMENT

It is of great importance to adopt a wise policy in the construction of new cities; to set goals, base decisions and evaluate results according to realistic, national, socio-economic parameters. The national and regional socio-economic plans should be based according to an agreed strategy taking into account the existing economic realities and the constraints on the development process. The most important constraint is the inability to allocate the full, required rates of investments to the new cities. What is needed is to have a continuous commitment by allocating a yearly percentage of the national economy for the development of the new cities. Planners realise that such big projects have long development periods, and that their benefits would not materialise except over a long span of time.

Ad-hoc investment policies and lack of coordination and planning would inevitably lead to a waste of resources. The most effective use of scarce resources is needed. This could be achieved through coordination in the planning and provision of main infrastructure facilities, industrial enterprises and housing to achieve a balanced growth. Sectors should grow closely linked to each other ensuring the optimum utilisation of resources, thereby avoiding any idle investment of scarce funds.

Unless new cities attract people in sufficient numbers, they certainly will not survive in a positive, contributory way. The scope for dispersal of population to new cities depends, largely, on the ability to create employment opportunities, and to provide adequate housing and all other needed services and recreation facilities.

5. ROLE OF TRANSPORT IN ACHIEVING DEVELOPMENT

The significance of transport lies not only in the services it renders, but even more in the stimulating influences it exerts on economic activities, see (5), (6), (7), (8), (9), & (10). Investments in transport are expected to contribute to the development of new cities. In newly developing regions, causal, dynamic, feedback relationships exist between elements of development such as transportation, industry, population, housing, etc. For new cities, particularly, the provision of transport is foreseen to have a significant influence on attracting industry, resettlement of people and the availability of labour.

There are two concepts pertaining to the role that transport plays in development. The first suggests that transport plays the major role in the development of land and resources; it is a prerequisite that automatically leads to development. The second suggests that transport is but one of the necessary catalysts for promoting development, and not necessarily the major catalyst.

The first concept may result in an over-investment in transport, consuming scarce capital resources, thus reducing the potential to support other, needed, catalytic investments. If no coordination exists between investments in different sectors, including transport, the second concept may result in an under-investment in transport leading to bottleneck situations and adversely retarding the progress in other sectors. So, a balanced strategy is needed: a strategy that views transport and its role in the development process within a holistic, coordinated systematic framework.

6. A SYSTEM FRAMEWORK FOR ASSESSING THE EFFECT OF TRANSPORT ACCESSIBILITY ON THE DEVELOPMENT OF NEW CITIES IN EGYPT

The self-contained cities are intended to be self-sufficient, with an independent economic base, and to act as development poles that positively affect the regions where they are located through distributive effects. These effects are expected to form a series of spatial interactions such as provision of elements of production, distribution of production, absorption of the work force, etc.

The main objective of this research is to gain a general insight into the development process of new cities in Egypt and, in particular, into the role played by transport. Investment in transport affects, and is affected by, investments in other sectors. Efforts to develop an integrated framework that considers the main factors contributing to the development process ought to be pursued, see (11). An aggregate cause and effect framework, envisaged in this research, is shown in Figure 9. It includes the following main elements:

1. transport accessibility represented by investments in city entrances and main road network;
2. provision of other main infrastructure elements represented by investments in water and waste water treatment as well as investments in electricity and communications;
3. industrial location incentives;
4. industrial development represented by industrial area;
5. provision of elements of services represented by total investments in services;
6. provision of housing represented by investments in housing;
7. population location incentives; and
8. population represented by number of city inhabitants.

These elements were chosen as they are perceived to be the most dominant components forming the urban structure of a new city in Egypt. This perception is based on the notion that the main goal of developing new cities in Egypt is to attract industry to locate and develop as well as people to migrate and settle in the new cities in order to relieve the mounting pressures on existing urban areas.

This framework would be used to show the effect of transport accessibility in comparison to other infrastructure provisions (water and waste water projects, electricity and communications projects) on the development of new cities in Egypt. Development is defined in terms of industrial and population development. The intention of this research is to use historical data to develop statistical models to verify the causal relationships displayed in this framework.

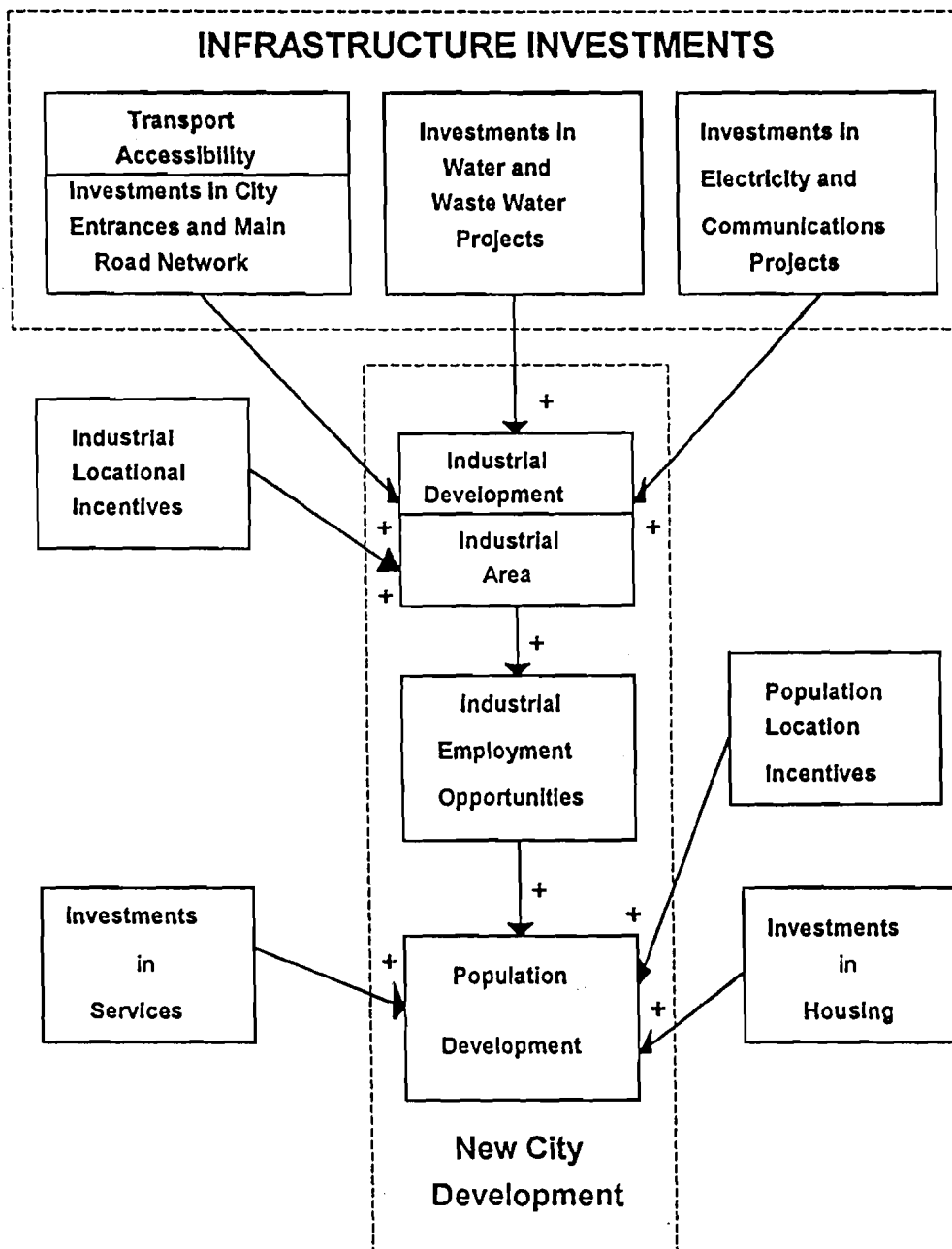


Figure 9: Cause and Effect Framework of the Development of New Cities

7. EFFECT OF INFRASTRUCTURE INVESTMENTS ON THE DEVELOPMENT OF INDUSTRIAL ENTERPRISES

The industrial sector is the prime determinant of the growth of new cities. Locating new industries will require substantial investment to overcome the economic development constraints of the desert regions. It follows that the provision of required infrastructure and location incentives stimulates the development process in new cities. The following tables and figures (see Tables 1, 2 & 3 and Figures 10, 11, & 12) show the recent historical trend (1988/95) of infrastructure investments in Tenth of Ramadan, Sadat and Six of October new cities.

Table 1: Infrastructure Investments in Tenth of Ramadan New City

Year	Tenth of Ramadan New City							
	1988	1989	1990	1991	1992	1993	1994	1995
City Entrances & Main Road Investments	26510	27422	28333	29863	31673	32713	34954	43011
Water & Waste Water Investments	70628	89547	94067	98167	102465	107715	117177	157465
Electricity & Communication Investments	38024	50766	55771	65211	80574	106446	156762	196694

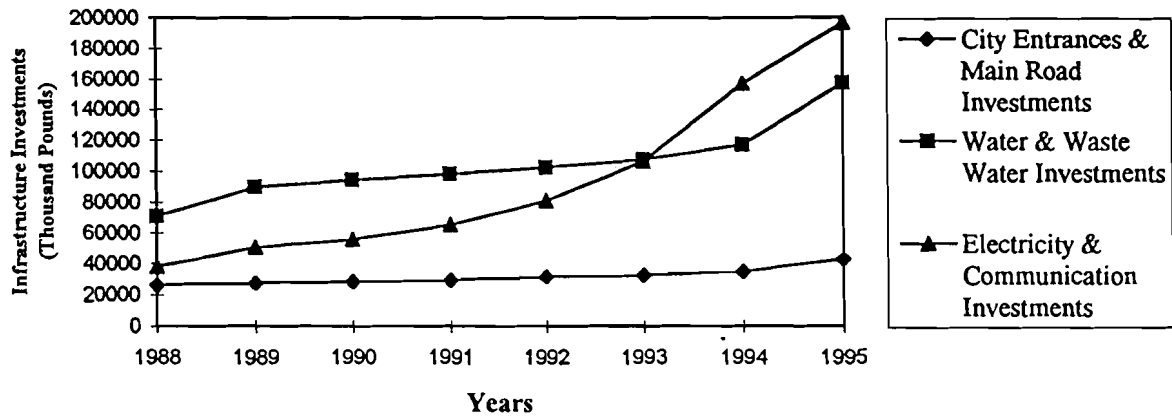


Figure 10: Historical Trend of Infrastructure Investments in Tenth of Ramadan New City

Table 2: Infrastructure Investments in Sadat New City

Year	Sadat New City							
	1988	1989	1990	1991	1992	1993	1994	1995
City Entrances & Main Road Investments	10263	10330	10496	10563	10623	10623	10623	10623
Water & Waste Water Investments	8185	9464	10675	11484	11666	11666	12998	18872
Electricity & Communication Investments	10502	14980	17954	21402	25747	26190	29981	40143

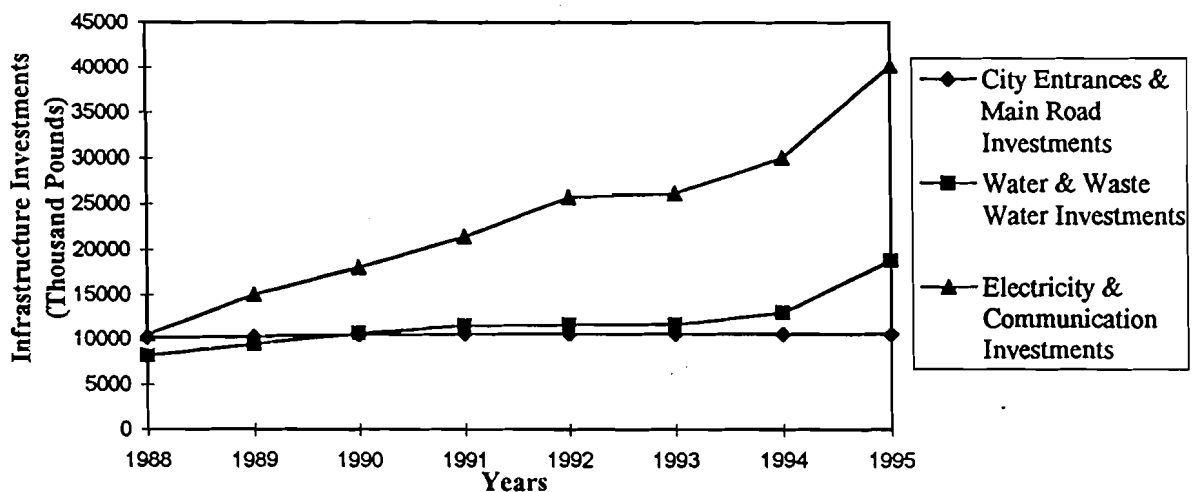


Figure 11: Historical Trend of Infrastructure Investments in Sadat New City

The figures demonstrate that rate of growth of investments in city entrances and main road network is very low. This indicates that the main projects in road infrastructure are almost completed to provide the planned and necessary accessibility to the new cities at an early stage.

The industrial development represented by the land area occupied by producing industries is depicted for the three cities in Table 4 and Figure 13. The figure shows that while the industrial area in both Sadat and Six of October cities had reached almost the same level in 1995, an exponential increase in the industrial productive area in Tenth of Ramadan city occurred in the years 1994 and 1995.

The research proceeds with investigating the following causal relationships depicted in figure 9:

- Effect of transport accessibility (represented by investments in city entrances and main road network) on the industrial development (represented by land area occupied by producing industries), see (12), (13), (14), & (15).
- Effect of investments in water and waste water projects on the industrial development (represented by land area occupied by producing industries)
- Effect of investments in electricity and communications projects on the industrial development (represented by land area occupied by producing industries)

Time series data was used to develop statistical regression equations to verify these relationships. All data is extracted from reports provided by the Egyptian Authority for Development and New Urban Settlements. These equations together with the necessary statistical parameters are displayed in Table 5. The main results that can be drawn from this analysis are:

- The causalities for all these relationships proved to be statistically valid as the coefficients of determination (R^2) varied from 0.7 to 0.97 indicating a relatively strong correlation. Only one relation, namely the effect of investments in water and waste water projects on the land area occupied by producing industries in Sadat new city, proved to be statistically weak, where $R^2 = 0.56$. This contradicts with the assumed causality displayed in figure 9. However, it can be attributed to problems of data accuracy and reliability.
- For both Tenth of Ramadan and Sadat new cities, the coefficients of determination R^2 , showing the effect of investments in city entrances and main road network on land area occupied by producing industries, were the highest in relative terms compared with the effects of other infrastructure investments.
- For the three new cities, the values of the slopes indicating the amount of change in land area occupied by producing industries resulting from a unit change in investments in city entrances and main road network are higher than the values of the slopes indicating the amount of change in land area occupied by producing industries resulting from a unit change in investments in water and waste water projects or in investments in electricity and communication projects.

Table 3: Infrastructure Investments in Six of October New City

Year	Six of October New City							
	1988	1989	1990	1991	1992	1993	1994	1995
City Entrances & Main Road Investments	20483	22979	29545	32951	35113	35463	36267	39849
Water & Waste Water Investments	113881	125934	137603	149533	177690	189681	231060	254421
Electricity & Communication Investments	42027	54372	58980	59566	65428	71862	71862	76840

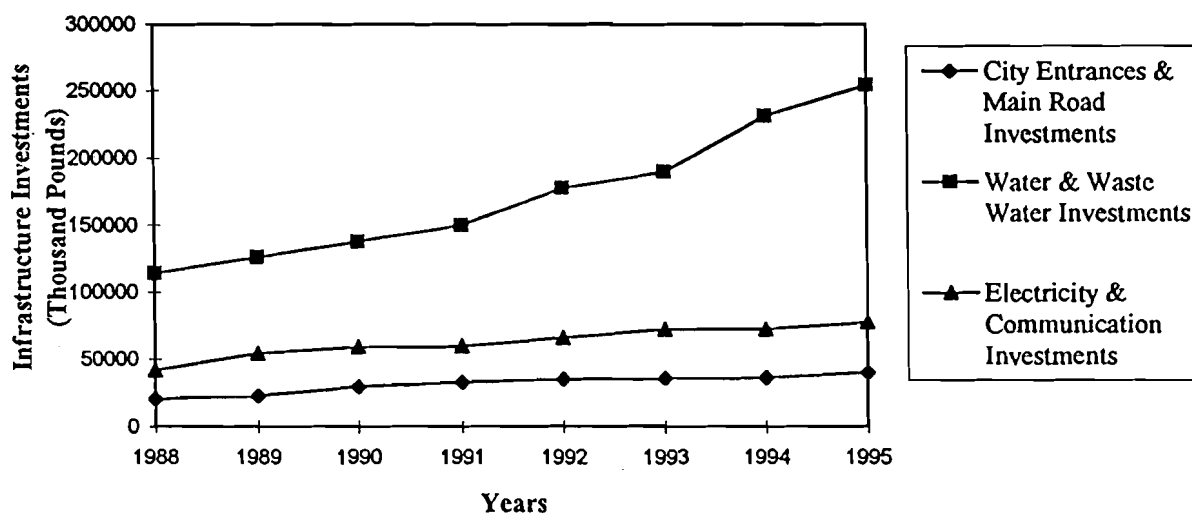


Figure 12: Historical Trend of Infrastructure Investments in Six of October New City

Table 4 : Industrial Area Occupied in New Cities

Year	Industrial Area Occupied in New Cities							
	1988	1989	1990	1991	1992	1993	1994	1995
Tenth of Ramadan New Cit	3123153	3562445	3851957	4019756	4569628	4770804	11938000	55327040
Sadat New City	1841431	2080081	3057511	3142156	3287948	3318403	3447480	3578818
Six of October New City	941235	1702998	1717830	2146450	2273910	2998886	3400000	3698188

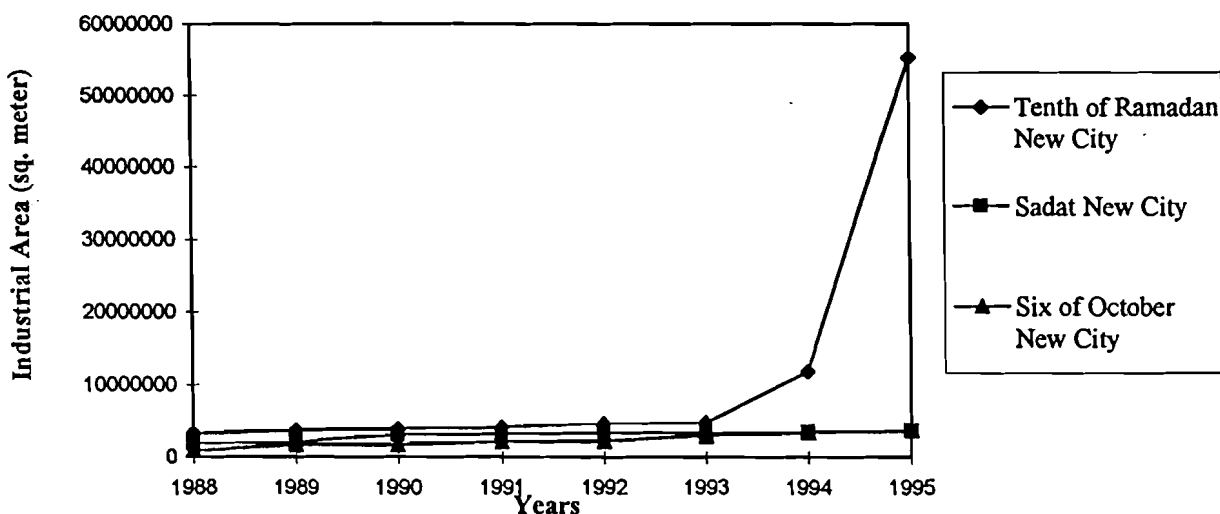


Figure 13: Historical Trend of Industrial Area Occupied in New Cities

Table 5: Statistical Models Showing the Effect of Investments in Infrastructure on the Industrial Development of Three of the New Cities in Egypt

New City Causal Relation	Tenth of Ramadan	Sadat City	Six of October
Effect of Transport Accessibility (Investments in Main Road Network) (RI) on Industrial Development (Industrial Area) (IA)	IA = 3047*RI - 86E+6 (586) R ² = 0.82 SEY = 8274736	IA = 4388*RI - 43E+6 (327) R ² = 0.97 SEY = 125193	IA = 127*RI - 164E+4 (24) R ² = 0.82 SEY = 429994
Effect of Investments in Water and Waste Water Treatment (WI) on Industrial Development (Industrial Area) (IA)	IA = 633*WI - 55E+6 (130) R ² = 0.8 SEY = 8738006	IA = 151*WI+117E+4 (55) R ² = 0.56 SEY = 463760	IA = 18*WI - 775682 (1.8) R ² = 0.94 SEY = 246386
Effect of Investments in Electricity and Communications (EI) on Industrial Development (Industrial Area) (IA)	IA = 265EI - 13E+6 (73) R ² = 0.7 SEY = 10881224	IA = 60EI + 1574668 (14) R ² = 0.74 SEY = 355489	IA = 81EI - 2688432 (9) R ² = 0.93 SEY = 269811

8. SUMMARY AND CONCLUSIONS

Egypt is an under-populated country with a problem of over-population.. The distribution of population in Egypt is characterized by the concentration of a large proportion of the urban population in a small area and the overwhelming dominance of the capital Cairo. In many countries of the world, decentralization has been the main strategy, in terms of national territorial planning, to cope with the pressures on the major cities as more dwellers move to the cities in anticipation of a better life.. Since 1978 the Egyptian government has embarked on a spatial planning policy based on development into the desert areas away from the Nile and the main cities of the Delta. A national strategy for developing satellite towns and medium-sized cities has been produced. Some of the new developments, like El-Eboor and Fifteenth of May, are intended mainly as satellite towns, close to the capital city, Cairo, to relieve some of the pressures of overpopulation. Others, notably Tenth of Ramadan, Sadat and Six of October cities, are developed as productive societies to stand alone in the desert and away from the Delta and Nile valley.

The self-contained cities are intended to be self-sufficient, with an independent economic base, and to act as development poles that positively affect the regions where they are located through distributive effects. These effects are expected to form a series of spatial interactions such as provision of elements of production, distribution of production, absorption of the work force, etc.

The main objective of this research was to gain a general insight into the development process of new cities in Egypt and, in particular, into the role played by transport. Investment in transport affects, and is affected by, investments in other sectors. A cause and effect framework that considers the main factors contributing to the development process was proposed. This framework was used to demonstrate the effect of transport accessibility in comparison to other infrastructure provisions (water and waste water projects, electricity and communications projects) on the development of new cities in Egypt. Development was defined in terms of industrial and population development.

This research used historical data for three new cities, namely Tenth of Ramadan, Sadat and Six of October, to develop statistical models to verify the causal relationships depicted in this framework. The main conclusions are as follows:

- The industrial sector and the population development are the prime determinants of the growth of new cities. Locating new industries will require substantial investment to overcome the economic development constraints of the desert regions.
- The concept of transportation as being one of the main determinants of the choice of location by industrial enterprises is well established in the literature on economic development. Transport accessibility is regarded as a major factor that affects the choice of location, progress and development of industrial enterprises, and hence the creation of jobs and the attraction of work force. Transport is considered to be one of the key elements that encourage industry to relocate, settle and use the available land area in the desert. Owners and managers of industrial enterprises, when choosing an area in which to construct and develop their enterprises, trade off and evaluate different site locations according to a set of criteria. It is clear that factors like distance to Cairo and basic accessibility are considered of the most important factors by industrial enterprises, when making their location decision
- The provision of required infrastructure and location incentives stimulates the development process in new cities. Transport is considered to be among the main factors to stimulate economic activity. The work force needs transport to move to the industrial or agricultural production sites. Raw materials need to be assembled, transported and delivered at desired times and in requested amounts to production locations. Production, whether industrial or agricultural, needs to be transported and distributed to dealers, and hence to consumers. Transport plays the key role in satisfying all of these needs.
- The main projects in road infrastructure are almost completed to provide the planned and necessary accessibility to the new cities at an early stage. It appears that there is an excess capacity of roads over what is actually necessary at the present state of development. This is unfortunate, since there is an opportunity cost to these scarce capital resources invested in constructing the road network, which is lying idle: these could have been used for other major developments required in the new cities. Thus, the situation is that previous investment in roads may be creating a bottle-neck for the development of other sectors, and in particular the housing sector. The provision of road infrastructure should be carefully planned to guarantee the availability of necessary road accessibility when required, and at the same time to ensure that road accessibility is not too far in advance of the other developments.

- A sound strategy for transport development is one which coordinates investments in transport to match the transport needs of other aspects of development, like growth of population, housing and economic (industrial) activities in the new cities. A staged development of the transport system is required. This could be attained by establishing transport routes and retaining land space. Ample space should be reserved, as a right of way, to allow for the future physical construction and widening of transport corridors as the need arises to support future potential development by accommodating the expected increases in traffic. In new cities, it is almost inevitable that the road infrastructure is one step ahead of other types of development, like industry and housing. Road accessibility is a key factor in attracting industries to locate in the new cities. The concept of balanced growth should be pursued. Over-capacity, due to excessive investment producing under-utilised road infrastructure, and under-capacity, due to insufficient investment as with the deficiency in the housing sector, should be avoided.
- For the three cities, the causal effect of transport accessibility (represented by investments in city entrances and main road network) on the industrial development (represented by land area occupied by producing industries) was statistically verified.
- For Tenth of Ramadan and Six of October, the causal effect of investments in water and waste water projects on the industrial development (represented by land area occupied by producing industries) was statistically verified.
- Only one relation, namely the causal effect of investments in water and waste water projects on the land area occupied by producing industries in Sadat new city, proved to be statistically weak, where $R^2 = 0.56$.
- For the three cities, the causal effect of investments in electricity and communications projects on the industrial development (represented by land area occupied by producing industries) was statistically verified.
- For both Tenth of Ramadan and Sadat new cities, the causal effect of investments in city entrances and main road network on land area occupied by producing industries was the highest in relative terms compared with the effects of other infrastructure investments.
- For the three new cities the amount of change in land area occupied by producing industries resulting from a unit change in investments in city entrances and main road network are higher than the amount of change in land area occupied by producing industries resulting from a unit change in investments in water and waste water projects or in investments in electricity and communication projects.

Research reported in (16) investigated and statistically inferred the way in which the managers of industrial enterprises in new cities in Egypt perceive the contribution of transport, amongst other factors, to their choice of location, progress, development and promotion. The main results of that research support the conclusions drawn in this research and can be summarised as follows:

- Industrial enterprises consider transport to be one of the significant factors in their choice of location. Accessibility is found to play an important role in the choice of location of an enterprise.

- Transport, in general, is not perceived by the industrial enterprises to be a source of problems in their future development and progress: it may be that the managers take for granted the continued existence of a high quality road network.
- The excellent achievement of the new cities in terms of providing the necessary incentives and facilities required to attract industrial enterprises to settle in them seems not to be matched by adequate or suitable development of the housing sector.
- Due to difficulties encountered by the work force in finding appropriate housing, they tend to regard the new cities in terms of offering employment opportunities and as a source of income.
- The industrial enterprises' provision of housing units is not sufficient to meet the accommodation demands of their work force. As most of the industrial enterprises do not provide sufficient housing units to accommodate their work force, they are in a sense obliged to compensate for this fact by providing enough transport services for their workers, specially for those workers who live outside the new cities. Most industrial enterprises provide sufficient transport facilities for the transportation of their workers.

REFERENCES

1. SWECO Cairo (1982) Tenth of Ramadan new industrial city, growth Plan 1982. **Final Report. Prepared for the Research and Studies Organization of the Ministry of Development of the ARAB REPUBLIC OF EGYPT.**
2. TENRAM Group, COPA Egypt, and SWECO Cairo (1978) Tenth of Ramadan. **Infrastructure Report. Prepared for the Advisory Committee for Reconstruction of the Ministry of Housing and Reconstruction of the ARAB REPUBLIC OF EGYPT.**
3. Ministry of Housing and Reconstruction - Advisory Committee for Reconstruction (1977) **The planning of Sadat city, Final Report: Implementing the plan. Arab Republic of Egypt.**
4. Ministry of Housing and Reconstruction - Advisory Committee for Reconstruction (1980) **The planning of Six of October city, Final Report: Implementing the plan. Arab Republic of Egypt.**
5. Dahms, L. D. et. al. (1983) Economic development and transportation. Report on Joint Conference, Eno Foundation Board of Directors and Board of Consultants. **Transportation Quarterly, (37)1, 193-224.**
6. Fromm, G., (ed.) (1965) Transport investment and economic development. **The Brookings Institution, Washington, U.S.A.**
7. Holland, C. J., and P. M. S. Sherman (1981) The link between road transport and economic development. **Proc. of the 9th Planning and Transport Research and Computation (PTRC) Summer Annual Meeting. U.K. Seminar D, 67-80.**
8. Inal, A. M. (1981) Relationship between regional economic growth and transportation measures: **Proc. of the 9th Planning and Transport Research and Computation (PTRC) Summer Annual Meeting. U.K. Seminar G, 153-164.**
9. Marais, H. J. (1986) Transport and development: a literature survey. **Technical Report RT/47, National Institute for Transport and Road Research, CSIR. South Africa.**
10. Straszheim, M. R. (1972) Researching the role of transportation in regional development. **Land Economics, (48), 212-219.**
11. Allen, P. M., M. Sanglier, F. Boon, J. L. Deneubourg, and A. DePalma (1981) Models of urban settlement and structure as dynamic self-organizing systems. **Report for the U.S. DOT/RSPA/DPB-10/6.**
12. Botham, R. W. (1980) The regional development effects of road investment. **Transportation Planning and Technology, (6)2, 97-108.**
13. Cooper, J. S. L., and P. Edwards (1982) Roads and industrial development. **Proc. of the 10th Planning and Transport Research and Computation (PTRC) Summer Annual Meeting. U.K. Seminar N, 67-72.**

14. Czamanski, D. Z. (1981) A contribution to the study of industrial location decisions. **Environment and Planning A**, (13), 29-42.
15. Wubneh, M. (1976) Spatial dynamics and infrastructure investment: an analysis of the effect of infrastructure on the development of urban areas and locational decisions of firms in Ethiopia. **Ph.D. Thesis**. The Florida State University, Florida, U.S.A.
16. Abbas K. A. (1991) **The Development of a Road Management System With Particular Reference to New Cities in Egypt: An Application of System Dynamics Methodology**. **Ph.D. Thesis**. Transport Engineering and Operations Division, Civil Engineering Department, University of Newcastle upon Tyne, U.K.