التخطيط والتصميم العمراني لنظم النقل والمرور المحققة للاستدامة في القاهرة التاريخية

Planning for Sustainable Transportation
in the Historic City of Cairo
The case of Al-Muizz Street

د. عمرو عبدالله عبدالعزيز عطية   د. محمد عبدالكريم صالحين   د. حسام البرمبلي

PLANNING FOR SUSTAINABLE TRANSPORTATION IN HISTORIC CAIRO: THE CASE OF AL-MUIZZ STREET

By

Dr. Amr Abdalla A. Attia
Ain Shams University

Dr. Hossam El Borombally
Ain Shams University

Dr. Mohamed A. Salheen
Ain Shams University

1. INTRODUCTION

Historic Cairo, which Al-Muizz Street is part of, is included in UNESCO's World Heritage List on an equal part with Venice (Antoniou, 1985). As noted by the UNDP (1997), Historic Cairo has a prominent physical urban character and a strong social identity. It contains the largest concentration of Islamic and Coptic monuments in the world which together comprise an unrivalled urban heritage and the remaining historic buildings are a finite resource and an irreplaceable asset.

The urban heritage in Historic Cairo has been deteriorating throughout the years due to the pollution generated from transportation modes, congestion and traffic problems. Indeed, despite the fact that transportation has an essential and positive role to play in economic and social development, the traditional red transport modes and the existing transportation network in Historic Cairo negatively affects the historical buildings and also the urban heritage of the historic areas.

Accordingly, this paper attempts to diagnose the transport and traffic problems in Historic Cairo in general and in Al-Muizz street in particular, and investigate methods for conserving the urban heritage from the negative effects of traffic congestion and of the traditional (red) modes of transportation. It also attempts to explore possible areas for intervention to mitigate transportation and traffic problems in the light of the principles of the sustainable transportation framework. It aims to draw conclusions and propose recommendations that would increase the efficiency and effectiveness of transportation plans in Historic Cairo and consequently achieve sustainable transportation.

This paper argues that utilizing green modes of transportation in areas with historic significance together with adopting a holistic and environmentally sustainable approach would contribute to increasing the efficiency of the city to achieve sustainable livelihoods[1], and at the same time protect the urban heritage and historic buildings for future generations.

---

[1] That is to enhance the economic performance of the city in trade and commercial activities, improve the quality of life for citizens, decrease the time of travel, solve mobility problems and protect the resources for the use of future generations.

2. CONTEXT:

Historic Cairo is defined by historic boundaries and physical barriers within a

Fig. 1: Location of Historic Cairo

loosely administrative jurisdiction (Fig. 1). It has a rectangular shape and extends along a north-south axis from Bab al Nasr and Bab al- Futuh to Bab Zuwayla and along an east-west axis from the historical wall to the east to Port Said Street in the west. The area is homogenous in the experience it evokes when one walks through its streets. Topographically, it slopes westwards towards the Nile with the eastern highest point along the Darrassa Hills.

Al-Muizz street is the commercial life-line for the whole Historic City. It also acts as a main high-street in the modern city. It is the most dominant route for pedestrians and has numerous activities along its length, particularly from Bab al-Futuh, (Fig. 2) to the Khayameya street (the Tent Makers). These include residential, educational, religious, tourism, commercial and increasingly light manufacturing industries, all of which affect the urban character and development initiatives along the spine. The surrounding areas include major religious centres such as Al Akmar Mosque (Fig. 3), Al Hussein (Fig. 4) and Al Azhar mosques, commercial centres near Al Azhar and Port Said Street, retail concentrations such as Sagha and Khan El Khalili, educational institutions such as Al Azhar University, and clusters of monuments near Al Hakim (Fig. 5), Qalawoon, and Al Ghuri mosques and Bab Zuweyla.

. *Fig 2:* Bab Al-Futuh

. *Fig 3:* Al Akmar

Fig. 4: Al Hussein Square

Fig. 5: El-Hakim Mosque

The analysis of the spine of Al-Muizz Street shows that major monuments are in close proximity to each other forming natural groups or clusters. The street is important in linking these clusters, in the mobility of people from one cluster to the other and in providing connection with wide range of activities.

Al Muizz Street links the north and south gateways (Bab Al Futuh and Bab Zuwayla respectively). It is further emphasized at both ends by the Al Hakim and Al Muayyad mosques. It extends to about 1.5 km, separating the old Eastern and Western Palaces of the Fatimids and serving as a processional way. By the 14th century, Al Muizz Street had become the commercial life-line of the whole old city. As new buildings were conducted along Al Muizz spine, provision was made for shops at ground level. Similarly, the Wakalas, which served as trading centers, had also provided housing accommodation above the ground floors. Other significant points along the spine are the sabil/kuttab of Abd al Rahman Kathkhuda and the sabil of Mohammed Ali at Al Aqqadin, forming important axial vistas and diverting pedestrian circulation. During the expansion of Cairo under successive dynasties, the street extended south (along Khayameya street) and maintained its prime importance, being eclipsed only in the modern era with the expansion of Cairo in a western direction. Yet it is still an extremely important commercial street. The lack of public open spaces in the historic city, necessitates the use of Al Muizz street for this purpose.
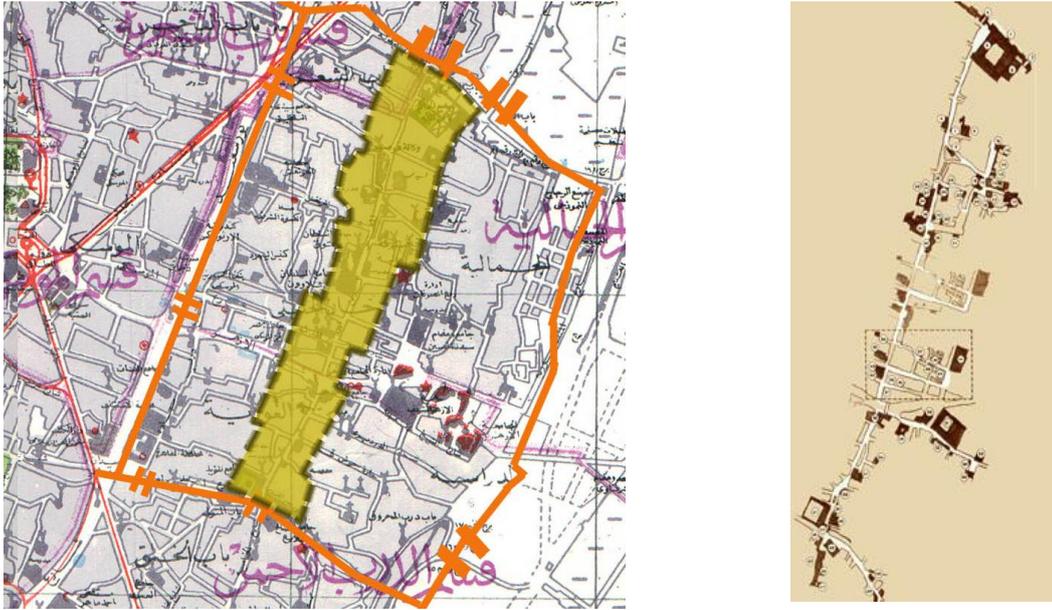
Fig. 6: The Study Area (Al Muizz Street)

Moreover, Al Muizz Street, (Fig. 6) consists of a stream of linear spaces branching from one another, producing a pattern serving the human scale. The average width of al Muizz Street is 9 meters and is considered the widest street pertaining to the original network. Three relatively new streets clearly differ from the rest of the space pattern in terms of width and horizontal alignment: Bait al Kadi Street is a short but wide path linking Bait al Kadi and El-Sagha square with the spinal route. Al Muski was created by Mohammed Ali in 1845. Al Azhar Street was constructed after 1920, fracturing the urban fabric of the historic city with its large width and high traffic volumes. Al Muizz Street continues inadequately along a metal foot bridge across al Azhar Street.

3. PROBLEMS
In Historic Cairo public paths compose an irregular network enclosing large residential plots (defined as super blocks, quarters or hettas). The blocks represent the basic morphology unit in Historic Cairo. Each super block incorporates several uses (i.e. residential, non-residential, service uses and others). Local paths reach the interior of the super blocks in an organized (but organic) manner. Super blocks consist of two main components: (a) the inner core, which deals mainly with residential functions mixed with handicraft activities and is composed of several local path units; (b) the outer core, which is bound by the public paths and contains a combination of residential, commercial and social activities.

The study area itself, shown on Fig. 6, has the highest density of commercial and small manufacturing enterprises in all Cairo (Fig. 7). It has one shop for every 23.9 residents as compared to 34.7 for Cairo as a whole (UNDP 1997).

The transportation issue in Historic Cairo is twofold. One concerns the through traffic and transportation, connecting the area with Greater Cairo; and the second concerns the traffic and transportation within its organic path system. Fig. 8 shows the existing transportation network within Historic Cairo. The present situation calls for an urgent formulation of a realistic policy, which will maintain inner-city connections, resolve transportation services and safeguard the historic path system of the area.

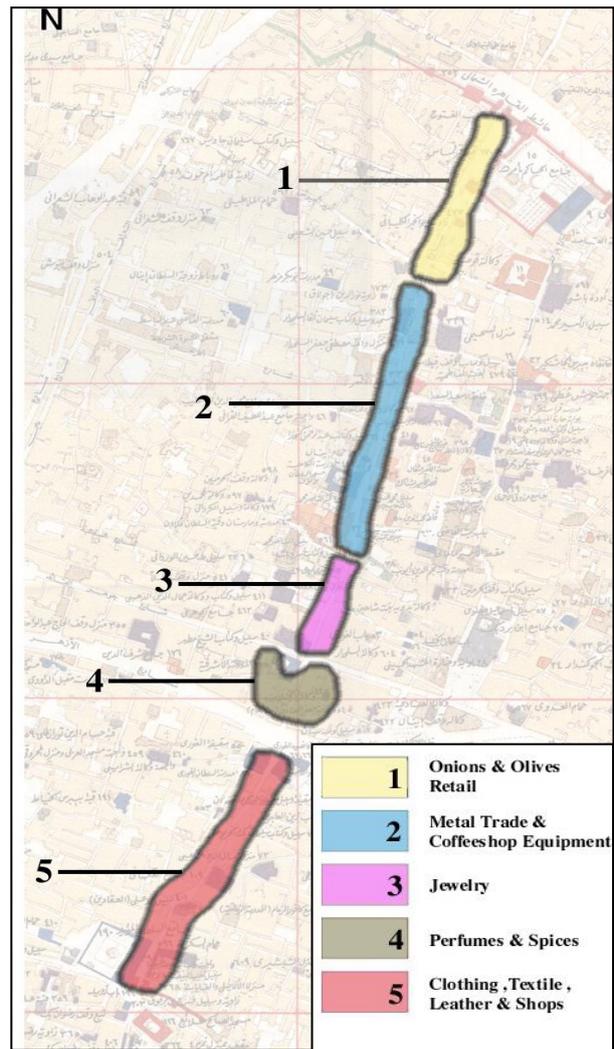Several problems could be identified in the study area and are discussed in detail in the following paragraphs.

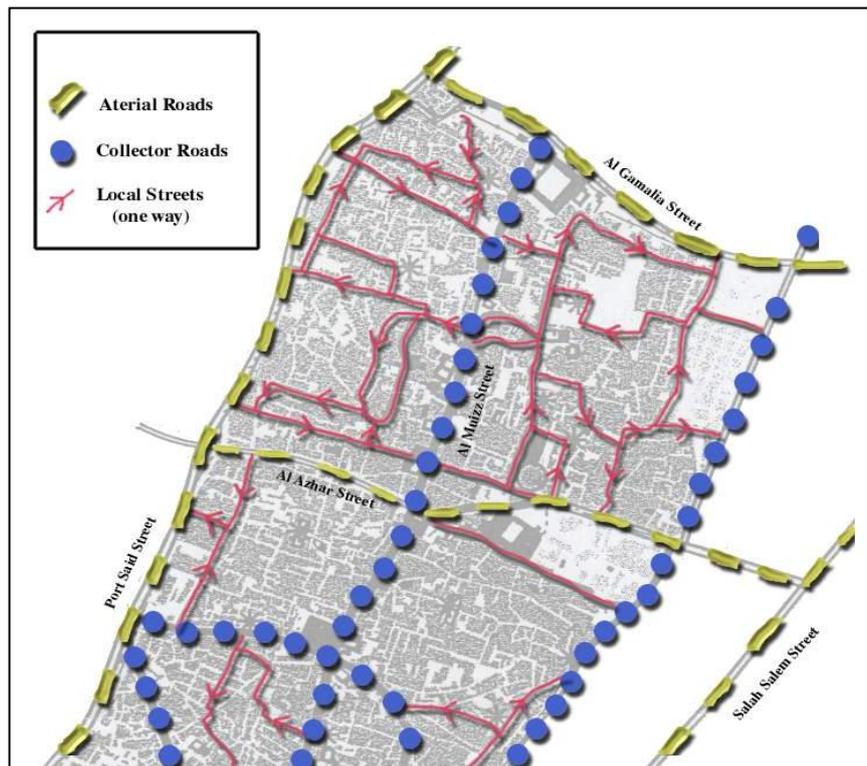Fig. 7: The Grouping of Commercial Activities along Al Muizz Street

Fig. 8: The Transportation Network within Historic Cairo

Accessibility by Public Transportation

The public service operates within very high traffic densities. The Port Said Street tramway is the only line on segregated tracks, extending its service on Mohammed Ali Street. The area is served by both public buses and private mini-buses with almost identical routes. There are two bus/mini-bus terminals in the immediate proximity of the area. Metro Line 1 (Helwan-ElMarg) does not serve the study area conveniently. Metro Line 2 (Shubra-Giza) has two stations (Attaba and Abdeen), still at some distance. Although it is recommended that in order to protect historic buildings, Metro Line 3 should not cross the study area (as previously planned under Al Azhar Street). Stations with adequate proximity to serve Historic Cairo are desirable.

Accessibility by Private Car

According to the traffic study commissioned by the UNDP (1997), approximately 36,000 vehicular trips are produced or attracted by the project area. An additional 5,000 vehicular trips make-up the amount of traffic within the project area, which indicates the relatively low car-ownership of residents within the area. Most network links and intersections in the area suffer from severe traffic congestion during peak hours (Fig. 9), due to high volumes in the organic layout system, where roads and sidewalks are used for commercial activities.

The highest traffic portion is the through-traffic (i.e. trips having both their origins and destinations outside the area) and consists of 174,000 vehicular trips

daily (ibid). This is almost five times the traffic produced or attracted by Historic Cairo and thirty-five times the amount of traffic within the study area. Al Azhar surface and elevated roads are the only facilities to accommodate the through-traffic. Al Azhar Tunnel has significantly contributed to resolve this problem, however insufficient.

Moreover, the project area suffers from severe parking shortage. Parking is unregulated, mostly on sidewalks and vacant lots, burdening the remaining historic paths deep inside the urban fabric. Most parking is currently provided along the streets. One-hour parking in the study area has 55 percent frequency, two-hour parking a 25 percent and subsequent longer parking duration's only 20 percent (Gamal, 2002). Accommodation of short-term parking is important. Enforced parking policies based on a pricing system need to be formulated. The area is neither serviced by parking lots nor underground nor multi-story garages.

Fig. 9: Congestion in Al Muizz Street

Accessibility by Delivery Vehicles

Delivery and pick-up trips are important traffic components in the area, and are the main cause of both congestion and over-extension of the network. Regulated access and entry/exit arrangements should be provided for their operation. They serve workshops and handicraft activities which are important to the area's economy. Currently, the three main entry points for delivery vehicles are at Salah El Din/Salah Salem Streets, the east and west extremities of Al Azhar Street and Mansouriah/BaGhala Streets at the northern edge of the area. These locations manifest the area with the highest concentration of such activities. Approximately 3,000 delivery vehicles have access to the study area on a daily basis (ibid).

Accessibility of Pedestrians

A traffic survey was undertaken by university students for the study area showed flows of 1,600 pedestrians per hour on certain parts of Al Muizz Street, particularly between Al Azhar and Ahmed Maher Streets (Ain Shams University

2001). Despite the fact that the area has a great potential as a walk for tourists, pedestrian movement is very difficult. Indeed, priority should be given to pedestrians. However, there are only few pedestrian zones and therefore the access to the monuments is difficult. At present, the highest pedestrian flows are observed on Al Muizz Street. The metal pedestrian bridge serving as the artificial link for Al Muizz Street (at its intersection with Al Azhar Street), is heavily utilized. Similarly, Al Azhar mosque pedestrian tunnel is fully utilized at 2,600 pedestrians per hour (ibid).

Built Form Problems

The close-knit quality of Historic Cairo is a principal reason for its vulnerability to change. The city's future is threatened by a combination of factors, leading to a rejection of the traditional setting and disorientation of the economic structure. This combined with the inadequacy of the infrastructure has lead the historic city to loose its traditional unique image, leading to a rejection of its qualities in favour of a "modern" model of urban planning (UNDP 1997).

Replacement of the urban fabric, through new construction, has been very slow in the study area as a whole. It peaked in the decade between 1940 to 1950, and had almost stopped by the beginning of 1980. New constructions (between 1976 and 1986) represent 1.2% of the total number of buildings in the study area (ibid).

Indicators for the decay of the urban fabric are ruins and vacant plots. Ruins and vacant lands within walls (inhabited) represent 5% of the total number of buildings (or plots). The highest percentages of vacant plots and ruins are to be found along the eastern and southern border of the study area.

Land Use Problems

Support activities such as coffee shops, food outlets and small take-away restaurants are a small proportion of the total number of shops and they provide a poor level of service. Al Muizz Street lacks public toilets, telephone booths and tourist information facilities. Similarly, public facilities count less than 2 percent of all ground floor activities along the spine. There are also peddlers who park their stalls at strategic locations, generally facing historic monuments and public facilities and sometimes confront other shops, blocking their entrances and colonizing parts of the street. There are also two types of activities which do not fit into the setting of Al-Muizz Street:

- Activities generating heavy traffic: causing hazards, nuisance and pollution are considered as non-conforming uses in the area. They include storage and wholesale premises (e.g. onions, lemons and olives, rope, cotton, paper, plastic bags, chemicals, wax and sheets), workshops (e.g. metal manufacturing premises) and junk and scrap yards.
- Some uses are considered incompatible to the character of Al Muizz Street. They are suited to a peripheral locations, or to a residential street

and are referred to as "outer" activities (in contrast to those requiring a prominent locations on Al Muizz street, which are called "inner" activities). The outer activities include hardware and electrical locksmiths, video film clubs, barber shops, pharmacies, butcher and grocery shops.

Landscape Problems

Inner streets suffer from severe congestion and conflicts of use. Commercial structures encroach upon public space, parking is random, street paving is poor, and solid waste collection is inadequate as shown on Fig. 10. The Tablita Market poses a particular problem with congestion and refuse disposal. Within the zones, the general picture that emerged is that about one half of the families were living in conditions of severe overcrowding (Gamal, 2002).

Fig. 10: Poor Infrastructure

Cultural Heritage Problems

Of the 313 listed buildings within the study area, only less than 5 percent are owned by the Supreme Council of Antiquities (SCA). Almost 95 percent are owned by the Ministry of Housing. Yet, SCA is the responsible for all the monuments, while the Ministry of Housing are acting as the landlord.

The indexed monuments in Historic Cairo are of major importance to Egypt's built heritage and their significance is internationally recognized. These buildings are a finite resource and an irreplaceable asset. Once a monument is lost, either damaged through unsuitable alterations or outright demolition, it cannot be replaced. The destruction of a historic building is in fact seldom necessary for reasons of good planning. More often, it is the result of neglect, or failure to make imaginative efforts to find a new use, or to incorporate it into a new development. Successful restoration in the historic city is the means of increasing the viability of resources, while stimulating attention and so establishing confidence in further conservation work and hence, the inflow of financial aid.

4. OBJECTIVES

An overall objective for Historic Cairo in general and Al Muizz street in particular is to achieve sustainability[2] (i.e. the conservation of its historic

---

[2] According to several writers "sustainability" and "sustainable transport" have no universal definitions (Beatley 1995, Litman 1999, and Zancheti, 1997). In Barten's (1995) opinion, sustainability is being used as a badge of environmental respectability, or as an incantation, which by mere repetition will work miraculous change. The World Commission on Environment and Development point out that sustainable development is about improving people's life-enabling habits to meet our needs in the present without compromising the ability of future generations to meet their needs" (WCED 1987). According to Litman (1999) 'sustainability is not about threat analysis; sustainability is about systems analysis. Specifically, it is about how environmental, economic, and social systems interact to their mutual advantage or disadvantage at various space- based scales of operation". Barten (1995) points out "sustainability is about the maintenance of the health of the biosphere and the husbanding of key resources of air, water, land and minerals".

buildings, preservation of its unique historic urban form and conservation of its character). The sustainability depends on not only the environmental sustainability (natural, man made and socio-cultural environments), but also the continuity of the urban spaces to preserve their historically prominent identity in the city serving the residents with basic services together with the residential, commercial, recreational, and all other needs. A prerequisite to achieve sustainability is to have an efficient transportation network and smooth traffic flows. MOST (1999) points out that the goal of sustainable transportation is to ensure that environmental, social and economic considerations are factored into decisions affecting transportation activity. Unsustainable transportation would negatively affect the urban heritage and indeed the livelihoods. According to the UNDP (1997), sustainability in Historic Cairo will depend on the ability to secure enough profits from the tourist and business activities and other community services to subsidize the efficient running of all other activities and transportation is a prime factor affecting such abilities. The following working objectives have been identified (ibid):

i-   To provide amenity, convenience and comfort for visitors and people who live and work in the area. Pedestrianisation, accessibility and safety are to be reinforced while respecting the organic urban pattern.

ii-   To enhance street life, vitality and activity, in order to attract people and increase economic prosperity.

iii- To ensure compatibility and harmony of land uses and activities along Al Muizz street together with integrating and blending the monuments with their surroundings.

iv-   To preserve the human scale of buildings and public open spaces by retaining the traditional nature of the street and by enhancing the unique character of the built form. An attempt should be made to revive an attractive image that, in general, accords with the appearance of the historic buildings, to promote the qualities of architecture in the area and to create the circumstances for contributing to the improvements of the street's aesthetics.

v-   To emphasize views, vistas and the visual quality of landmarks and gateways, contributing to the street's sense of place.

vi-   To promote appropriate management, including maintenance of the uniqueness of the street, to achieve sustainable transportation.

5. CONSTRAINTS

Meeting the above mentioned objectives is not straightforward. There are several obstacles that would constrain the realization of a sustainable urban form and sustainable transportation. The following is a brief illustration of the key constraints that hinders the realization of objectives:

- Al-Muizz Street is extremely congested, especially the sections which lie both north and south of Al-Azhar Street. Shoppers, tourists, cars, pickup trucks, motorcycles and vendors, all compete for extremely limited space.

- Not only is the medieval street very narrow (its width averages between 6 and 9 meters), but illegally parked cars and shop-ware displays reduce the constrained space even more. Vehicles passing through Al-Muizz Street must travel at a snail space, so they create disruptions for both pedestrians and merchants.

- Even though there is an increasing demand to transfrom Al-Muizz street for pedestrian use only, blocking of Al-Muizz Street to vehicular traffic is not straightforward. For much of Gamalia and al Darb al Ahmmar districts, the street serves as the only entry/ exit point for vehicles making deliveries to and from the numerous shops, warehouses, and workshops found on adjacent lanes. Private car owners (shop owners, some residents, and government employees working in the area) consider entering and parking to be their right, regardless of the inconvenience this causes. Traffic enforcement authorities, struggling to cope with the larger chaos of Greater Cairo, have pedestrianisation programs.

- The organic configuration shown on Fig. 11 of Historic Cairo's path system is unsuitable for heavy modern traffic conditions and lacks continuity. Except for the recently created (and now heavily used) roads, surface conditions are poor with varying widths. Al Muizz Street, for example has widths varying from 4-16 meters. This makes the historic spine more appropriate as a pedestrian zone, rather than a traffic route.

Fig. 11: The Urban Fabric in Historic Cairo

6. METHODOLOGY

This paper has, so far, provided an overview of the main transportation features and problems of Historic Cairo. It attempts to draw conclusions and propose a framework for sustainable transportation in the light of the sustainable urban conservation principles that were outlined in the above-mentioned studies and plans that were prepared for the study area. This paper has highlighted the significance of the interrelationships between the issues related to the preservation of the urban heritage with the efficiency of transportation networks

and transport modes and traffic solutions in order to maintain historic buildings and protect them from degradation caused by transportation and/or other activities.

In order to fulfil its attempts, this paper has identified the obstacles and constraints that would face the implementation of sustainable transportation principles in Historic Cairo. It utilised the rehabilitation project that was prepared by the UNDP in association with the Supreme Council of Antiquities (UNDP 1997) and in co-operation with Cairo Governorate. The UNDP study attempted to demonstrate and convey the new strategies and approaches of sustainable development in historic Cairo. Therefore, this paper will propose revised principles for transportation planning that would achieve sustainability. It seeks to address problems and propose strategies and processes of planning for sustainable transportation in Cairo through a creative and holistic approach. These appropriate strategies and approaches would facilitate travel, enrich and enhance the urban heritage and the scenic beauty, preserve the existing historic areas, protect the socio-cultural heritage and contribute to achieving an environmentally sustainable transportation. The remainder of this paper will discuss the strategies for achieving the sustainable transportation objectives and will finally draw conclusions.

Before discussing the strategies it is necessary to note that transportation network and traffic movements are main factors affecting city planning decisions. They have detrimental effects on the efficiency of the city to perform and achieve its objectives of meeting public needs and sustainable livelihoods. In particular, cities that have historical districts such as Cairo, Alexandria, Athens, Istanbul and many others, the traffic movements and transportation networks have a direct effect on the preservation or the deterioration of the historical heritage. They also define the rehabilitation schemes, trade and mobility because transportation not only connects the different parts of the city, but also links its different activities.

The current international concern for sustainable development is an additional challenge for planning for transportation networks. Sustainable development originally focused on resource consumption issues, but is increasingly defined more broadly to include economic and social welfare, equity, human health and ecological integrity (Litman 1999). A narrow definition of sustainable transport tends to favour technological solutions to decrease pollution, while a broader definition tends to favour more integrated solutions, including traffic solutions, improved travel choices, economic incentives, institutional reforms, land use changes as well as technological innovation. Thus, planning for sustainability would require changing the way transportation problems are viewed.

Replogle (1991) argues that major changes are needed in the priorities for transportation policy in the 'Third World' if development is to meet human needs rather than benefit only the world's current elite groups. The cost of the failing to redirect transport policies today will be paid in the decades to come through a

sharply reduced quality of life in the world's cities, increased conflict between the mobile elite and the mobility-restricted poor, and reduced capacity to solve the problems of capital shortages, un-payable debt burdens, toxic air pollution, and global climate change (UNCHS 1984, WB 1986, Replogle 1991). Replogle (1991) also, points out that:

> "Current transportation policies in developing countries, forces shaping these policies, and have implications on low-income people, the environment, and economic development. Current policies favour rapid motorization of transport to the detriment of modal diversity and non-motorized modes, such as bicycles, cycle-rickshaws, and pedestrians. Such policies, rather than fostering real development, accelerate global climate change, increase air pollution, and weaken petroleum-importing economies, while often increasing inequality, social conflict, and poverty. Economic efficiency is diminished by decreased diversity in urban transportation systems, forcing people to conform to the few higher-cost ways of travelling offered rather than allow these movements to be made by the most appropriate and affordable means".

However, the majority of all trips made in the world are made by foot. In developing countries, most people rely on non-motorized transportation, occasionally or regularly supplemented by public transportation, often provided by the informal sector of the economy (UNCHS 1984).

According to the international Conference on The Sustainable City, which was held in Rio de Janeiro, Brazil "the concept of sustainability as applied to a city is the ability of the urban area and its region to continue to function at levels of quality of life desired by the community without restricting the options available to the present and future generations and causing adverse impacts inside and outside the urban boundary"(WIT 2000, Barten 1995).

Traffic and Transportation are functions of activities. Therefore, the concentrations of activities in cities explain why there is so much traffic in cities and towns. This explains also why traffic flows between towns and between towns to countryside - because there are complementary activities generating cross-movements (Buchanan 1963). Activities are numberless, but there are only four basic ways in which motor vehicles are used in connection with these activities. Such ways differ according to the nature of the activities for example:

- Transport of raw materials, merchandise and food.
- Conveyance of passengers in bulk (buses, coaches, etc.)
- Conveyance of persons individually or in small numbers (cars, motorcycles, etc.)
- Mobile services (fire engines, clinics, libraries, etc.)

Urban transportation systems play a critical role in city planning decisions due to their interaction with other urban systems such as environment, energy, land-use, safety and security, and in many cases may be viewed as the nucleus for sustainable cities. Sustainability in cities is extremely unlikely to be achieved without addressing the urban transportation problems (WIT, 2000). Indeed, transportation could have unfavourable & negative impacts on the city, for example:

- Environmental impacts: air, noise and visual pollution are the most environmental pollution, which are produced or emitted by traditional modes of transportation (UNEP 2001, Cohn 1981, Buchanan 1963).
- Economic Impacts: transportation affects the efficiency of city activities and its function, wastes time and money that sometimes increases the costs of freight delivery due to the congestion of city streets and the resulting delay.
- Social Impacts: transport could have a negative effect on city street life, social isolation, and social insulation (Crawford 2000, Buchanan 1963).
- Historic Impacts: deterioration of historic buildings and monuments: chemicals reactions caused by traffic pollutants such as SO^2 are damaging the structure of the rocks, which used in many historical buildings (Mediterranean Kit 1996).
-

In addition, it can be safely argued that transportation facilities and activities could have significant negative impacts, including those listed below in table 1.

Economic	Social	Environmental
Traffic congestion	Inequity of impacts	Air and water pollution
Mobility barriers	Mobility disadvantaged	Habitat loss
Accident damages	Human health impacts	Hydrologic impacts
Facility costs	Community interaction	DNRR
Consumer costs	Community livability	
DNRR	Aesthetics	

DNRR= Depletion of Non- Renewable Resources
Source: Litman (1999)
Table (1) Transportation Impacts on Sustainability

Therefore, as Barten (1995) argues, transportation, as one of any city activities, can be planned through maintaining the global ecology, husbanding natural resources and improving the quality of the local human environment. Hence an important question is left to be answered: "Are the red modes (and especially cars) anti-urban structures (or cause an anti-sustainable cities)?" In order to answer such a question, an examination of attempts to limit the role of the traditional red modes must take account of two powerful facts: One fact is that urban structures, which provide for a high degree of access and mobility by red modes, are inherently incompatible with structures served predominantly by other modes of travel. This is because, especially private car, requires a lot more space than other passenger modes. In fact, ten or twenty times more space per person travelling, not to mention the parking spaces required at homes and destinations as shown in Fig. 12 (Pharoah and Apel 1995).

The other fact depends on where the car is accommodated., This will, to some extent, reduce the ability of the urban structure to support both the patronage and quality of public transport, and the possibility for journeys to be made on foot or by bicycle.

Unit for each transport mode

PKM = Per person kilometer, PT = Per person traveling
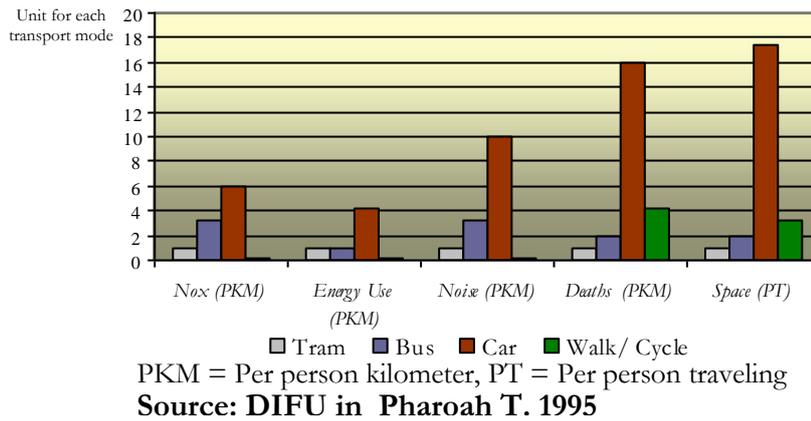**Source: DIFU in Pharoah T. 1995**

Fig. (12) Urban Transport Modes Compared

There is one fundamental and over-arching question, which is asked by those seeking a change in urban transport planning, and sustainable transportation, namely: how can we limit traffic in order to improve life in our cities? It is already widely understood that cities cannot accommodate all the possible demands for car use (Buchanan 1963)? This was demonstrated at least 40 years ago, and that traffic was already limited at some places and times by congested roads and lack of parking space. The question, therefore, is not about whether traffic can be limited, but whether better outcomes can be achieved by limiting traffic as a matter of deliberate and positive policy (Pharoah and Apel 1995).

It could be argued that traffic has to be limited as a response to environmental imperatives, such as the threat of global warming due to excessive emissions of carbon dioxide, and that politicians must take bold action and brave the consequences. Alternatively, it could also be argued that public transport and cycling facilities must be improved in advance of any curbs on car use. Pharoah (1992) and Pharoah and Apel (1995) point out that some believe that people and jobs will abandon the cities unless they are able to use their cars as they wish, while others believe the opposite to be true, i.e. that people and jobs will move out of cities unless traffic is reduced and environmental conditions are improved.

The challenge of sustainable transportation, as Pharaoh (1993) points out, is the choosing of the green modes of transportation and the relationship between modes of travel. He argued that it is important to consider not only the position of cars vis-à-vis other modes, but also the position of these other modes in relation to each other.

Therefore, the concept of sustainable transportation, as Reploge (1991) argues, calls for a more holistic approach to policy and planning to achieve a diverse and balanced mix of transport modes and a sensible arrangement of land use that enables conservative use of energy and capital to fulfil mobility needs. Sustainable transport strategies are those that can meet the basic mobility needs of all and can't be sustained into the foreseeable future without destruction of the

planetary resources base particularly those resources that are a finite resource and an irreplaceable asset such as those in Historic Cairo.

Hence, the current international concerns for sustainable development pose a challenge for transport planners particularly in cities with historical zones to serve the whole components and activities of the city socially, economically and environmentally as well as to maintain the bearing capacity of the environment. Indeed, transportation modes should be directed towards serving the environment and the various activities in the city by focussing on the advantages and diminishing negative impacts.

The transportation process includes three main components: the users (people), the goods and the vehicle (any mode of transportation), which transfer people and goods from origin to destination (Barten 1995, Tolley 1997, Litman 1997, Litman 1999). Fig. 13 shows the relationship between these elements.
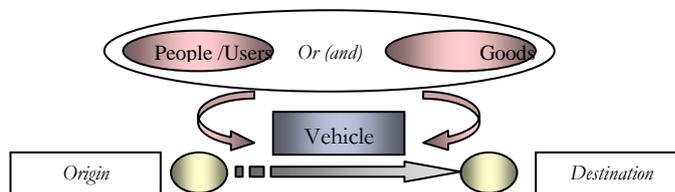
Fig. (13) **the Transportation Process**

The complexity of the transportation process poses extra challenges on transport planners. The various variables and challenges involved in the transportation process increase its complexity. Paul (1989) illustrates the main three variables of the process and the factors affecting each variable in Fig. 14.
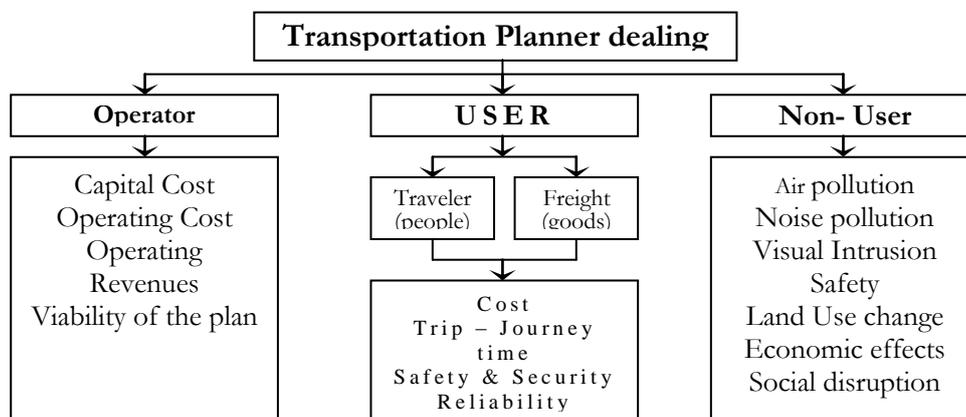
Fig. 14 Variables and Factors, which transportation planners have to deal with

Appraising sustainability requires indicators capable of moving from the physical definition of cities (understood as clearly limited geographic and administrative entities) to a broader understanding of the consumption and production patterns within cities and their appropriate carrying capacity (Allen 1994). At the Rio Earth Summit, it was agreed that:

"Indicators of sustainability need to be developed to provide solid bases for decision-making at all levels and to contribute to self regulating sustainability of integrated environmental and development systems" (United Nation 1993, Frey 1999)

Litman (1997) argues that sustainability is usually evaluated using indicators that measure various impacts. The selection of indicators can greatly influence sustainability analysis. A smaller set is more convenient and easier to understand, but may overlook important impacts. Planners sometimes focus too much on quantitative objectives, which are relatively easy to measure, rather than qualitative objectives, which are more difficult to measure but better reflect society's goals. Different performance indicators reflect different perspectives about the nature of transportation. In most cases, no single indicator is adequate, so a set of indicators that reflect various goals and perspectives are used (Litman 1997).

Experts often emphasize that, "you can't manage what you can't measure". What is measured? How it is measured?, How data are presented?. How problems are defined? and What solutions are selected? (TDM Encyclopaedia 2000). In order to simplify measuring the transportation indicators, it has to concentrate the attention on the variables that cut across the dimensions of sustainable transportation (ecological, economical and social dimensions) and present the inputs and outputs of its component that are required and produced by all the human and economic activities in the historical cities. Pharaoh (1995) points out two main aims of sustainable transportation: better access and quality of life. They can be elaborated in the form of hierarchy, into more specific sustainable dimensions (Economy, Environment, Social and Personal). The prime purpose of these main sustainable dimensions and objectives is to provide means of finding out, over time, whether progress is being made, i.e. whether change is in the right direction. An objective or each dimension is therefore distinguished from a general aim by its susceptibility to measurement as proposed in Fig. 15.
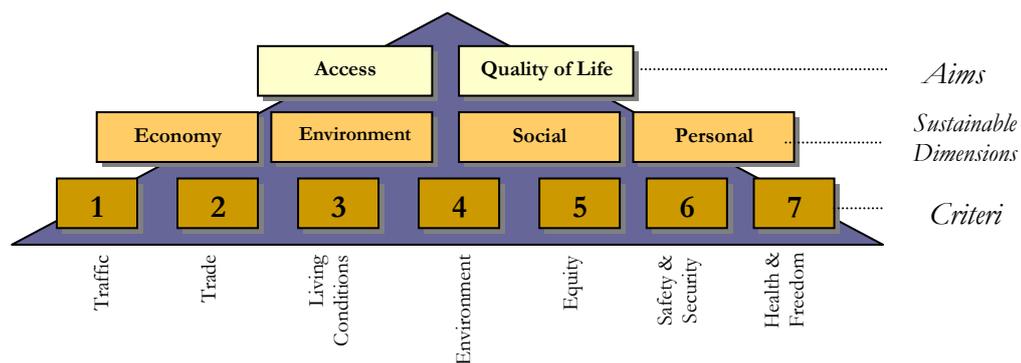

Fig. 15: Aims of Sustainable Transportation

Dimensions of the sustainability (Objectives) can be more specific still if they take the form of criteria, which include not only measurable indicators but also a timescale within which specified results must be achieved. The assessment of what has been achieved in specific cities is rarely simple, but in the case study an attempt is made to separate rhetoric from real commitment and action.

Hence Fig. 16 is a set of proposed and preliminary indicators for sustainable transportation in the light of the above-mentioned variables (shown in Figs 14 and 15 above) of the transport process and the factors affecting each variable in order to determine which are the most appropriate tools to appraise sustainable transport in historical cities at the urban level.
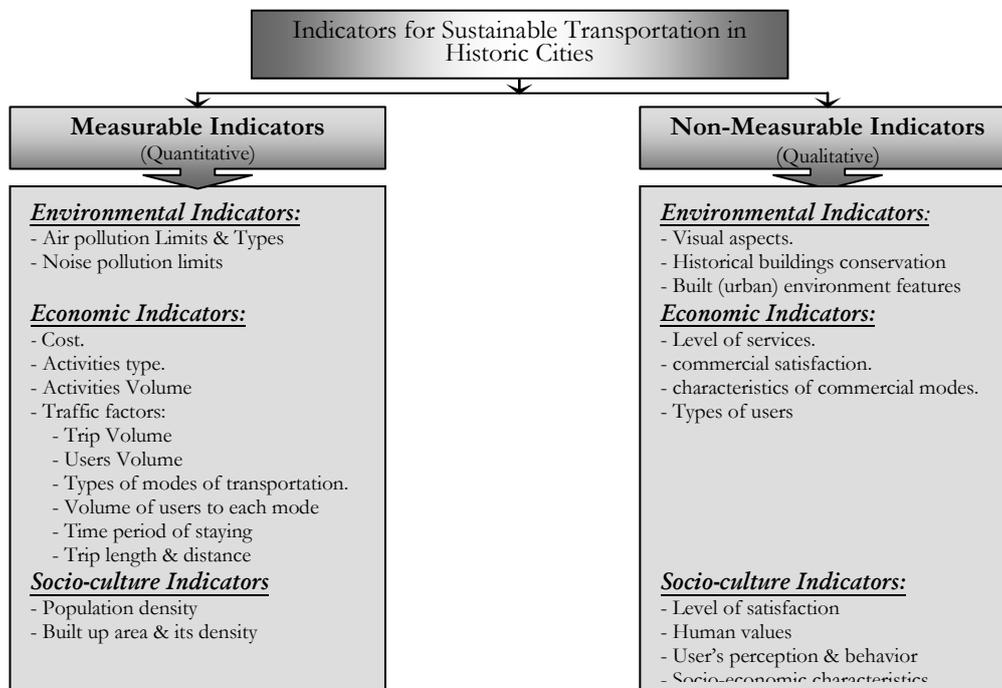

Fig. (16) Anticipated Sustainable Indicators for Transportation in Historic

As the historic cities have different variables and activities affecting transportation modes and systems, the achievements of sustainable green transport can be assessed in relation to the objectives and dimensions of the historic city themselves, and this is the fairest way to offer judgements. At the same time there may be merit in assessing achievements against a different set of criteria, especially if any comparison between some chosen historic cities is being attempted. According to Pharaoh (1995), there are at least three further justifications for assessing achievements of individual historic cities against standard criteria or objectives rather than their own. Firstly, data is rarely sufficiently good to allow full quantitative analysis of objective achievement. Secondly, independent analysis or monitoring of data can be useful in highlighting weaknesses or inconsistencies in the objectives, which the historic cities have set themselves. Thirdly as already mentioned, the objectives are not always specific enough to allow measurements of progress. It has to rely rather heavily on some crucial aspects, which form the lake of objectives and arise from the transportation problems of the historic city.

7. CONCLUSION

As noted above, the overall objective for Historic Cairo in general and Al Muizz street in particular is to achieve sustainability. Sustainable transportation and the sustainability of its urban heritage not only depends on the environmental sustainability, but also the continuity of the urban spaces to preserve their historicaly prominent identity in the city including the provision of amenity, convenience and comfort for visitors and people who live and work in the area. Accordingly, strategies to achieve sustainability are not confined to transportation and traffic strategies (although they represent a major part) but include strategies for land use distributions, movement patterns, built form, landscape, heritage, environmental, as well as transportation strategies. In addition, it is necessary to continuously measure sustainability by utilizing the above mentioned indicators (measurable and non-measurable).

The strategy for achieving sustainable transportation in Historic Cairo calls primarily for the blocking off the Al Muizz Street to vehicles and pedestrianising the square linking Al Azhar and Al Hussein mosques by diverting certain routes away from al Azhar Street to Galal Street to conserve and maintain the major landmarks within Historic Cairo shown on Fig. 17. For example, the objective for the conservation of Historic Cairo is to have appropriate and integrated green modes of transportation for all activities and uses, or to improve alternatives to the traditional red modes as a means of enabling, though not necessarily ensuring, a switch from car use. By identifying, the quality of green modes of transportation (as walking, cycling and tramways), and public transport facilities at any

Fig. 17: The Buildings' Ground Floor Uses

given point in time is insufficient to bring about mode transfer from the car. Yet
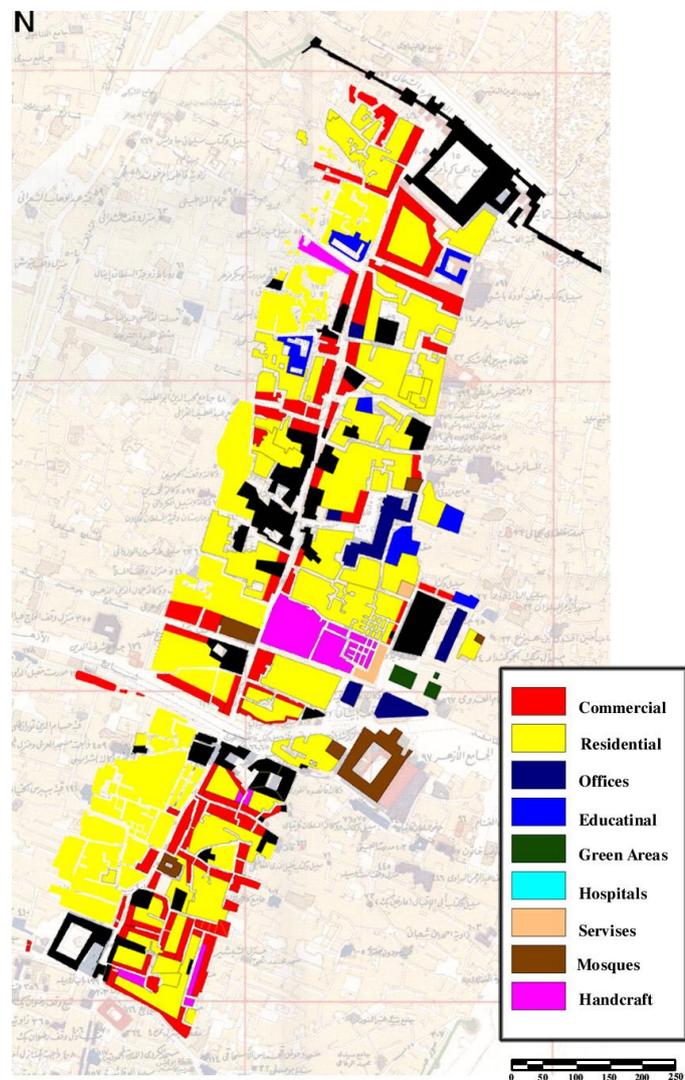
improvements in the quality of the environment-friendly (green) modes are a precondition for the success of any traffic limitation strategy but without damaging economic performances. Therefore, in order to improve the natural, socio-cultural environments as well as the economic performance of Historic Cairo, it is necessary to derive context-specific indicators for sustainable transportation to find out, over time, whether progress is being made and whether change is in the right direction. These include measurable indicators (such as time duration of the trip, cost, distance, types of the modes, pollution amounts and limits); or non-measurable indicators (such as level of satisfaction, comfort, service level, types of users, users behaviour, mode's affect on historical building, visual performance).

In addition to the sustainable transportation strategy, it is necessary to adopt a holistic and a comprehensive development approach that would contribute to increasing the efficiency of the city to achieve sustainable livelihoods, and at the same time protect the urban heritage and historic buildings for future generations. Such approach would include complementary integral strategies for land use distribution, built form, landscape, and heritage conservation strategies. For example, the intensification of the existing activities where intermediate nodes that contain intensified activities should be introduced carefully as the Al Muizz Street is fully intensified (Fig.
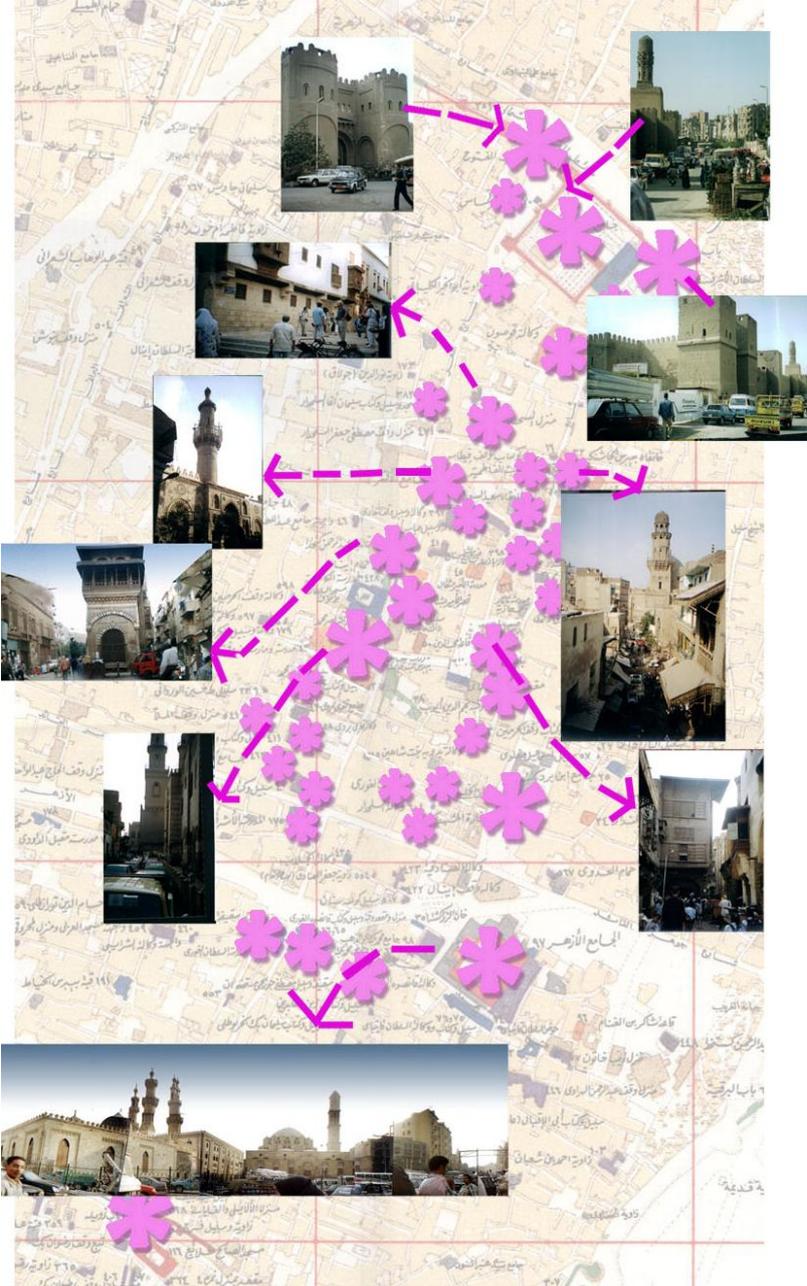

Fig. 18: The Major Landmarks within Historic Cairo

18). Complementary activities to retail premises should be introduced such as workshops. In addition diversifying and increasing the Mixed-Use Activities along Al-Muizz Street - the main public space in Historic Cairo. It is also necessary to adopt an adaptive re-use approach to ensure the preservation and maintenance of historic buildings. Moreover, it is necessary to remove the inappropriate uses to preserve the urban fabric and to link traffic capacity to the environmental capacity Furthermore, carefully designed new buildings should be introduced to revive the historic urban form of the area such as the specialized wakala, and reviving the gateways on the historic street. Moreover, appropriate treatment of space surfaces and street furniture is recommended to enhance the Al-Muizz Street. In addition, the development of an advertisement control policy is necessary to control the visual pollution where trade signs should be integrated into the design of the shop fronts, or buildings as a whole.

Moreover, it is necessary to provide walkway information and maps. Furthermore, a landscaped buffer area should be created between the improved Galal Street and the north wall where careful consideration of the location of trees to ensure their integration with the street character. Finally, a periodic updating of the Monument Index is necessary for protecting the monuments from vandalism (Fig. 19).

To conclude, the above discussion has successfully achieved the objectives of this paper which could be summarized as follows:

First it highlighted and supported the need to put the sustainable transportation planning on the level of the strategic thinking and policy development of Historic Cairo through identifying sustainability indicators;

Second, it proposed a dynamic and flexible methodology for achieving sustainable
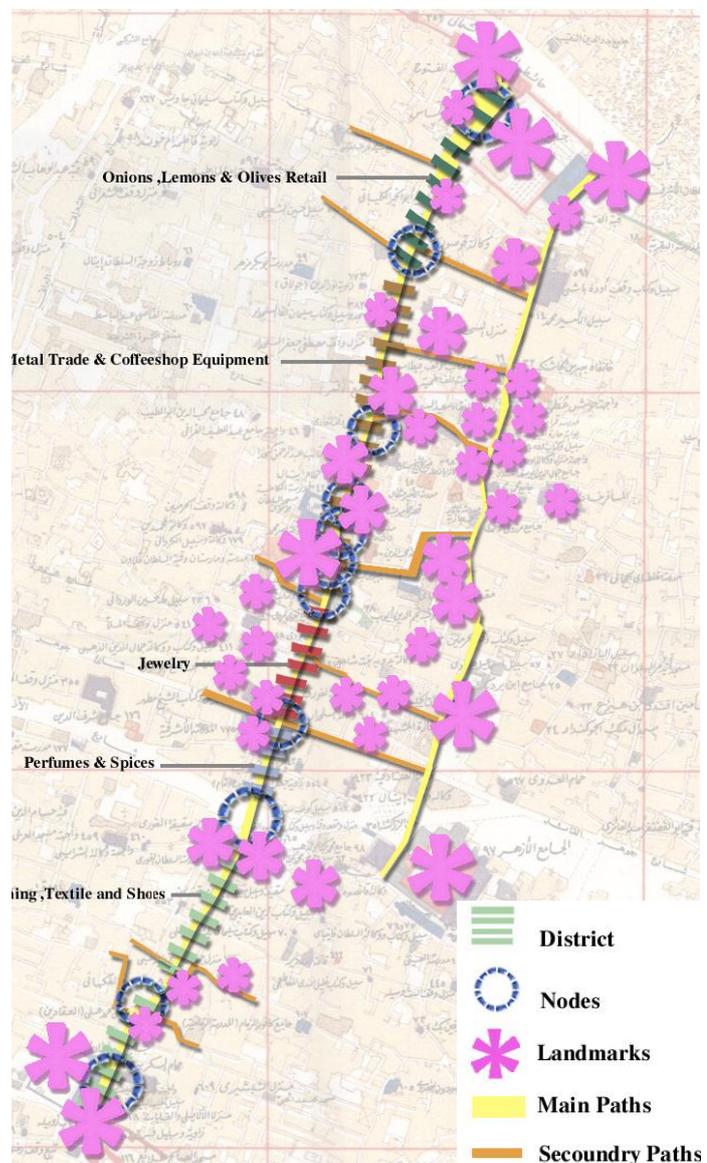

Fig. 19: Pedistrianizing Al-Muizz Street

transportation network for the Historic City of Cairo; and

Third, it explored the possibility of using effective and fully accessible environmental friendly (green) public transport system that could be used to maintain and protect Historic Cairo.
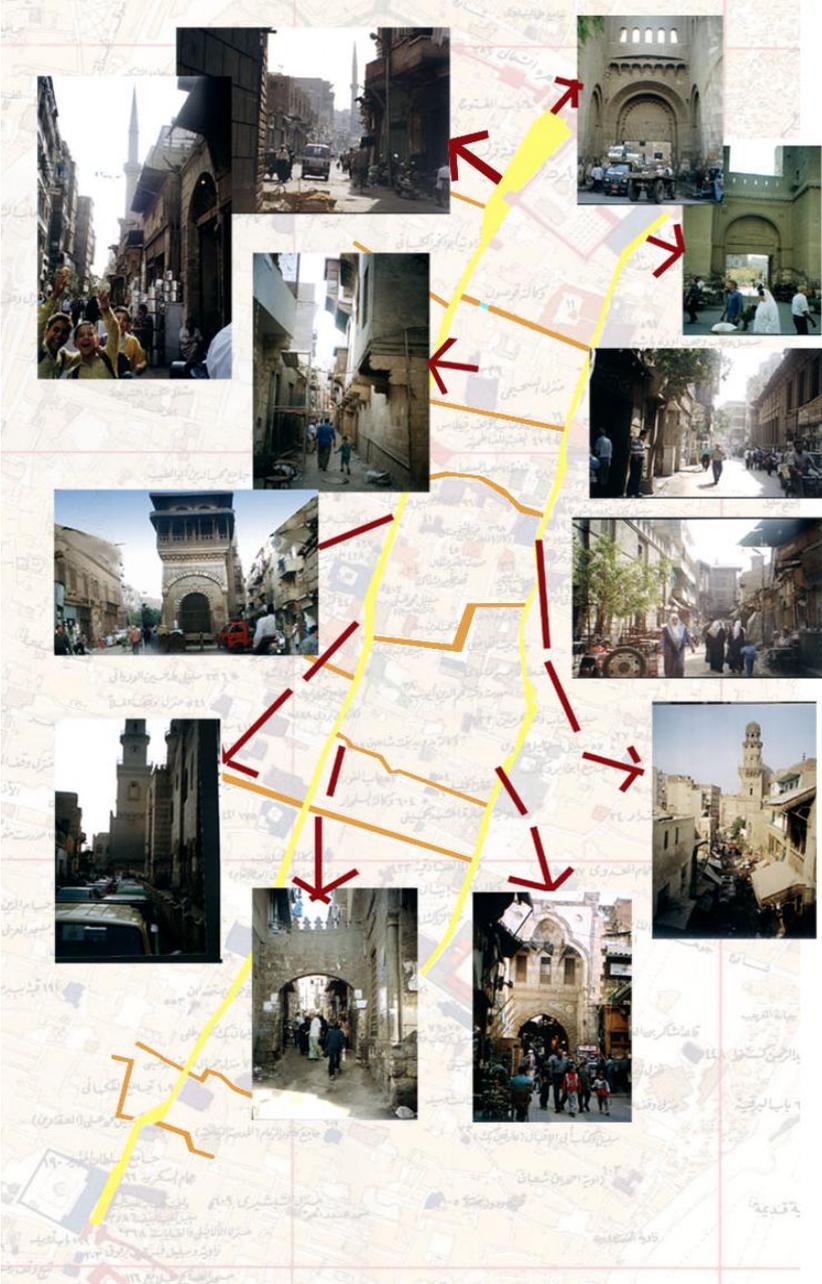

Fig. 20: The Pedestrian Network in Historic Cairo

REFERENCES:

Ain Shams University, (2001), Upgrading Historic Cairo, Unpublished Report Based on Students' Survey, Department of Urban Planning.

Allen, A. (1994), Re-assessing Urban Development: towards the definition of indicators of sustainable development at urban level, unpublished M.Sc. thesis, Development Planning Unit (DPU), University Collage London (UCL).

Antoniou, J., (1985), Historic Cairo, AUC Press, Cairo.

Barten, H.; Davis G. and Guise R. (April 1995), Sustainable settlements - A Guide for Planners, designers and developers, published by the University of the West of England and the Local Government Management Broad.

Beatley, T. (May 1995), The Many Meanings of Sustainability, paper published in Journal of Planning Literature, Vol. 9, No. 4.

Buchanan, C. (1963), Traffic in Towns: A Study of The Long Term Problems of Traffic in Urban Areas, Report of the Streeting Group and Working Group, Ministry of Transport, published by HMSO (Her Majesty's Stationery Office), London.

Cohn, L. F. (1981), Evolution of Environmental Analysis at the State Transportation Department Level, New York State Department of Transportation, paper published in Transportation Research Record No. 789, Environmental Issues in Transportation: Analysis, Noise and Air Quality, National Research Council, Transportation Research Board (TRB), Washington DC.

Crawford, J. H. (July 2000), Car Free Cities: Life City-Car Crisis", published by International Books, Internet materials found at http://www.carfree.com/intro_cfc.html, and was printed on 19/01/02.

Frey H. (1999), Designing the City: towards a more sustainable urban form, published by E & FN Spon, an imprint of Routledge, London.

Gamal, N., (2002), Designing Public Spaces: Towards a Sustainable Urban Form, Unpublished MSc thesis, Ain Shams University, Cairo.

GOPP/IAURIF, (1988),

GOPP/IAURIF, (1989),

Litman, T. (1999), Issues in Sustainable Transportation, VTPI, Internet materials found at http://www.vtpi.org, and was printed on 14/01/02, Victoria Transport Policy Institute, Canada.

Litman, T. (1997), Sustainable Transportation Indicators, VTPI, Internet materials found at http://www.vtpi.org, and was printed on 14/01/02, Victoria Transport Policy Institute, Canada.

Mediterranean Kit & CEEC Kit (1996), The Cities Environment Kit - European Union and Central and Eastern European, World Federation of United and Twinned Towns, United Towns Organization, Levallois – Perret, France.

MOST (1999), Transport Canada, Moving on Sustainable Transportation, Internet materials found at (http://www.tc.gc.ca/envaffairs/most), and was printed on 22/07/00.

Paul, H. W. and Norman, J. A. (1989), <u>Transportation Engineering Planning and Design</u>, 3rd edition, published by John Wiley, New York.

Pharaoh T. M. (1993), <u>Tensions between Bicycles and Public Transport</u>, Velocity Conference VII, (conference papers Nottingham, 5 – 10 September), Nottingham Country Council, Nottingham.

Pharaoh T. M. (1992), <u>Less Traffic / Better Towns</u>, Friends of the Earth, London.

Pharaoh T. M. and Apel D. (1995), <u>Transport Concepts in European Cities</u>, (Avebury Studies in Green Research), published by Ashgate Publishing Ltd., England

Reploge, M. A (1991)., <u>Sustainable Transportation Strategies for Third-World Development</u>, Institute for Transportation Development Policy, paper published Transportation Research Record No.1294 (Non-motorized Transportation, Safety and Human Performance), National Research Council, Transportation Research Broad (TRB), Washington DC.

TDM Encyclopaedia (2001), <u>Measuring Transport: traffic, mobility and access</u>, copy right VTPI (Victoria Transport Policy Institute), Internet materials found at <u>http://www.vtpi.org/tdm/tdm55.htm</u>, and was printed on 20/01/02, Online Encyclopaedia (Transport Demand Management).

Tolley, R. (1997), <u>The Greening of Urban Transport: planning for walking and cycling in western cities</u>, 2nd edition, Published by John Wiley & Sons Ltd.

United Nation, (1993), <u>Earth Summit Agenda 21: the UN Programme of Action from Rio</u>, United Nations, New York.

UNCHS (1984), Transportation Strategies for Human Settlements in Developing Countries, United Nations Center for Human Settlements (Habitat), Nairobi.

UNEP (2001), <u>Activities: Environmentally Sound Technologies for Air Quality Management in Cities</u>, International Environmental Technology Center (IETC), United Nation Environment Programme, Internet materials found at <u>http://www.unep.or.jp/ietc/activities/urban/airqualitymanagement.asp</u>, and was printed on 26/7/2001.

UNESCO, 1980, Conservation of the Old City of Cairo.

UNDP, (1997), Rehabilitation of Historic Cairo, Technical Cooperation Office, United Nations Development Program, Cairo.

WB (1986), <u>Urban Transport. Policy Study</u>, World Bank, Washington, D.C.

WCED (1987), <u>Our Common Future</u>, World Commission on Environment and Development (Brundtland Commission), Oxford University Press.

WIT (2000), <u>The Sustainable City Conference</u>, First International Conference on Urban Regeneration and Sustainability, proceeding by Wessex Institute of Technology, UK and Universidade Rio de Janeiro, Brazil; with collaboration of the ISC Group of Companies of Italy, held in Rio de Janeiro, Brazil (25 – 27 April).

Zancheti, S. M. And Jokilehto, J. (1997), <u>Values and Urban Conservation Planning</u>, paper published in Journal of Architectural, No. 1.