World Applied Sciences Journal 12 (3): 266-278, 2011
ISSN 1818-4952

Landscape Impact on Roadside Improvement in Egypt Case Study of Salah Salem Road, Cairo, Egypt

Nermin M. Mohamed and Ahmed K. Abdel-Gawad

Civil Engineering Department, National Research Center, Egypt

Abstract: Transportation plays a major role in almost everyone's daily life. It is intrinsically woven into the fabric our existence, encompassing not only how to get from place to place, but also how to conduct the daily routines and the choices that make about what may be done. Because transportation is so tied to the daily lives, it provides a perfect opportunity to address the livability concerns of communities. Quality of life in the communities can be influenced by the visual quality of the road travel experience. Hence, the designer should study the Aesthetic design process which contains early involvement of some experiences in transportation architecture and visual understanding, comprehensive aesthetic design coordination, formation of a multidisciplinary design team. So, the current research will focus on evaluating the nature of aesthetic treatments and elements, which have been used or may have application within the roadway in Egypt. After this, studying the current concerning aesthetics is very important to start from it to new design concept. These concepts will aid in developing appropriate evaluative questions that focus on the effect of aesthetics on driver performance and decrease the accidents.

Key words: Road aesthetics · Road visual quality · Aesthetics planning · Aesthetic design

INTRODUCTION

City streets are not just thoroughfares for motor vehicles. They often double as public spaces where people walk, shop, meet and generally participate in many social and recreational activities that make urban living enjoyable. Under the social and economic changes, which reflected on the architectural and urban charts, faded architectural and urban design features of roads in Egypt. That fact is evident in the deformation of the image for visual roads in Egypt, increasing the proportion of air and noise pollution, increasing the proportion of accidents and many of the problems that achieve in the roads of Egypt [1]. Directly related to transportation, studies have found that People have more favorable perceptions of communities with green roads and Drivers seeing natural roadside views show lower levels of stress and frustration compared to those viewing built settings [2]. Another study found a decrease in crash rates on urban roads after landscape improvements were made [3].Contrary to what is commonly that high-quality trees play many roles in environmental, social and economic benefits for community improvement. In other words, street trees may buffer pedestrians from hazardous oncoming traffic [4].

By studying the current situation of roads in Egypt, one can find the following points:

- The high proportion of pollution on the roads
- Lack of proportion of green spaces
- High noise ratio
- Visual pollution
- Bad maintenance
- Random road design factor.
- Statistics estimate that the number of deaths resulting from road crashes in 2002 about 1.26 million deaths, in addition to 60 million infections and the presence of five million cases of permanent disability. The causes of accidents in Egypt, 2005, are 72% the behavior of drivers, 22%the technical status of vehicles., 4% weather, 2% road condition [5].

So, the main objective of our research here is to investigate the need of studying the aesthetic at the design process, as shown in Fig. 1. Knowing the facts that:

Corresponding Author: Ahmed K. Abdel-Gawad, Civil Engineering Department, National Research Center, Egypt.

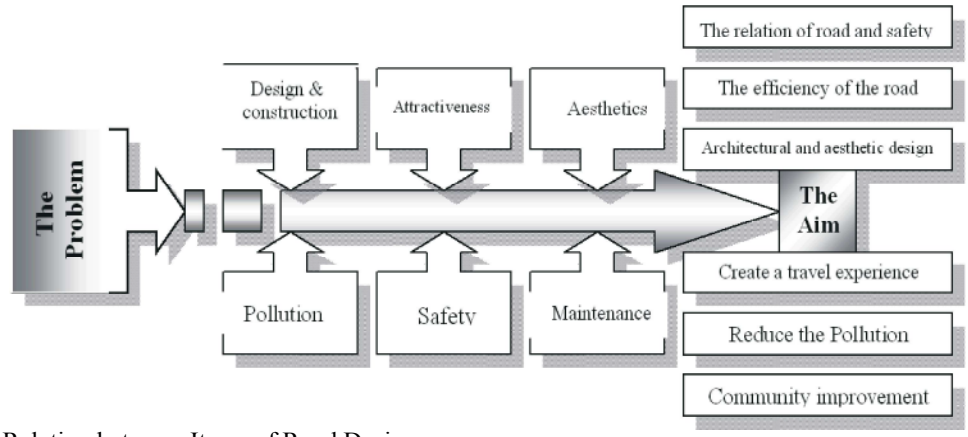

Fig. 1: The Relation between Items of Road Design

Fig. 2: The main roads in Cairo-Egypt

- Not all auto accidents are result, of driver error. In some cases, an auto accident is caused, in part, by road design and road construction.
- The condition, safety and attractiveness of the urban, suburban and rural corridors are important issues with residents and travelers along the roads.
- The tourist economy is dependent upon a well-maintained and aesthetically pleasing road system.

The current research paper will focus on a deeper understanding of the "relation" of Road and Safety of Human LIFE, but a clearer vision of better roads for Better Living, of Healthy roads free of the ills of deteriorating roadsides and resultant economic loss both to the efficiency of the road and to the assets of the local community. Then, Develop architectural and aesthetic design for transportation corridors to incorporate long-term aesthetic qualities which are context-sensitive, affordable, constructible, visually appropriate and maintainable. Finally, it can be contribute to the development of transportation corridors that are safe, functional and beautiful, reflecting current and emerging aspects of landscape architecture, environmental planning and management. Our goal is to optimize user safety and integrate the transportation corridor with its setting to create an aesthetic travel experience.

Monitoring the Reality of the Roads in Egypt: Transportation in Cairo includes massive road networks, linking Cairo and other Egyptian cities and villages. Nowadays, there is a new ring road surround the outskirts of the Great Cairo city. There are also a very large number of bridges, such as the 6 October Bridge which is the longest bridge in Egypt, which links between east and west sides of Cairo crossing the central part of Cairo city (Fig. 2).

Fig. 3: The high noise in Cairo streets

The high proportion of pollution on the roads, which exceeded the averages of natural maximum allowable globally in areas with high traffic density in different parts of the territory, "according to the State of Environment Report of the Environmental Affairs Agency (EAA) [6], not only the tragedy of pollution compounds Cairo, but extends emissions of the factories, in addition to the burning of 20 thousand tons of municipal solid waste, including the Provisions of garbage and medical waste, etc., produced by the Greater Cairo daily.

- Lack of proportion of green spaces, or lack of it.Greater Cairo are now some 16 million people, equivalent to 22% of the population of Egypt, placing seventh in the rankings of the largest cities in the world, as population density region about 257 people per hectare, which is of the highest densities in the world and studies suggest that about «the status of the green areas in Greater Cairo», per capita share of green spaces in Cairo of 1.5 square meters, compared to 20 sq m to the citizen in the British capital London and 23. 6 meters square per person in Berlin, Germany and 124.7 square meters in Vienna, Austria.
- High noise ratio has become an integral part of the lives of citizens living in Cairo, the reports and monitoring units Environmental Affairs Agency has proved that noise ratio exceeded the normal rates in many areas on the roads (Fig. 3).
- Visual pollution: it causes damage in the sense of beauty and the breakdown of aesthetic considerations and satisfaction and acceptance of the image of the ugly [7].

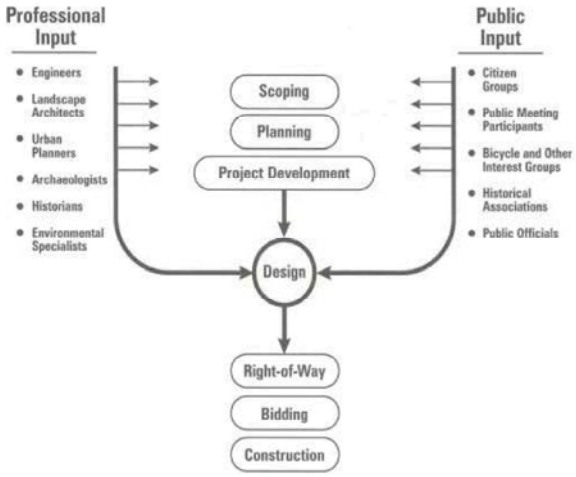

Fig. 4: Scoping brings all participants into the road design

- The poor condition of roads due to negligence and bad maintenance in Egypt, the driver loses concentration, lack of planning of the streets, not divided into lanes and lack of clear demarcation of the road, in addition to the lack of signboards.
- Random road design factor: the absence of design and lack of availability and rates of international and Safety Code (trends and the quality of the raw materials used), it causes the increase of accidents.
- loss of identity and the absence of a relationship the way in surrounding areas.

Criteria for the Efficient Functioning of the Roads: Road design, in the broadest sense, rests upon landscape principles as well as upon the more commonly recognized engineering principles of alignment, profile, grade cross-section, roadway and right-of-way width, drainage and structural strength and durability (Fig. 4). A balanced agreement with the two sets of principles characterizes the best design. All these things may be done in complete consistency with the utilitarian functions of the road. The role and responsibility of the designer is to gather and incorporate all of the interdisciplinary engineering and environmental input required to develop the road design.

The Landscape Architect's Primary Role: It is to assist in integrating environmental and aesthetic concerns with engineering and safety requirements (Fig.5). Landscape architects in transportation practice have five primary responsibilities: safety of the traveling public,resources, mitigation,integration of the transportation network into the adjacent landscape,enhancement of the aesthetic quality of the transportation network (Fig. 6).

Fig. 5: Factors to consider in planning

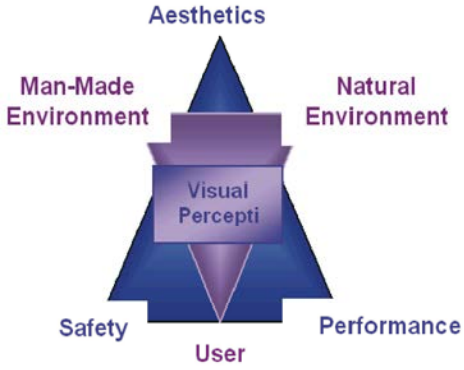

Fig. 6: Aesthetics and Creativity in Road Design

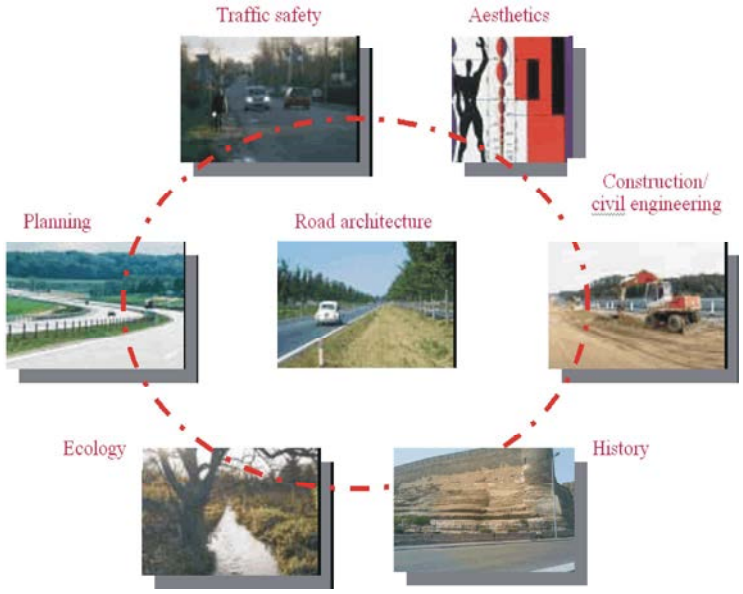

Fig. 7: Factors influence road architecture

Table 1: Factors influence road architecture

	Architecture values
History	Both the road's own history and that of its surroundings may be taken into account in choosing the right architectural design.
Planning	Planning has great importance for road architecture. Urban development and land allocation are controlled through planning, which sites and defines roads long before their concrete design has even been considered
Traffic safety	Traffic safety and road architecture are interlinked in many ways.
Ecology	Environmental and ecological aspects are gaining increasing influence on all physical planning. Fauna passages over and under roads can help increase the motorist's contact with nature.
Aesthetics	This aesthetic conservatism has helped preserve the landscape's original beauty, but it can also hinder innovation. Road architecture can create new aesthetic values based on existing conditions.
Scale	A unity of scales between the road's geometry and its different elements

Road Architecture: Architecture is an art form that is bound up with utilitarian, technical and economic considerations and with the "sense of place" and physical conditions of a site. Architecture is thus often described as a balancing and coordination of aesthetic, functional and technological considerations. Road architecture is even more emphatically tied to a locality and concrete conditions. This makes specific demands of technical design, safety, visibility and lighting. Since aesthetic considerations must be incorporated into these premises, the potentials for variation are limited. Road architecture is moreover distinctive in that much of its aesthetics is dictated by the surroundings themselves. Creating road architecture consists in seeing and understanding these qualities and incorporating them into our aesthetic experience of the road [8].

A number of very different factors consequently play a role in road architecture: historical heritage, civil engineering work, traffic safety, ecology, legislation, other planning, economic interests, etc [9]. All these factors influence road architecture and must be dealt with by taking an overall architectural approach to planning (Fig. 7 and Table 1). A detailed description of the project's impact on the surroundings and environment – including traffic accidents, noise and air pollution, the barrier effect, insecurity – as well as impact on the landscape, cultural heritage, soil, water, fauna, flora, raw materials and refuse depots.

Roadway Elements: These are safe environmentally sound, attractive and responsive to the public's needs. Every road is comprised of three parts: the road (travel way, pavement, alignment, subsurface, crown, curb, gutter, shoulder, structures), the right-of-way (swale, barrier, lighting, signs, sidewalks, paths, tree lawn, street trees, utilities, structures) and the setting (roadside architecture, landscape features, character, view shed). The road elements include structure elements as well as landscape elements. The current paper concentrates on landscape elements, such as: plant material and its relationship to the structures [10].

Landscape (Native Plants and Materials): The landscape along the roadside is having a positive affect on driver behavior and perception. The following sub-sections will illustrate the landscape native plants and materials.

The Objectives of Road Landscape Design:

- To provide vegetation that will be an aid to safety and aesthetics (Planting location, Spacing, Arrangement) [11].
- To provide vegetation that will aid in lowering construction and maintenance cost
- To provide vegetation that creates interest, usefulness and beauty for the pleasure and satisfaction of the traveling public.
- To improve the road environment, to absorbing carbon dioxide and releasing oxygen into atmosphere, trees reduce glare and lower temperatures up to 10 degree in hot and humid climate.plant materials also absorb runoff water and buffer roadway noise (Fig. 8).

Improve Road Landscape Practices:

- Use regionally native plants in landscaping

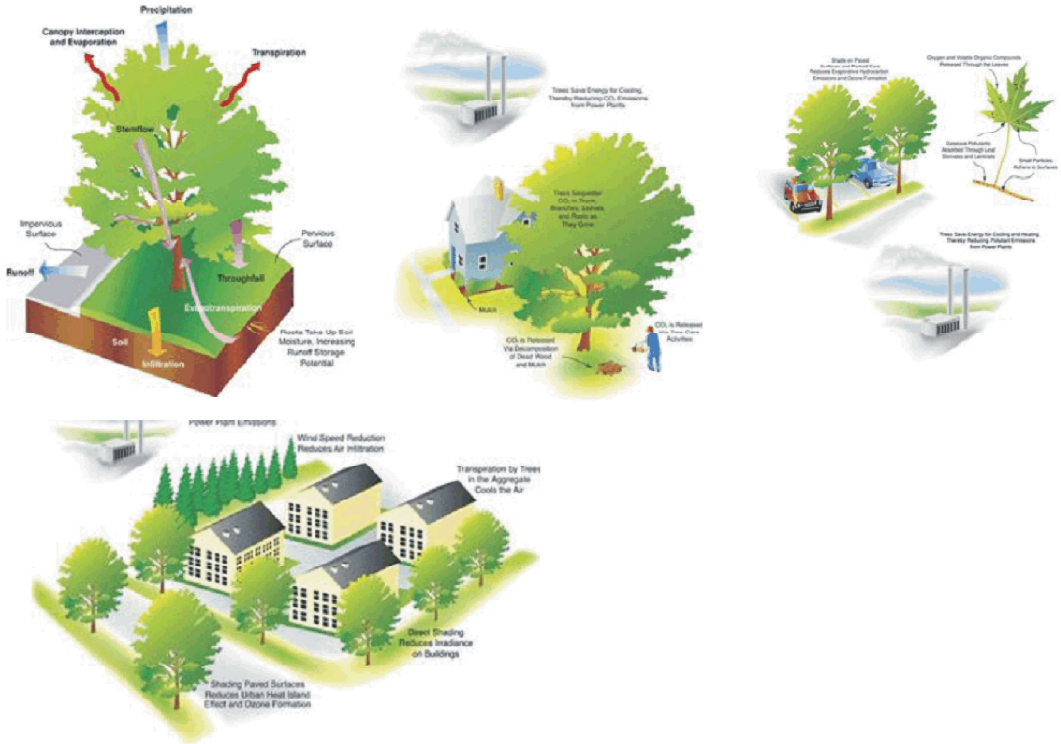

Fig. 8: The important of city trees and urban greening: Improving air quality, reducing atmospheric carbon dioxide, reducing storming runoff, conserving energy

- Seek to prevent pollution by reducing fertilizer and pesticide use, using integrated pest management techniques, recycling green waste and minimizing runoff. Noxious and invasive exotic plant materials must not be used.
- Implement water-efficient practices, such as use of mulches and efficient irrigation systems.
- Create outdoor demonstrations incorporating native plants, pollution prevention and water conservation techniques [12].
- Design, use or promote construction practices that minimize adverse effects on the natural habitat.

Select the Appropriate Species of Tree for the Road Environment: An important aspect of roadside landscape design is the treatment of Trees [13]. Trees provide a visual "edge" to the roadway that helps guide motorists. They also add to the aesthetic quality of a highway. In urban and suburban areas, trees soften the edges of arterial and collector streets. Trees are an important aspect of community identity and carry a great deal of emotional ties with the residents [14].

Plant Material Relationships to Structures:

Signs: No plants with the potential of blocking a sign should be placed in front of the face of any sign (Figs. 9 and 10) [13].

Retaining and Noise Walls: Plants should not be placed any closer to a wall structure than half the expected mature spread of the plant.

Elevated Roadways: Plants should not be placed where foliage may intrude to within 10 feet of the travel lane of elevated roadways and bridges (Fig.11).

Storm Water Structures: Trees placed near drainage structures may inhibit mowing equipment and lead to excessive hand maintenance. Keep trees at least 20 feet from headwalls and culverts to allow mower access.

Intersections: Intersections are the most complex transportation elements. For this reason landscape and aesthetics development in an intersection requires careful consideration to ensure that safety is not compromised [15].

Four basic elements should be considered in intersection design: Human Factors, Traffic Movement Considerations and Physical Elements and Economic Factors.

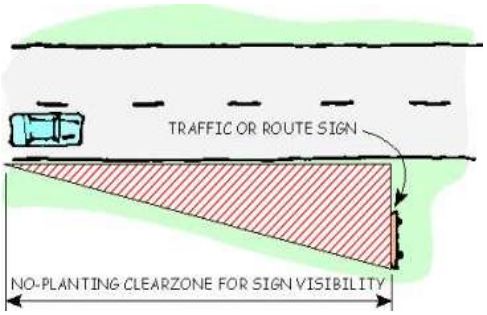

Fig. 9: Plants must not be placed where they may obstruct any sign

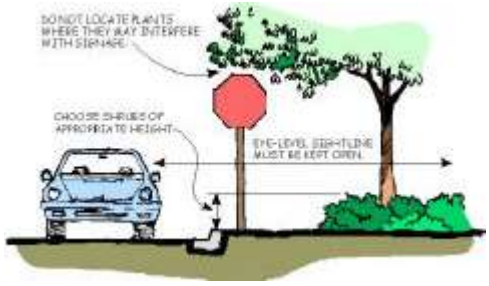

Fig. 10: Select and maintain plants at intersections that provide open visibility in all directions.

Fig. 11: Trees should not be placed where their mature height or spread will interfere with utilities or encroach on travel lanes.

The aesthetics goal within intersections should focus on ensuring visibility and clarity of traffic-related activities [14] (Figs 12 and 13).

Planning and Design for Landscape Maintenance: The suitability of any development for roadways will finally be determined by its ability to be managed and maintained. Improvements must avoid the creation of unsafe conditions for motorists or maintenance personnel.

- Allow ample room around drainage structures to facilitate maintenance.

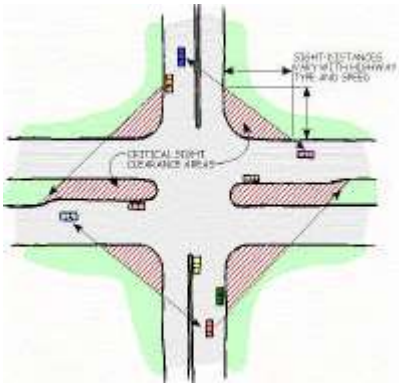

Fig. 12: Visibility within intersections is always a primary goal. Plant use in intersection areas must be limited to low-growing varieties.

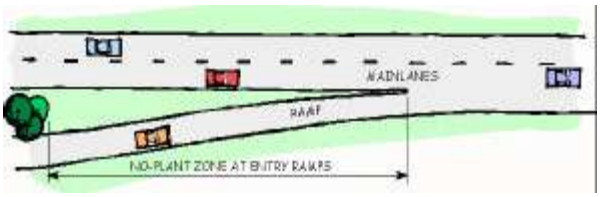

Fig. 13: Approach ramps require long, unobstructed sightlines. Do not place plants near merging lanes.

- Always provide paved setbacks near traffic lanes for the safety of maintenance crews.
- Concrete paving in hard-to-reach areas reduces maintenance costs and improves roadway appearance.
- Trees on steep slopes can impose dangerous turning motions on mowers and often lead to damage of soil-holding grasses.

Case Study of one of the Main Roads in Egypt: Salah Salem Road is one of the most important roads in Cairo. It runs about 22 km. This road runs east of central Cairo between ancient Cairo and the Cairo International Airport (Fig. 14). This road has many intersections, tunnels and bridges. This road also serves the travelers that cross Cairo from Nile Delta and Suez Canal Region to Giza governorate and Upper Egypt. In studying Salah Salem road, one can be divided this road into three sectors: North, centre and South.

Northern Sector of Salah Salem Road: This sector runs about 12 km. In the northern part of the sector**,** the road west side is clubs, residential buildings and huge buildings. In the east side of this sector, there are some huge government buildings. These sector starts at Cairo international airport and ends at El-Abbasia Square (Fig.15). The northern sector of Salah Salem road is characterized by the existence of huge green spaces and the aesthetic elements that increase the beauty and glamorous of the way.

Central Sector of Salah Salem Road: This sector runs about 6 km. The central sector of Salah Salem road starts at El-Abbasia square till the Castle. This section surrounded by government buildings like: police academy at the western side and military clubs at the eastern side until the intersection of graves legions (called Firdous Square now). Then it extends east along the Mamluk graves. In The western side there are many police and governmental buildings, then Al-Azhar Park (Fig. 16). In the first part of the sector, it is characterized by the presence of a large area of green spaces, Part II is confined either the presence of green spaces in Al Azhar Park.

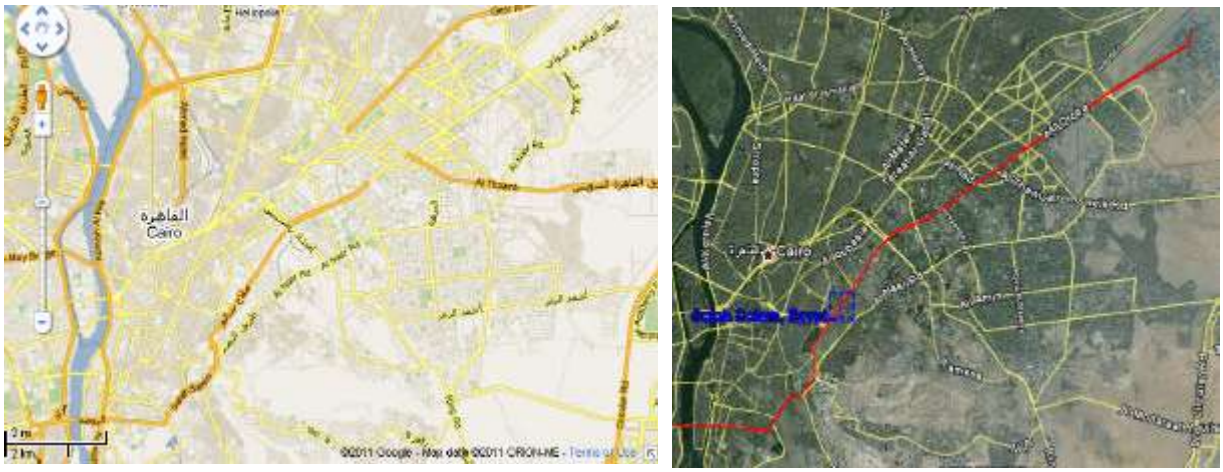

Fig. 14: Salah Salem Road runs from Cairo International Airport and cross River Nile to get to the Elahram Street

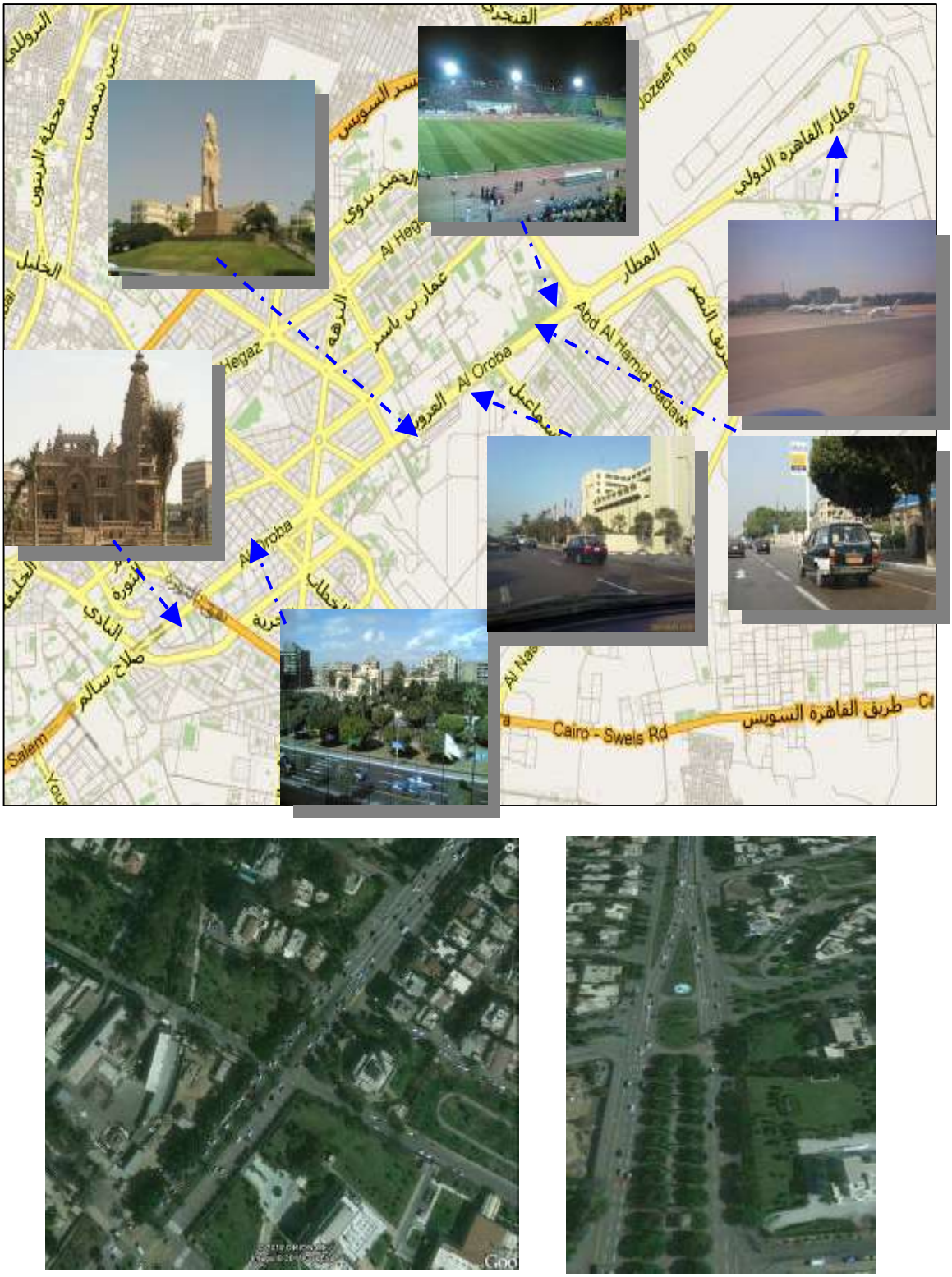

Fig. 15: Northern sector of Salah Salem Road

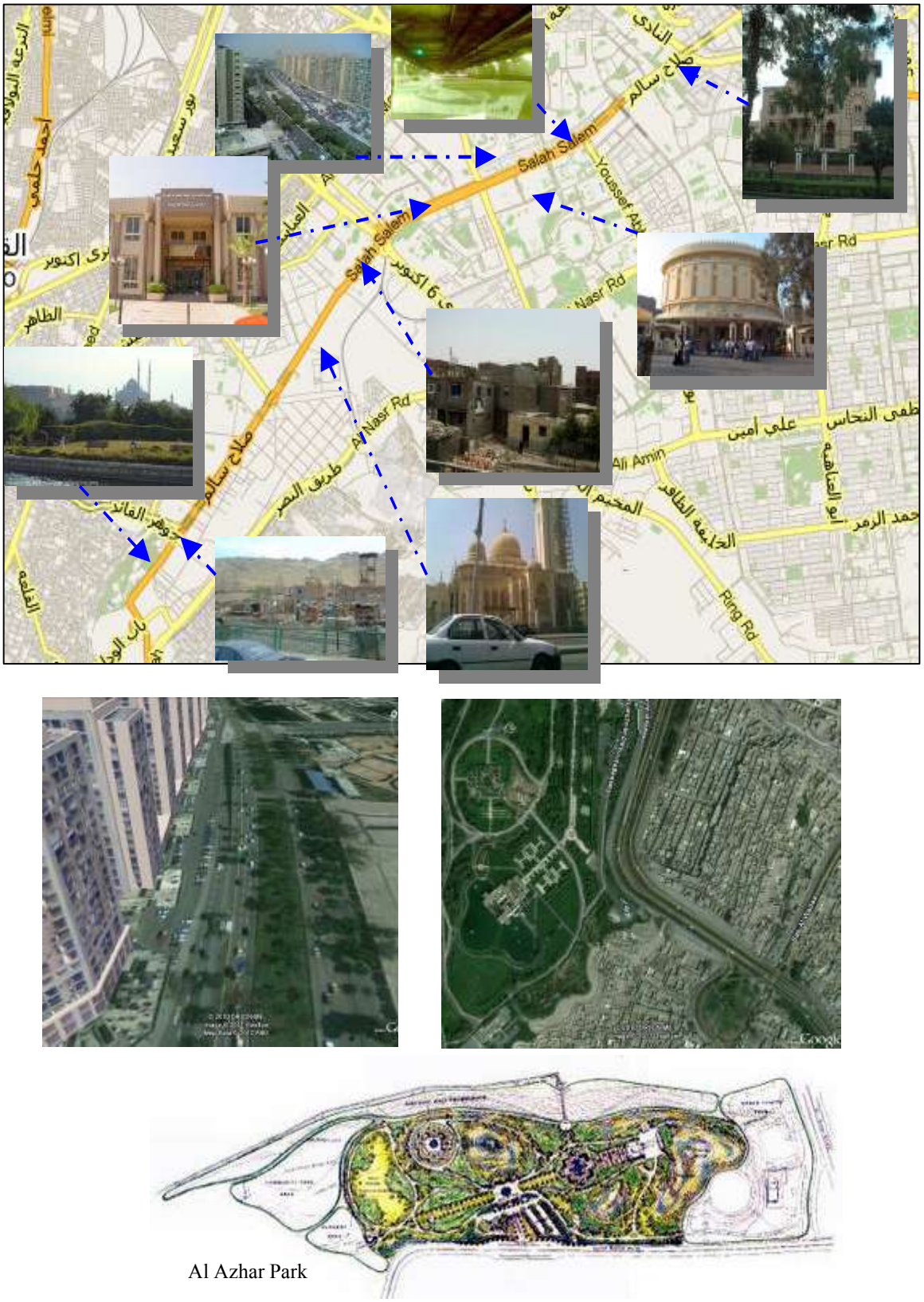

Fig. 16: Central Sector of Salah Salem Road

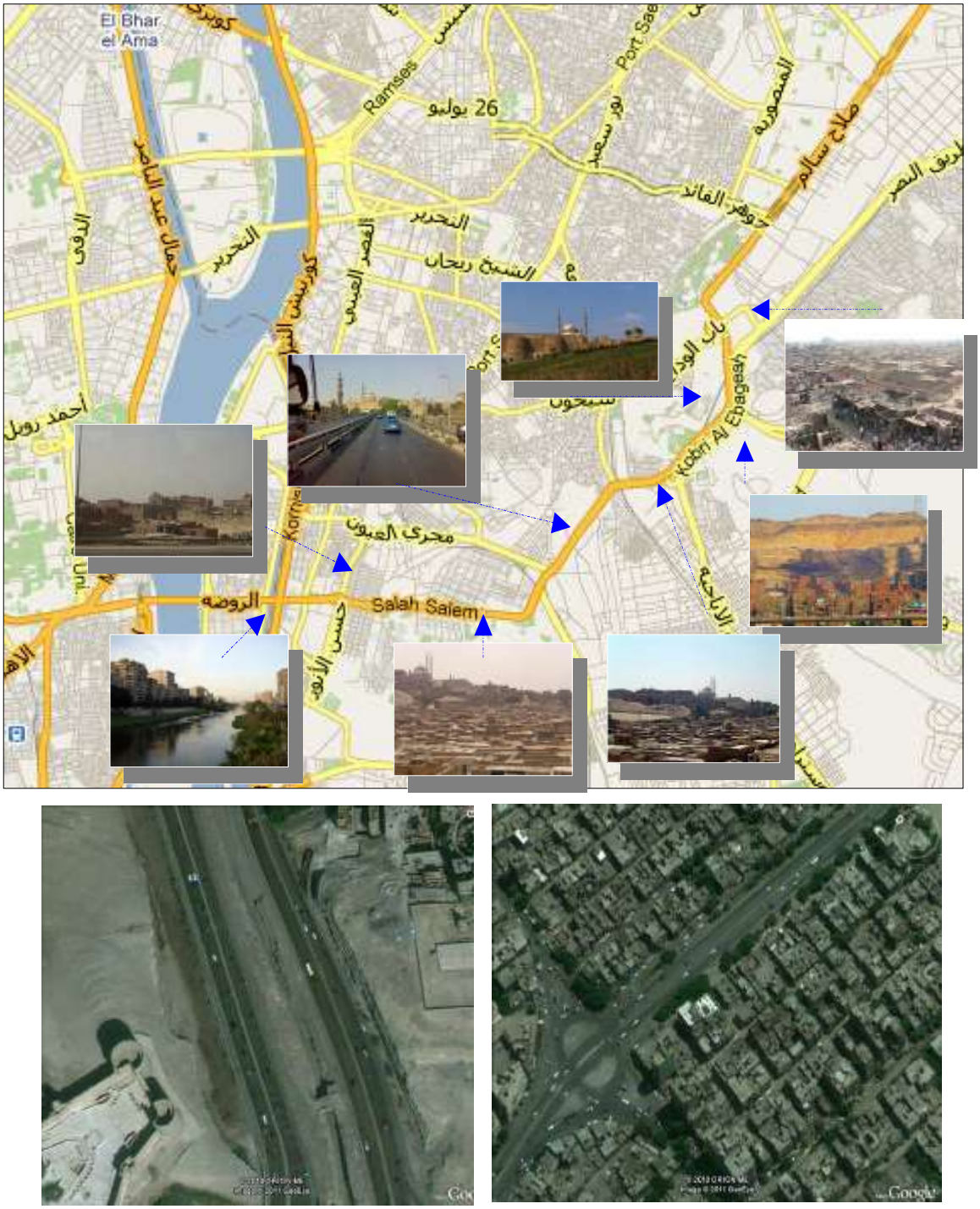

Fig. 17: Southern sector of Salah Salem Road

Southern Sector of Salah Salem Road: This sector runs about 4 km. In this part, the road surrounded by several archaeological zones (the Castle and the Sultan Hassan mosque), many graves (Bab el wazer) and slums (the slopes of Mokattam, Nasser) (Fig.17). In the southern sector, there is Non-existent of green spaces and the way fades the aesthetic elements such as the lighting and signs, etc. The prevailing atmosphere of gloom and silence on the region where there is no dialogue between driver and road vehicles.

Table 2: Salah Salem three sections

Section	Visual pollution	Air pollution	Green spacesand road elements	Noise	Road Condition
Northern sector of Salah Salem Road	Remove villas, Building of stylish and surrounded by a wide gardens to be replaced by blocks of constructivism deaf-density structural, high population and the disappearance of gardens and trees.	High proportion of pollution due to the increase of the traffic density	-there are appropriate green Areas. -Availability of lighting units, signs, flowers, Fountains and coordination of pavements.	High proportion of noise pollution due to the increase of the traffic density	Good state
Central sector of Salah Salem Road	- The heterogeneity of the modern buildings design with the surrounding environment - Conversion of ground floor of apartment buildings to the shops in some non-commercial areas. - Placing the advertisements without controls or restrictions	- The high proportion of pollution due to the increase of the traffic density and the lack of the green areas.	- Lack of green areas because of the continued occupancy of roads and sidewalks by high-pressure rooms and electrical transformers. - lack of road elements.	High proportion of noise pollution due to the increase of the traffic density	Good state
Southern sector of Salah Salem Road	- Vertical and horizontal extensions of the old buildings. - The use of bad colors in the interfaces. - Delete and add elements of external interfaces, which led to a distortion of the architectural character of the facades. - bridges for pedestrians and cars is another source of visual pollution, which lead to a lack of privacy for buildings and the disappearance of their windows	- The high proportion of pollution due to the increase of the traffic density, the lack of the green areas. And burning of waste and rising fumes of some factories	-Lack of green areas. - Lack of road elements.	- High proportion of noise pollution due to the increase of the traffic density - Using bridges for pedestrians and cars.	bad state

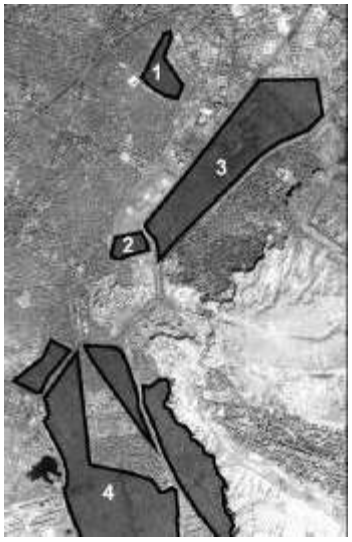

Fig. 18: Huge areas of grave (1-Bab Elnasr, 2-Bab Elwazer, 3-Elmamalek, 4-Alemam Elshafee and Elbasaten)

Central and Southern sector of Salah Salem Road are surrounded by huge areas of graves such as: Bab Elnasr, Bab Elwazer, Elmamalek, Alemam Elshafee and Elbasaten (Fig. 18) [16]. Graves exploit a very wide area and it can be cultivated with trees and palm to contribute to the site coordination.

Comparison Between the Three Sectors of Salah Salem Road: Table 2: illustrate a comparison between the three sectors of Salah Salem Road.

Generally, Salah Salem Road, or segments of it, can be described as having the following urban design qualities and characteristics (Fig.19):

- Lack of Definition and Identity. There are no features or elements that define or identify the Corridor as a distinct and special place.

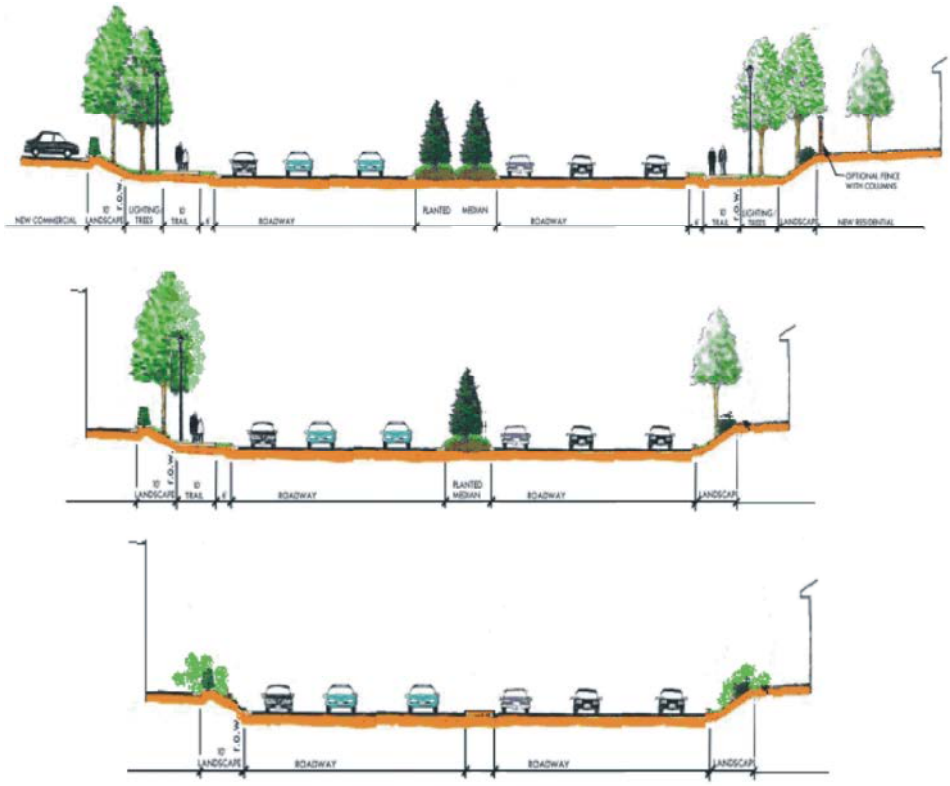

Fig. 19: Three sections in Salah Salem Road

- Lack of Consistency. There is no urban design or landscaping treatments that are continuous for the whole length of the road.
- Lack of Embellishments. There are few special features or elements that stand out or provide a sense of character or uniqueness.
- Inconsistent Streetscape Elements. The streetscape elements in the road, such as street lights and traffic signals, lack uniformity and consistency in style and color.
- Sporadic Landscaping Treatments. Some sections of the road have some very nice landscaping treatments along the edges or in the medians, while others are completely bare and lack any kind of landscaping.
- Limited Amount of Private Development Enhancements. Very few of the private developments along the road include any substantial amount of landscaping treatments or other enhancements.
- Unsightly Overhead Utilities. A few segments of the road have an extensive amount of unsightly overhead utility lines.

Analysis of Results According to the collected data from the three road sectors as well as the comparison between them, the following points can be extracted:

- Transportation officials admit that research about urban roadside design in Egypt is limited in both scope and quantity. Because of these limitations, better urban roadway data systems and safety analysis should be created.
- Separation between Participants into the road design.
- A number of different factors consequently play a role in road architecture: historical heritage, civil engineering work, traffic safety, ecology, legislation, other planning, economic interests, etc. All these factors influence road architecture and must be dealt with by taking an overall architectural approach to planning.
- In large cities, broad streets and boulevards often carry far more traffic than they were intended for. Safety and accessibility requirements have in many cases changed the cross-section and added a growing number of signs, markings, etc. It is a balancing act to preserve the original quality and beauty of these streets to keep them from being reduced to transport corridors, ignoring aesthetic aspects and the surroundings.
- Findings suggest that the use of roadside landscape has a positive affect on overall performance and can be used as a tool to improve the safety performance

of urban streets if the specifics of the affect on driver performance can be identified. There is a correlation between certain types of landscape treatments and reduction in crash rates, indicating that the landscape along the roadside is having a positive affect on driver behavior and perception.

CONCLUSIONS

For selecting the appropriate cross-section elements and dimensions, designers need to consider a number of factors, including the following:

- Volume and composition (percent trucks, buses and recreational vehicles) of the vehicular traffic expected to use the facility.
- The likelihood that pedestrians will use the route
- Climatic conditions.
- The presence of natural or human made obstructions adjacent to the roadway (e.g., rock cliffs, large trees, wetlands, buildings, power lines).
- Type and intensity of development along the section of the road facility that is being designed
  Safety of the users.

To overcome the bad-optical image of the southern sector of Salah Salem Road, the following is suggested:

- It can be use Retaining Walls and Noise Walls, depending on the color and texture they will tend to blend or contrast with the background. In most cases the designer should pick colors that blend with the natural surroundings. Scale is also an issue, particularly in residential neighborhoods. Wall heights can be so commanding that they overpower the surrounding homes.
- Well conceived works of art, properly located for visibility and safety, improve the driving experience and enrich adjacent neighborhoods.
- To overcome the lack of green spaces must follow the following:

Agriculture roofs - both sides of the road - central islands - Agriculture graves.

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