Improvement of Highway Rest Area Design Case Study: 
Cairo-Alexandria Desert Road, Egypt

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Abstract: Rest areas are very important part of highways. They provide clean, safe and comfortable places for travelers to rest and manage their needs. Efficient Planning rest areas help in saving money and improving site performance. This study evaluated the nature of aesthetic treatments and elements, which have been used. This also may have applications within the highway in Egypt to achieve safety, economical and efficient rest areas that will serve the traveling public and tourism. In this study, Cairo-Alexandria desert highway which is considered the main highway that connects Cairo and Alexandria was used as a case study. This research aims to raise the priority of the safety rest area system as an integral to highway safety and improve its function, design, service and operations.

Keywords: Roadside management • Highway visual quality • Rest areas design • Cairo-Alexandria road

INTRODUCTION

The condition, safety and attractiveness of the urban, suburban and rural corridors are important issues with residents and travelers along the highways [1]. The tourist economy is dependent upon a well-maintained and aesthetically pleasing highway system [2]. Because transportation is so tied to our daily lives, it provides a perfect opportunity to address the livability concerns of communities. Quality of life in our communities can be influenced by the visual quality of the highway travel experience [3]. Egypt witnessed a great interest in development of highways, covering all the main parts of the country (Fig. 1), increasing the lengths of roads to reach 46.9 thousand miles during the year 2006/2007 (According to the website of the Egyptian Ministry of Transport), these roads are Considered investment and tourism opportunity should be exploited, including a large service centers, markets, restaurants and oil stations. Table 1 shows some of the main highways in Egypt and their Lengths in Km.

Rest areas are an important part of highway to ensure traveler safety [4]. They provide clean, safe and comfortable places for travelers to rest and manage their needs. Attractive and useful, rest areas encourage travelers to use a safe location off the roadway to take a break and return more alert to the highway [5]. Landscaping and pedestrian amenities invite the traveler to rest and relax. By studying the current situation of rest areas in Egypt, one can find the following points:

- Lack of strategic planning.
- Unsuitable site location.
- Poor site design (Fig. 2A&2B).
- Poor services (Fig. 3A&3B).
- Long distance the drivers often do not have an appropriate place that is safe and secure to rest.

So, the main objective of the current research here is to investigate the need of studying the aesthetic at the design process (Fig. 4). Knowing the facts that:

- The condition, safety and attractiveness of the rest areas are important issues with residents and travelers along the roads.
- The tourism economic is dependent upon a well-maintained and aesthetically pleasing rest area system.

The current research paper will focus on a deeper understanding of the "relation" between the highway and rest area design. Also, a clearer vision of better highway will be discussed for Better Living and tourism of Healthy highway free of the ills of deteriorating roadsides.

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Fig. 1: The main highways in Egypt

Table 1: Some of the main highways in Egypt and the length in Km.

<table>
<thead>
<tr>
<th>No.</th>
<th>The beginning</th>
<th>The end</th>
<th>Length in Km</th>
<th>No.</th>
<th>The beginning</th>
<th>The end</th>
<th>Length in Km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kasr el-Eini</td>
<td>Ain Sokhna</td>
<td>137</td>
<td>9</td>
<td>Cairo</td>
<td>Aswan (west of the Nile)</td>
<td>994</td>
</tr>
<tr>
<td>2</td>
<td>Cairo</td>
<td>Suez</td>
<td>134</td>
<td>11</td>
<td>Cairo</td>
<td>Aswan (east of the Nile)</td>
<td>946</td>
</tr>
<tr>
<td>3</td>
<td>Cairo</td>
<td>Ismailia (desert)</td>
<td>116</td>
<td>12</td>
<td>El Fuwer</td>
<td>Marsa Alam</td>
<td>220</td>
</tr>
<tr>
<td>4</td>
<td>Cairo</td>
<td>Ismailia (Agricultural)</td>
<td>139</td>
<td>13</td>
<td>Qena</td>
<td>Safaga</td>
<td>180</td>
</tr>
<tr>
<td>5</td>
<td>Cairo</td>
<td>Alexandria (Agricultural)</td>
<td>224</td>
<td>14</td>
<td>Marsa Matrukh</td>
<td>Suez</td>
<td>300</td>
</tr>
<tr>
<td>6</td>
<td>Baniyas</td>
<td>Alexandria (desert)</td>
<td>124</td>
<td>15</td>
<td>Alexandria</td>
<td>El Alamein</td>
<td>122</td>
</tr>
<tr>
<td>7</td>
<td>Cairo</td>
<td>Suez</td>
<td>210</td>
<td>16</td>
<td>Suez</td>
<td>Haifa</td>
<td>1967</td>
</tr>
<tr>
<td>8</td>
<td>Alexandria</td>
<td>Sallum</td>
<td>528</td>
<td>17</td>
<td>Ring Road around Cairo</td>
<td>--</td>
<td>110</td>
</tr>
</tbody>
</table>

The resultant economic loss both to the efficiency of the road and to the assets of the local community will be explained. Then, developing architectural and aesthetic design for rest areas are incorporate long-term aesthetic qualities which are context-sensitive, affordable, constructible, visually appropriate and maintainable. Finally, it can be contributed to the development of transportation corridors.

Roadside Management: Roadside management encompasses planning, design, construction and maintenance of the roadside environment [6]. The roadside is managed to fulfill four functional categories: operational, environmental, visual and auxiliary functions. In reality, these functions are interrelated and inseparable, but the four functions help communicate the range of roadside management issues [7]. Table 2 shows the functions and some examples of those functions.
Fig. 2A: Al-alamin Highway is one of the important highways in Egypt. This highway connects between Cairo Alexandria Highway and The International Coastal Highway. (Image Source - Google)

Fig. 2B: Shows some views from the Al-alamin highway, the rest areas at this highway is very rear, which affect the tourism activity on that road

Fig. 3A: Matrouh-Seiwa Highway is one of the important highways in Egypt, which connect between two tourism areas. This highway connects between Seiwa Oasis and The International Coastal Highway. (Image Source - Google)
Fig. 3B: Shows some views from Matrouh-Seiwa highway, the rest areas at this highway is very rear, which affect the tourism activity on that road.

Fig. 4: The relation between items of rest area design

Table 2: Roadside Functions

<table>
<thead>
<tr>
<th>Functions</th>
<th>Operational</th>
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<tbody>
<tr>
<td>Operational functions</td>
<td>Those functions that provide safe and multiuse roadsides. Operational functions include access control and providing recovery areas and sight distances with accommodations for signs and utilities</td>
</tr>
<tr>
<td>Environmental functions</td>
<td>Those functions that protect and enhance our natural and built surroundings. Environmental functions include water quality preservation, protection and improvement, storm water detention and retention, wetland and sensitive area protection, noxious weed control, noise control, habitat protection, habitat connectivity, air quality improvement and erosion control [8].</td>
</tr>
<tr>
<td>Visual functions</td>
<td>Those functions that are designed and experienced primarily from a visual perspective. Visual functions promote a positive quality of life and are integral to operational, environmental and auxiliary functions. They include positive guidance and navigation, distraction screening, corridor continuity, roadway and adjacent property buffering and scenic view preservation. There are two primary roadside views: those from the roadway and those toward the roadway. In addition, many environmental functions, such as noxious weed control, wetland and sensitive area preservation and habitat preservation are readily perceived and evaluated through sight.</td>
</tr>
<tr>
<td>Auxiliary functions</td>
<td>Those functions that provide additional operational, environmental and visual functions for a complete transportation system. Examples of auxiliary facilities are community enhancement areas, safety rest areas, roadside parks, viewpoints, agricultural uses, heritage markers, bicycle and pedestrian facilities, park and ride lots and quarries and pits [9].</td>
</tr>
</tbody>
</table>

**Rest Area:** Rest areas are off-road designated locations provided for drivers and passengers to take rest breaks and overcome fatigue. They provide roadside amenities which improve the driving experience on Egyptian roads and support tourism. Rest areas also provide places for heavy vehicle drivers to stop so that they may observe statutory regulations for driving [10], take rest breaks to check their loads and fill in log books.

Rest areas should be designed to encourage road users to take rest. If rest areas are overly noisy, unattractive or poorly serviced they will not fulfill their purpose. Therefore the planning and design of a rest area...
The initial planning should use an integrated approach along a route long term rather than focusing on the microscopic details of individual rest areas. In assessing the long term needs of a route, consideration must be given to natural traffic growth and redirected traffic from other sources as route improvements are provided. Consideration should be given to reserving or acquiring necessary land to allow the flexibility of upgrading existing or new rest area in the future [13].

**Rest Area Location:** Potential rest area locations can be identified based on preferences of rest area features that the sites naturally provide such as grade, natural shade, good views of the surrounding area, availability of utilities and by considering the geometric and environmental constraints of the sites. The following lists some factors that assist in identifying preferable rest area locations:

- Rest areas should be located within close access to the route and outside the clear zone.
- Better utilization can be expected from sites with a clear view to the facility.
- Straight sections prior to descends, with good visibility of facilities are preferred.
- Flat areas are important for truck parking in rest areas [14].

![Factors of successful rest area](image)

**Factors of successful rest**

- **Access and egress**
  - Grade, Sight distance to entrance and exit of rest area.
  - Access arrangement, Acceleration and deceleration lane.

- **Rest area layout**
  - Truck parking spaces, the circulation of vehicles, recreational use, and collaborative design approach involving road designers and urban designers.
  - A landscape buffer zone.

- **Environmental Considerations**
  - Run-off treatment, heritage

- **Provision of Facilities**
  - Toilets, shade, information boards, water supply, picnic tables and chairs, lighting, safety and crime prevention through design, play equipment, and rubbish bins are considered the most desirable.

- **Aesthetics**
  - Landscape design, Natural noise mounds, rest area theme

- **Comfort**
  - Quiet Environment, shade, Flat surface.

- **Maintenance and life Cycle Cost**
  - It plays an important role in up-keeping the attractiveness and encouraging drivers or occupants to take rest breaks.
Factors of Successful Rest Area Design: There are many factors that need to be addressed in the development of a successful rest area. [15] (Fig. 6). It is important that an overall concept is prepared [16].

Case Study of the Main Rest Area on Cairo-Alexandria Desert Road in Egypt: Cairo-Alexandria desert road is the main highway that connects Cairo to Alexandria, the two largest cities in Egypt. It provides access to many of its largest employers and tourists. It is 210 km long (Fig. 7). The road is dark at night, no lights - but it has a lot of traffic signs that help the driver to know the way. It begins at Giza and ends in Alexandria El Kilo 21. It contains a lot of rest houses.

<table>
<thead>
<tr>
<th>No</th>
<th>Rest Area</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carrefour &amp; Dandy</td>
<td>Km 28 Cairo - Alex</td>
</tr>
<tr>
<td>2</td>
<td>Omar Oasis</td>
<td>Km 111 Alex - Cairo</td>
</tr>
<tr>
<td>3</td>
<td>The Assad Village</td>
<td>Km 59 Cairo - Alex</td>
</tr>
<tr>
<td>4</td>
<td>Safari park</td>
<td>Km 65 - Alex - Cairo</td>
</tr>
<tr>
<td>5</td>
<td>Master Resort</td>
<td>Km 106 Cairo - Alex</td>
</tr>
</tbody>
</table>

Generally, some rest areas on Cairo-Alexandria desert road can be described to have the following urban design qualities and characteristics (Fig. 8), but others have good design, Table 3 shows Cairo-Alexandria desert road Rest Area Locations.

Carrefour Shopping Center and Dandy Mall: Carrefour Shopping Center & Dandy Mall Km 28 Cairo - Alex - desert road (Fig. 9). It has built over 82,000 m² with an additional 38,000 m² for expansion, the mall offers an exclusive variety of services that meet the needs of visitors from around the world. It contains a shopping mall, food court, theme park, cinema complex, parking (Parking Area 3,000 car).
Fig. 9: Carrefour Shopping Center & Dandy Mega Mall Located on the Cairo-Alexandria Desert Road 28 km from the city centre (Image Source - Google)

Fig. 10: Omar's Oasis Km 111 Alexandria-Cairo Desert Road. (Image Source - Google)

Fig. 11: Green areas, restaurants, oil station and small zoo at Omar’s Oasis

**Omar Oasis:** Omar’s Oasis Km 111 Alexandria-Cairo Desert Road (Fig. 10). It contains a Fuel Station, Egyptian Pigeon lofts, restaurant and park (Fig. 11). A bit further down the road to Alexandria, few guests stop for a meal here ventures out to the few cages of animals. One can buy bread from the restaurant, the deer scrambled to their feet, flocking to the fence and almost desperately nosing each other in competition for a scrap of food.

**The Assad Village:** The Assad Village Km 59 Cairo-Alexandria Desert Road (Fig. 12), the area is 4 feddans-Desert roadside attraction is a more like a jungle-themed
resturant (Fig. 13). The entrance is the mouth of a tiger; three sleepy lions rest on a molded rock outcropping just inside the gate; and cages containing ostriches or monkeys are just feet away from the dining tables, which sit under stuffed wild animals in aggressive poses hanging from the rafters.

**Africa Safari Park**: Africa Safari Park Km 65 - Alex-Cairo Desert Road (Fig. 14). The 160-feddan Park, it is near Alexandria and it is a place where a traveler can experience a safari in his car. The animals are in good condition. There is a shopping mall and a park for children (Fig. 15). The owner of the Africa Safari Park has employed a
veterinarian from the Cairo Zoo to come once a month to check his animals, which he imported from across Africa and all of the employees were trained by experienced animal trainer.

**Master's Rest:** Master rest house Km 106 Cairo-Alex Desert Road (Fig. 16). Master's Zoo, at the busy master's rest stop almost halfway between Egypt's two largest cities, is still stocking its large garden with animals (Fig. 17).

**Comparison Between the Rest Areas of Cairo-Alexandria Desert Road:** Table 4 illustrate a comparison between the rest areas of Cairo-Alexandria desert road.
Fig. 18: Design proposal of rest area
1. Car parking
2. Rest building
3. Native grasses
4. Truck parking area
5. Provide a buffer for increased safety
6. Rest Area Piece sculpture
7. Picnic tables and shade structure
8. Waste treatment
9. Enhance with shade trees
10. Separate picnic areas for privacy.

Fig. 19: Design proposal of rest area
1. Screen maintenance areas
2. Facilities should match design themes and materials specified in the corridor plan.
3. Picnic area
4. Seats with shade trees
5. Good views and an attractive setting
6. Main plaza courtyard and open play area
7. Visitor parking
8. Overhead structure entry event scheme
Analysis and Output of Case Study

- The spacing of rest areas should be considered in light of the traffic volume and type of traffic. The spacing of rest areas should also consider the directional benefits and safety of locating rest areas on both directions on dual carriageways with high traffic volumes and on divided carriageways [8].
- Rest areas should be located within close access to the route and outside the clear zone (Figs. 18 and 19). Flat areas are important for truck parking and Potential locations for rest areas should undertake environmental assessment to ensure environmental impacts are minimized.
- As an alternative energy source, solar energy can be used to produce hot water and electricity in the rest areas. The roof of a toilet structure can be designed such that it maximizes natural lighting for energy savings and good ventilation. Ventilated toilet designs should be used to minimize odour problems.
- Solid waste, waste water management: The designer should provide information on plans for collection of trash and recycling at the proposed facility [17].
- The size of a rest area closely relates to the demand for parking spaces. Design and parking requirements should be discussed in consultation with the Driver Reviver site manager. Benefits may be obtained by dividing the truck parking area into smaller parts [18].

CONCLUSIONS

Safety rest areas are comprised of a number of distinctive elements; they model the ideology and visual aesthetic of the era that produced them. Site selection, site plan and landscape plan define the physical location and natural space of a site. Architectural elements including the toilet building, picnic shelters and other constructed elements such as, benches, table-bench units, trash receptacles and children’s play equipment are elements of design schemes intended to create a cohesive sense of place. Building interiors exhibit varying levels of architectural interest. Analysis of Results According to the collected data from the rest areas, the following points can be extracted: Generally, the rest areas in Egypt can be described as having the following urban design qualities and characteristics:

- Lack of Definition and Identity. There are no features or elements that define or identify some of the rest area as a special place.
- Lack of Embellishments. There are few special features or elements that stand out or provide a sense of character or uniqueness.
- Inconsistent Elements. The streetscape elements, such as street lights and traffic signals, lack uniformity and consistency in style and color.
- Sporadic Landscaping Treatments. Some rest areas have some very nice landscaping treatments, while others are completely bare and lack any kind of landscaping.
- The care of the animals, workers at each of the small zoos in rest areas - the animals need to have regular checkups from veterinarians and cared for by trained employees.
- No factors are taken into consideration in relation to spacing of rest areas.
- Most of the petroleum service stations and car parks on the highways suffer degradation level of services despite the high prices and lacks the overall management, Traveler suffers from many difficulties and troubles of non-availability of adequate resta on the roads and lack of efficient architectural design

Recommendations

- Rest areas should be designed to encourage road users to take rest, it is important to note that all features should be included in accordance with the design concepts of Rest Area.
- Planning and landscape design of rest area to provide:
  - Balance mobility, safety, maintainability and economic needs with adjacent land use and aesthetic, environmental, scenic and community values;
  - Improve traveler safety through the design of context sensitive roadways for motorists, transit, bicycle and pedestrian users;
  - Improve traveler and worker safety by providing solutions that reduce the frequency and duration of maintenance worker exposure to traffic;
  - Improve traveler safety through the design of safety roadside rest areas and management of rest area system needs.

REFERENCES


