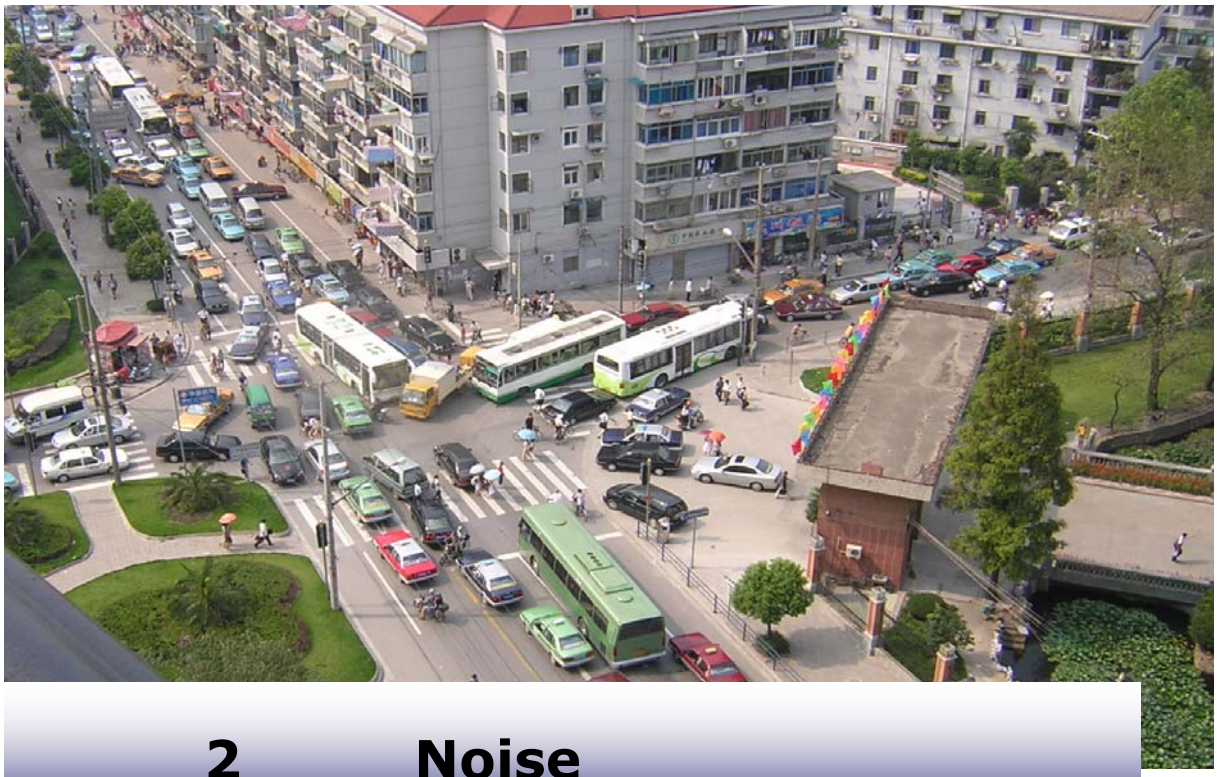

2 Noise

Introduction

Maintaining a tranquil noise-free environment has become one of the significant human life necessities. Noise has been defined as unwanted s. We have all observed that noise levels are apparently on the ascent in the Egyptian street over recent years becoming a source of nuisance and discomfort having reached locally and internationally unacceptable levels. This is evident in most regions of the Republic especially metropolitan cities and governorates' capitals where permissible limits set forth in the Executive Regulation of Environment Law no 4/1994 as indicated in Annex (2-1) and according to Table (A) were unfavorably exceeded due to population increases and expansion of related activities in the absence of proper urban planning. Noise virtually poses a threat to the Egyptian citizen's health since frequent exposure to noise brings pressure to bear on the individual and gets on his nerves, to say the least of how it adversely affects his production capacity in addition to its negative impact on social relations.

Noise Sources in Egypt and Critical Challenges

Egypt had been the scene of ever-growing development of new projects especially in metropolitan cities. Continued population increases drew expanded commercial activities and industrial facilities within residential areas to say the least of higher traffic intensity and the increase in the number of vehicles particularly recently, which normally brought to the extreme noise levels in some locations in which the Egyptian Environmental Affairs Agency monitored noise to find excess in permissible limits set in with the Executive Regulation of the Environment Law no 4/1994 on Environment Protection.

Main sources of noise in Egypt can be summerized up in the following:

1-Noise Caused by Means of Transport and Roads

Noise created by means of transport and roads constitutes the first and foremost cause of environmental noise in Egypt as it accounts for almost 60% of total noise causes, and where all regions at the metropolitan city level are subjected to and so is the citizen at work, at home and on the way. Transport and road noise can be classified into:

a. Vehicle Noise
b. Railway Noise
c. Aircraft Noise

2-Noise Produced from Power-Generating Plants

The Ministry of Electricity annually establishes power stations with high-potential generation capacity given ceaseless need for electricity, which are considered among major noise sources in cities, thus means of reducing sound and redressing noise resulting from it should be envisaged in an effort to control its implications.

3-Industrial Facility Noise

4-Construction and Building Noise

5-Commercial and Human Activity Noise

6-Loudspeaker Noise

7-Central Air-Conditioning and Heating Systems Noise

Noise Levels in Southern Cairo during 2005 (1)

Annex (2-1) shows the permissible limits of noise level in different locations. Helwan region houses large number of plants covering various industrial areas (iron and steel, vehicles, cement, charcoal, light and heavy industries). Since these factories set in operation a fleet of buses and lorries transporting workers and goods to all parts of the Republic. The South Cairo region has been selected as a noise-monitoring empirical project of the Noise Management System in Cairo to be generalized all over the Republic.

Noise level measurements were performed along the Korniche Road in South Cairo in 2005 where traffic statistics that included all types of passing-by vehicles from and to Helwan showed the relation between the total number of vehicles and noise level equivalent. Analysis was conducted in three stages as follows:

First Stage: Calculation and analysis of traffic volume data.

Second Stage: Noise data measurement and analysis.

Third Stage: Preparation of a noise map covering an area (part of the road) of 1.5 km long and 1 km wide.

1- Traffic Statistics

Data were collected on a 24 hour basis. Numbers were divided into two directions during the working day whereas traffic statistics data relevant to selected locations were recorded. Within this framework:

a- Traffic statistics locations were selected to survey the two lanes incoming and outgoing Helwan.

b- Determine types of by-passing vehicles

along the Korniche Road from and to Helwan (private cars, buses, mini-buses, micro-buses, light transport, trucks, motorcycles, heavy transport) as shown in Figure no.(2-1), Figure no. (2-2).

c- The period from 10 a.m. to 10 p.m. Tuesday had been set as an example of traffic flow.

Results:

Traffic statistics findings:

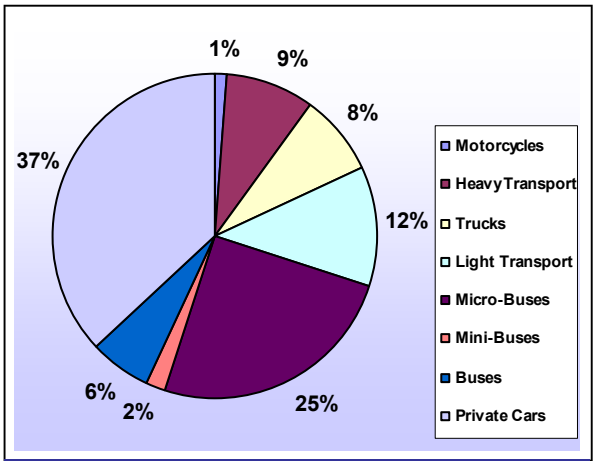

Figure (2-1) Types of Vehicles and Their Percentage to the Total Number of Vehicles Outgoing from Helwan in 24 hrs.

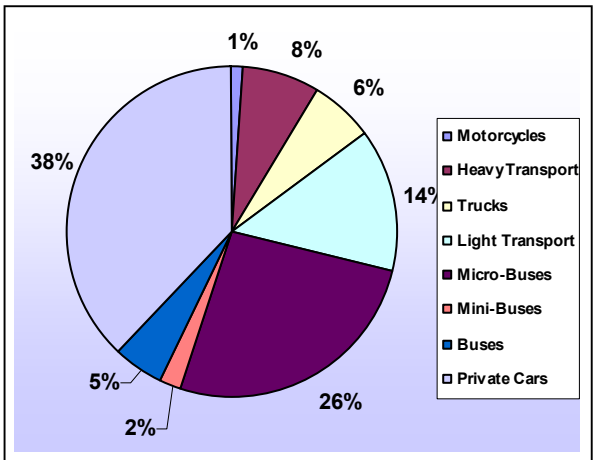

Figure (2-2) Types of Vehicles and Their Percentage to the Total Number of Vehicles Incoming to Helwan in 24 hrs.

Table (2-1) Comparison Between Traffic Flow in Each Lane and Equivalent sound level A-weighting L_{Aeq}

Time	No. of Vehicles Outgoing from Helwan	No. of Vehicles Incoming to Helwan	Noise Level Equivalent
12:00 at noon	380	542	82,11
1:00 p.m.	468	646	78.66
2:00 p.m.	547	679	78.15
3:00 p.m.	700	692	78.33
4:00 p.m.	626	710	75.72
5:00 p.m.	700	764	79.74
6:00 p.m.	463	538	76.19
7:00 p.m.	586	809	80.31

2- Noise Measurements

a. Management of the selected measurement locations as point measurement for 5-15 minutes taking a sample of each selected location during the traffic peak time (12:00 at noon to 7 p.m.) explaining its results in Table (2-1).

b. Location Measurement: took place in 16 locations across the road from and to the Nile Korniche as shown in Table (2-2).

c. Measurement of Equivalent Sound level LA_{eq} in subject locations as shown in Figure (2-3).

d. Drawing of a contour map for noise levels distribution according to measurement points along the Korniche, Figure (2-4).

Table (2-2) Locations whereby measurements in South Cairo were performed

Location	L_{Aeq} (dB)	Description
1	82.11	Helicopter landing location
2	78.66	Korniche El Nil – Egyptian Environmental Affairs Agency Premises
3	78.15	1,5 km. away from the Egyptian Environmental Affairs Agency Premises
4	78.33	Tora Prison
5	75.72	St.Gearge Church
6	79.74	Portland Cement Co.- Tora
7	76.19	Al Maasara Engineering Industries Company
8	80.31	Al Maasara Street
9	72.26	Al Kook Company
10	62.11	Helwan Iron and Steel Company
11	75.04	Portland Cement Company
12	80.24	Al Nasr Car Company
13	67.45	Tora Street
14	70.4	Within Al Maasara Area
15	64.85	Egypt-Helwan Agricultural Road (Al Kamal School)
16	66.61	Egypt-Helwan Agricultural Road (Behind Tora Prison)

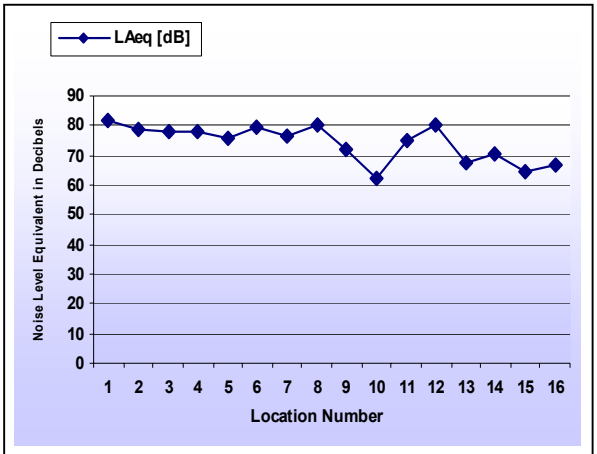

Figure (2-3) Equivalent Sound level LA_{eq} in Measurement Locations Identified in Table (2-2)

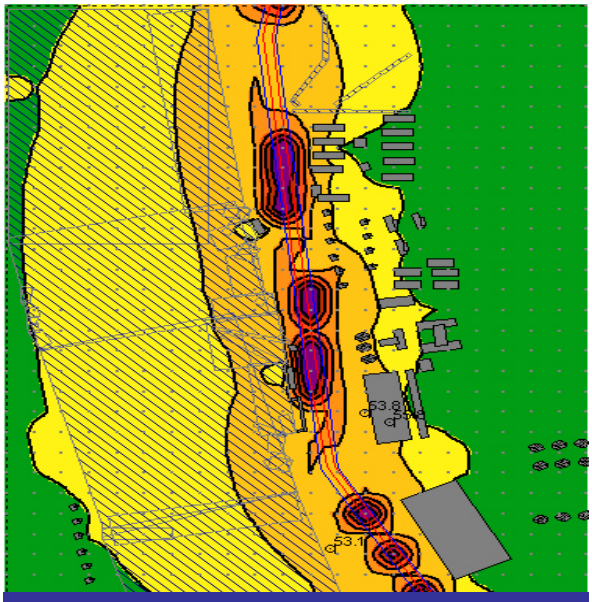

Figure (2-4) Contour Map Showing Noise Levels of Kornich Road (Maadi – Helwan) With the Perception of establishing Noise barriers

Key of the Road's Contour Map Levels; Noise Levels Are Identified In Colors

nr	from	to	fill color
1	0.00	50.00	
2	50.00	55.00	
3	55.00	60.00	
4	60.00	65.00	
5	65.00	70.00	
6	70.00	75.00	
7	75.00	100.00	

3- Measurements Analysis

a. Heavy trucks and buses are largely seen as traffic components and substantially contribute to raised noise levels given the presence of a number of factories in the industrial area.

b. Equivalent Sound level (L_{Aeq} [dB]) increases with augmented traffic volume especially heavy transport traffic.

c. Average noise level in locations 1-8 measured along the road from and to Helwan was estimated at around 78.7 decibels.

d. Measured locations nearby plants recorded average value of 72.4 decibels,

thus pointing to the high noise levels that can be attributed coming from the traffic rather than plants activities.

e. Measuring time period from 12 noon time to 7pm recorded the highest equivalent sound level due to heavy transport traffic attributed to plant and worker shuttle and commuting buses during that period of time.

f. Low frequency component (frequency range 31-250 Hertz) proves the negative impact on public property which requires devising appropriate means and ways of alleviating noise levels.

g. In accordance with the Executive Regulation of Law no 4/1994, the permissible limit of sound levels in residential areas on a main road is 60 decibels during daytime, 55 decibels in the evening and 50 decibel at night. This means that residential areas adjacent to the Kornich road in South Cairo region are exposed to noise levels exceeding permissible limits set forth in the Executive Regulation due to the absence of sound urban planning.

h. It is essential to take necessary measures to reduce noise in residential areas by 15 decibels by using inclined (sloping) barriers by almost 7 degrees on the Kornich road in populated areas.

Subway Noise Levels during 2004/2005

The Egyptian Environmental Affairs Agency has undertaken a study on the assessment of noise levels to which the Egyptian citizen lines and on station platforms inside tunnels is exposed. The study also covers subway and cab drivers.

Table (2-3) Average Results of Noise Equivalent sound level measurements (L_{Aeq}) in First and Second Subway Lines in Different Locations

Measuring Location		First Line		Second Line		Remarks
		Morning	Evening	Morning	Evening	
Station platform inside tunnels		82.8	85.7	83.6	83.1	During passage of subway cars
		77.6	79.0	80.5	82.4	During operation of TV circuits
		69.2	70.3	72.3	73.2	In the absence of subway cars
Station platform outside tunnels (above ground)		80.4	71.7	80.8	80.6	During passage of subway cars
		72.8	65.2	74.6	68.2	In the absence of subway cars
Driver's cab	Inside tunnel	83.3	88.2	85.8	88.7	
	Outside tunnel	80.5	84.1	79.8	87.8	
Passenger Cars	Inside tunnel	88.3	88.9	88.8	89.9	
	Outside tunnel	78.2	86.4	82.8	85.7	

Subway Station Noise Levels

1. Based on the results of Annex (2-2), it transpired that noise levels in the second subway line is higher than levels in the first line, and even higher during rush hours. This can be attributed to the passengers' movement and raised levels of sound resulting from individual conversations, amounting to 91.8 decibels, Annex (2-2) Table (A).

2. Noise levels in subway stations are mostly higher than in outside external stations especially on cars entering the subway station due to sound reflections from the tunnel body . This can be justified by lack of using sound-absorbents with high-potential absorption coefficient for coating the tunnel interior body. It is also clear that sound levels in outside stations are lower where background noise levels are not as high such as Maadi Station because of sound absorption by air media in open stations unlike sound reflections inside tunnels in underground stations.

3. Sound levels are raised due to the operation of TV circuits in subway stations which leads to higher noise levels. This is apparently connected with turning on rather than turning off TV circuits especially in Dokki, Opera and El-Behouth stations, as sound levels during operation have reached 86.1 decibels in the morning shift Annex (2-2) Table (C).

4. Noise levels were proved to be higher in some outside stations such as the Cairo University Station because of passing-by trains close to the subway station. These levels (have reached 93.5 decibels) Annex (2-2) Table (B).

5. The highest noise level recorded during the car passage inside the underground station was in the main station joining the two subway lines (Hosni Mubarak Station) because of passenger intensity and ramified exits plus mounting rates of passenger movement in this station. The highest continuous equivalent sound level A-weighting was recorded during peak hours that is 91.8 decibels Annex (2-2) Table (A).

Noise Levels Inside Passenger Cars During Subway Car Traffic Flow

1. Noise levels within passenger cars were proved to be higher during subway traffic flow inside rather than in walking distances outside the tunnels. The equivalent sound level A-weighting reached 91.6 decibels. Passenger intensity in a given car has an effect at the noise level Annex (2-2) Table (D).

2. Noise levels are almost equal in morning and evening shifts, ranging between 78 decibels outside the tunnels and 88 decibels inside the tunnels Table (2-3).

Noise Levels Inside Drivers' Cabs during Subway Traffic Flow

1. Average equivalent sound level A-weighting which drivers inside cabs are exposed to is around 85 decibels whether inside or outside the tunnel which actually fall within permissible limits set forth in the Executive Regulation of Environment Law no 4/1994 and the Labor Law no 12/2003 which it is suitable for the daily exposure period for drivers that is 6 hours a day Annex (2-1) Table (B).

2. Sound level inside the driver's cab is higher in the underground tunnel than during the subway car passage in outside

places where it is measured inside the tunnel by 89.3 decibels and 84.1 decibels outside the tunnel Annex (2-2) Table (E).

It has been coordinated with the Ministry of Transport to make use of the feedback of this study in treatment of noise produced in current subway lines while taking measures to reduce noise levels in subway lines planned to be extended as lines 3 and 4.

Harmful Impacts on Man Resulting from Exposure to Noise

The noise problem is considered one of the serious environmental pollution problems in Egypt based on enumerated complaints filed at the Egyptian Environmental Affairs Agency. Health effects resulting from exposure to high noise levels can be classified into:

1-Hearing Effects

Temporary hearing loss is likely because of exposure to high noise levels for short periods of time, which can be turned into permanent hearing loss if exposure took longer periods of time.

2-Physiological and Psychological Effects

This include high blood pressure and cardiac diseases, insomnia, lack of concentration, and nervous tension which certainly may lead to increased rates of accidents and crimes. According to road accident statistics in Egypt, human error represents 73% of accident-occurring causes. Exposure to high noise levels may likely be one of the causes leading to human errors.

Challenges to Noise-Reducing Programs

Major challenges faced in the area of noise abatement in Egypt are:

1. Absence of sound planning of land uses, intervening areas and shanty towns and slums.
2. Failure to abide by safety areas (roadside) on establishing facilities.
3. Advance of residential areas into industrial zones and subsequent increased noise-producing activities inside population compartments.
4. Utilization of outdated technology in some industries.
5. Lack of sound barriers on most highways and bridges passing through populated areas.
6. Absence of adequate green areas and belts as well as soundproof and noise-reducing barriers.
7. Wrongful attitudes in using car horns and the peddlers' use of loudspeakers as well as using microphones in celebrations held in residential areas.

Efforts of the Ministry of State for Environmental Affairs To Combat Noise in 2005

The National Noise reduction Plan had been prepared to reduce noise levels (acoustic pollution) including:

1. A national program for noise-fighting and controlling its sources is expected to be implemented over the coming 6 years in which all ministries concerned were to take part. Obligations and responsibilities were defined respectively Annex (2-3).
2. Undertaking joint campaigns by the Egyptian Environmental Affairs Agency and organs of the Ministry of Interior to streamline discipline to be in control of noise sources. These campaigns include:
   a. Intensifying campaigns with envi-

ronment police to control stationary noise sources (commercial areas- industrial zones- cafes- ceremony halls- cassette shops- schools). Environment police had been provided modern noise-measuring devices.

b .Intensifying campaigns with traffic and environment police and security directorates to control mobile noise sources (vehicles- means of transport- peddlers' use of loud-speakers- railways – subway lines- river cruises).

3. Periodic inspection of facilities and measurement of noise levels inside and outside the given facility through the Agency's regional branch offices. Preparation of a database of measurement results and taking legal actions against violators.

4. Implementing media campaigns to upgrade environmental awareness of the Egyptian citizen regarding participation in noise-reducing efforts to redress relevant negative implications. Workshops on noise risks and control were held in youth centers, clubs and associations at the republic level. Also to this effect, informational material (flyers and posters- 100,000 posters and 30,000 pamphlets had been distributed) to reach out to the public regarding noise risks during celebrations held on World Environment Day in June 2005.

5. Participation in the Committee on the Preparation of Egyptian Sound and Noise Specifications at the Egyptian Organization for Standards and Quality Control with a view to abiding by applicable standards ensuring reduced levels of noise resulting from its different sources.

Future Plan 2007-2012

It is obvious that substantial effort still needs to be made to address the above mentioned challenges, most important of which:

1. Establishment of noise-monitoring network since no such network is yet installed at the Egyptian Environmental Affairs Agency, therefore the Agency, except for a few disparate studies, is still wanting in official data on noise levels in squares, highways, and tourist and commercial places. The object of this network is to prepare an environmental noise database and map to form the basis for noise reduction plans or urban planning of new infrastructure and reform of the existing situation to help reduce noise rates in metropolitan cities provided that this has to be substantiated during the period from 2007-2012.

The environmental noise-monitoring network is expected to start with 20 monitoring stations to be initially implemented in Greater Cairo region to be followed by the rest of the Republic's governorates. Suitable locations for the establishment of monitoring stations in different areas shall be identified in compliance with international and local standards.

2. Capacity-building of qualified staff operating in the field of protection from noise and preparation of specialized technical cadres working at the Agency and branch offices as well as environment department staff in different ministries.

3. Implement an expanded media campaign involving citizens and (civil associations) NGO_S towards boosting noise-fighting programs and providing data and information to lobby massive public support in favor of these programs.

4.Preparation of a program designed to facilitate loaning and provision of grants and technical assistance to noise-producing facilities with proven firmness to proceed with measures for controlling their noise sources.

5. Cutting down customs duties on sound-reducing and insulating equipment and materials.

6. Coordination with governorates with regard to arbor zing roadsides and middle islands and installing sound barriers on highways passing through populated areas.

6. Coordination with the Ministry of Housing, Utilities and Urban Development in constructing traffic lanes for bicycles when planning new cities to encourage their driving as a means of transport to reduce noise levels.

8. Assessment of environmental impact of new roads and bridges and observance of noise treatment mediums while in the designing stage.

9. Updating and developing noise standards in harmony with international standards.

10.Completion by ministries concerned of the implementation of the National Plan for Noise-Fighting.

11.Kept-up periodic noise-measuring inspection and emphasis on the facilities' compliance with standards cited in the Executive Regulation of Environment Law no 4/1994 whether inside or outside these facilities.

12.Modernizing cooperation plans with the Ministry of Interior represented in traffic and environment police with the aim of intensifying inspection campaigns as regards noise-producing vehicles and establishments. Annex (2-2) shows the plan envisaged by the Ministry of State for Environmental Affairs for noise reduction.

References

(1) Study on Noise Levels in Helwan for 2005- Mansour El Bardisi- Teacher Assistant in the Design and Production Engineering Department at the Faculty of Engineering – Ain Shams University.