



Some aspects of environmental problems caused by transport in Dubai: a geographical perspective

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Abstract

The aim of this paper is to evaluate the impact of transportation means in Dubai on the environment. This paper mainly focuses on two major problems: **air pollution and noise pollution**, which are the results of increased use of Transports' means. The city of Dubai is a commercial centre and it is the feature that has made this city unique amongst the other emirates. The excessive transportation demand has caused several different problems over the various spatial features of Dubai. There are active factors which also result in an increment in transport. Certainly there are, such as population growth, land use and economical development etc. all these factors naturally processing and result in day by day increased demand for transport. The analysis of this problem will be presented from a the geographical point of view. This significant problem has a great influence on the local community in Dubai. Dubai was and is still recognized as an unpolluted emirate, but how long can it retain its environment with such rapidly growing activities

1. Introduction

Nowadays the issue of economic and social development in any community has become more complicated when and where it is to be copped with the transport system. Movement of people and goods, in urban areas requires more access to the transport facilities. In the other words we can say that the economic and social development cannot go without a well established road network and well managed transport system. On the other hand 'air and noise pollution' generated by the Transportation System is a top list issue in the world's Environment Conferences.

There are very few studies which have examined the relationships between the transport and environment of the Emirates region. Siddiqui, Khan, and Baig (1992), have traced the heavy metallic particles in the soil of Dubai roadsides.¹ Only few attempts were made by the Environmental Protection & Safety Department to monitor some aspects of pollution.

2. Scope of the study

Dubai is the most prominent emirate in the UAE because of its commercial and economical activities. In addition, it is a Gulf's land mark as a trade center or it may be



196 Urban Transport and the Environment

called a 'transit point' for the whole world. Its land use has increased from 530 Hectares in 1960 to 11,000 Hectare in 1985, which shows a rapid development of the infrastructure within a limited period of 25 years. In a city or country, transport plays a very important role for the continued progression of economic activities. All three main forms of transport namely air, sea and road, have over pressurized this emirate. For instance, air traffic volume is about 150 flights per day.

3. Major Factors in the problem of pollution

Pollution is the outcome of several different activities in the environment. The main source is human activity. Development of Industries produce a lot of advantages and disadvantages, and at the end a question arises about whether the environment is being improved or destroyed. Industry represented by the factories in the different areas of Dubai is sharing in passive pollution through its transport outcome.

There are also an additional number of noticeable factors that have had an influence on the environment, particularly air pollution, those are:

- * The rapid urbanization of the city that started from the mid 1960s to date.
- * Rapid growth in population.
- * Extensive construction of roads, buildings, tunnel, bridges and other infrastructures.

After the establishment of the Federal Government in 1971, several policies were made to assist the improvement of infrastructures as stated above. Thus in the course of the past 25 years, a high progress was achieved but at the same time this led to the pollution's problem in the city and now many of its areas are suffering air, noise and other forms of pollution mainly caused by the excessive use of transport means.

3.1 Population

The rapid growth of population in Dubai and its expansion in industrial and commercial activities and the more general activities and urbanization are intensifying the use of vehicles: private cars, buses, and other forms of public transport. Figure 1.1 shows the total population of Dubai between 1975 and 1991 from which the huge increase in car ownership can be inferred. This leads to a lot of problems and pressure on various services in the city and especially the problems of pollution in the urban areas which covers 43,485 Hectare of area. The annual growth of Dubai's population was estimated at 8.6 percent between 1975 and 1980 known as the 'peak period'.²

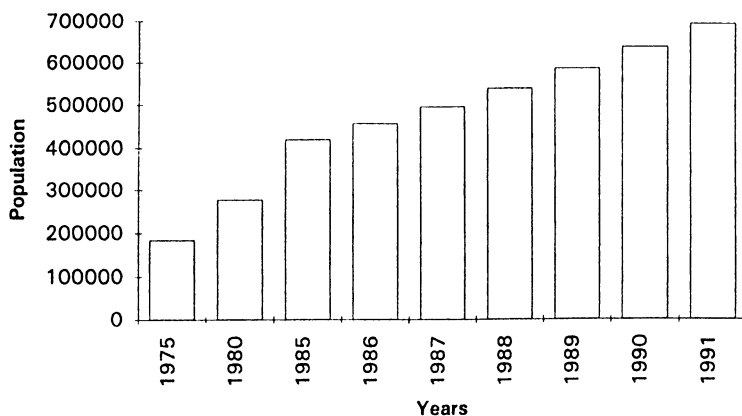


Figure 1.1 Population growth of Dubai Emirate from 1975 to 1991.
(Source: Dubai Municipality, 1992).

The concentration of population as shown in Figure 1.2, through out the areas in the city, is related to the human activities in the fields of industry, commercialization and transport places (creeks and sea ports).

3.2 Car Ownership

The last section gives us some indications on the growth of population and the need for the people to use transport means and the need for improved of mobility. Car ownership has greatly increased with the increase in the population of Dubai. The rate of car ownership in Dubai is 6.2 person per car.³ The car ownership amongst the Dubai population depends on the nature of the occupational status of individuals. As a commercial function of Dubai, most of the trips carried out are towards the place of work and back. The relationship between the trips and socioeconomic status is a very important point to measure the degree of car use and its effects on the community.⁴

Table 1.1 Trips by transport modes in Dubai Emirate in 1991.

Transport mode	Percent	No. of trips
Private car	54.9	841,958
Taxi	19.5	298,431
Light commercial vehicle	13.9	213,583
Heavy vehicle	0.9	14,164
Non-scheduled bus	6.8	103,590
Scheduled bus	1.2	18,535
Abra (small local ferries)	2.8	43,168
Total	100	1,533,429

Source: DHC, 1991



198 Urban Transport and the Environment

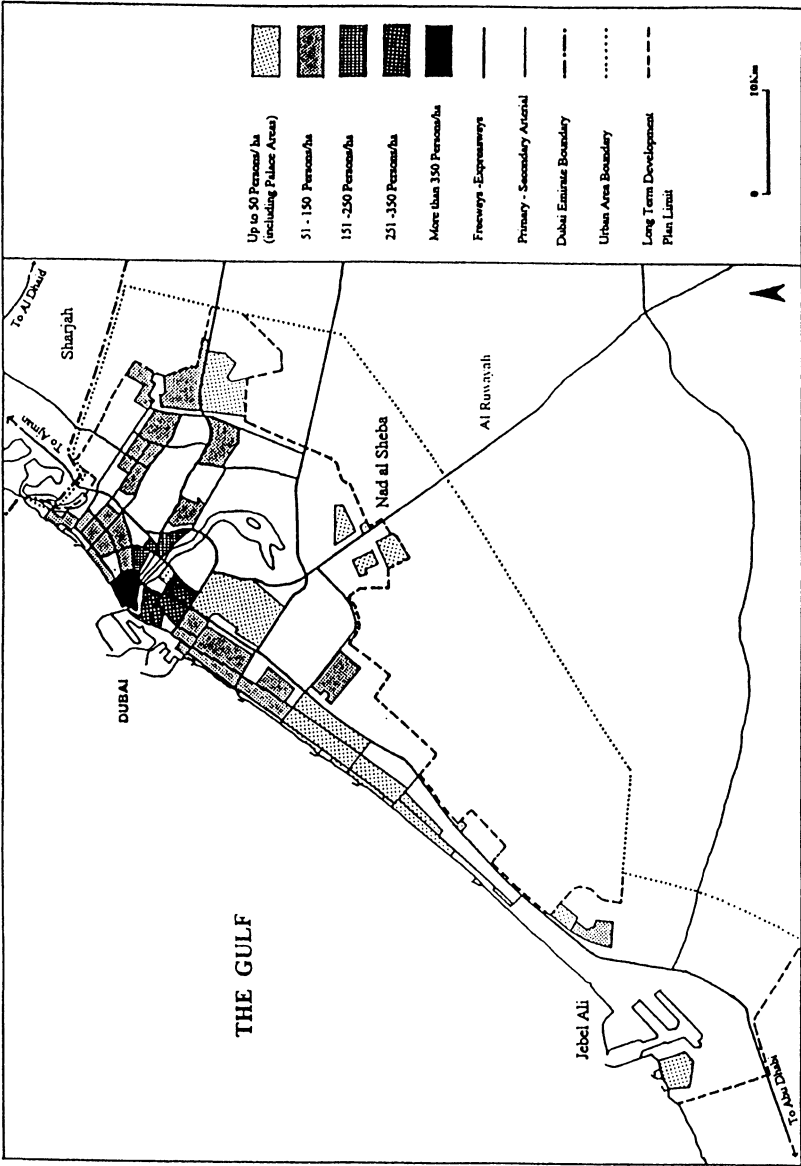


Figure 1.2 Population distribution of Dubai Urban Area. (Net Residential Densities)

The use of private cars has led to congestion on the main roads of Dubai especially in the CBD. Traffic congestion is one of the environmental problems in the urban areas of Dubai. This is related to the use of private cars instead of buses. The problem is well related to the high movement on the road as we will see it in the coming sections. The high traffic, surely produces a lot of the air and noise pollution. The majority of the population uses the private cars followed by the public transport (buses system) as can be seen in table 1.1.

3.3 Land Use

The city has gone through a complex process of planning over many years and by various consultants. This has resulted in BD evident problems such as parking shortage and a lack of coherent land use planning.

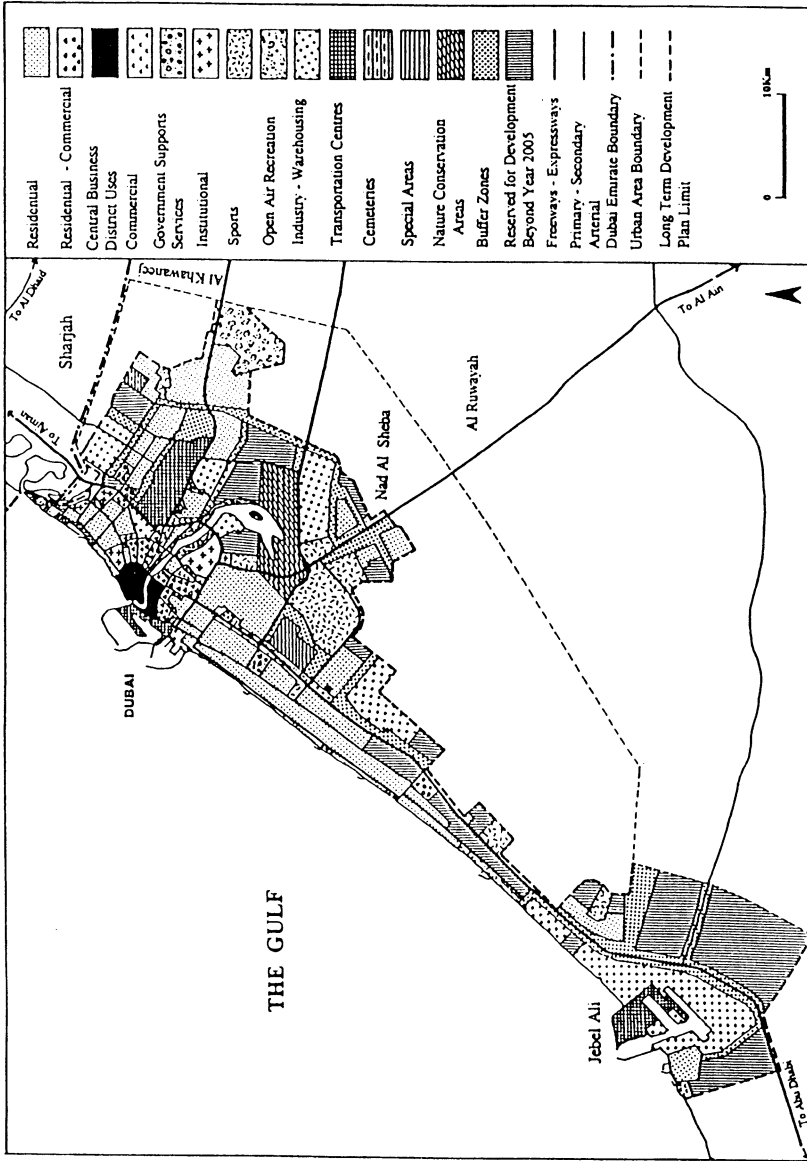
We cannot ignore the fact that the topic of land use/transportation / environment is a very complicated issue.⁵ A consequence of human activities as governed by land use and their interaction with transportation has meant increased vehicles emissions especially in areas of leisure and shopping facilities in the city.

Figure 1.3 shows the type of land use patterns in Dubai city. The residential area is estimated at 44.7 per cent, the commercial is 9 per cent and the road network 7.3 per cent of the total. The policy of land use in Dubai has been changed many times to cope with the fast development of the city. Starting from the first Master Plan in 1960, then the plan of 1970 and then new plans of Dioxides in 1988 and recently a new strategic plan being prepared and expected to be approved soon. These types of plan have created some major problems. For instance, Al Mankhool Road in Bur Dubai that links two major commercial centres Bur Dubai and Satwa passing through residential areas; this movement is classified a 'high movement' compared to other urban roads which adversely affect the environment residents who are located along this road.

Another significant factor that constitutes part of the problem is the type of land use and its association with the transport system of Dubai. The density of movement is related to the type of land use, commercial, residential or any other. There are some attempts made to link the land use with the volume of traffic through urban roads of Dubai. Day by day, the business and commercial activities such as internal and external trade are developing rapidly. This needs some intervention by the planning authorities to manage the movement of all types of vehicles (trucks or private cars). Otherwise, there will be a significant increase in congestion and roads accidents. Thus, there is a lot of integration to be achieved between these two aspects, that we will describe in the next pages.

4. Environmental problems of transport

The increased awareness from the officials and public, of the environmental problems in Dubai, in particular, and UAE in general has led to a strategy being formalized to control this issue. As mentioned above, the Dubai is not presented as a polluted city at



Dubai Municipality, 1988

Figure 1.3 Land use patterns of Dubai city.



the main time but it is likely to edge towards becoming so, if the significance of hazardous pollution is not realized. Air Pollution Bulletin (1994)⁶ has reported that Dubai air quality is good; but there are some pollutants are being released into the air by the different types of activities. The following details will point out some more facts in terms of their relation to “role of transport in the environment”.

4.1 Air pollution

Transport is considered a main source of air pollution. The degree or quantity or type of pollutants is related to the odd fuels, density of movement; roads design etc. are also indirect sources of pollution. The pollutants of Carbon Monoxide, Ozone, and Nitrogen Dioxide which are mainly produced by vehicles emissions.

In Dubai the monitoring of air quality has investigated and measured the at various Industrial and densely populated places. If we thoroughly look into the matter we see that we should not ignore the fact that the air pollution is also linked with traffic density on the roads, urban roads, seaports and airports etc.

4.1.1 Road Network

In the CBD area the trips are estimated to be about 16% of total trips which are carried daily in urban areas.⁷ 25% of these trips do have movement within the CBD area. The traffic volume in the CBD is high and so is the emission from the vehicles' movement. Carbon Monoxide is the main atmospheric pollutant. Among other pollutants CO₂ is mainly emitted from cars which have high movement along the roads, the incomplete combustion of fuels is also a constituent.

The movement in the urban roads of Dubai. It shows that in Deira, the CBD is highly populated more than the other areas of Dubai. It also show in the figures that the location of commercial activities are in the CBD and together with the densely populated areas which are also located there (Fig.1.2). These are concentrated the main reasons for congestion in the CBD. Moreover, the proximity of transport components like seaports (Rashid Port and the Creek) and the airport attract and encourage the movement of goods and people. See Figure 1.4 that shows the Urban Development Plan of Dubai.

Other pollutants such as Nitrogen Dioxide are concentrated in two major areas of Dubai, Deira and Al Safa, which later recorded higher readings than Deira, with the maximum daily average level 0.036 PPM in Deira and 0.058 PPM in Al Safa. This reflects that Al Safa has industrial activities and high traffic volume. The main road passing along these areas is a link between two major emirates Dubai and Abu Dhabi. A high range of Sulphur Dioxide is recorded in the industrially established areas as mentioned, alongwith Jebel Ali Port and the Free Trade Zone. This emission is the result of refineries and factories located in the area.

Lead is one of the remarkable pollutants emitted from the motor vehicles. It is the element added to petrol to raise its octane value. There are two sites in Deira, one is in the centre of the CBD and the other is out of the CBD, but both of them are located in the urban area of Dubai city; namely: Baniyas Square and Al maktoom street. The

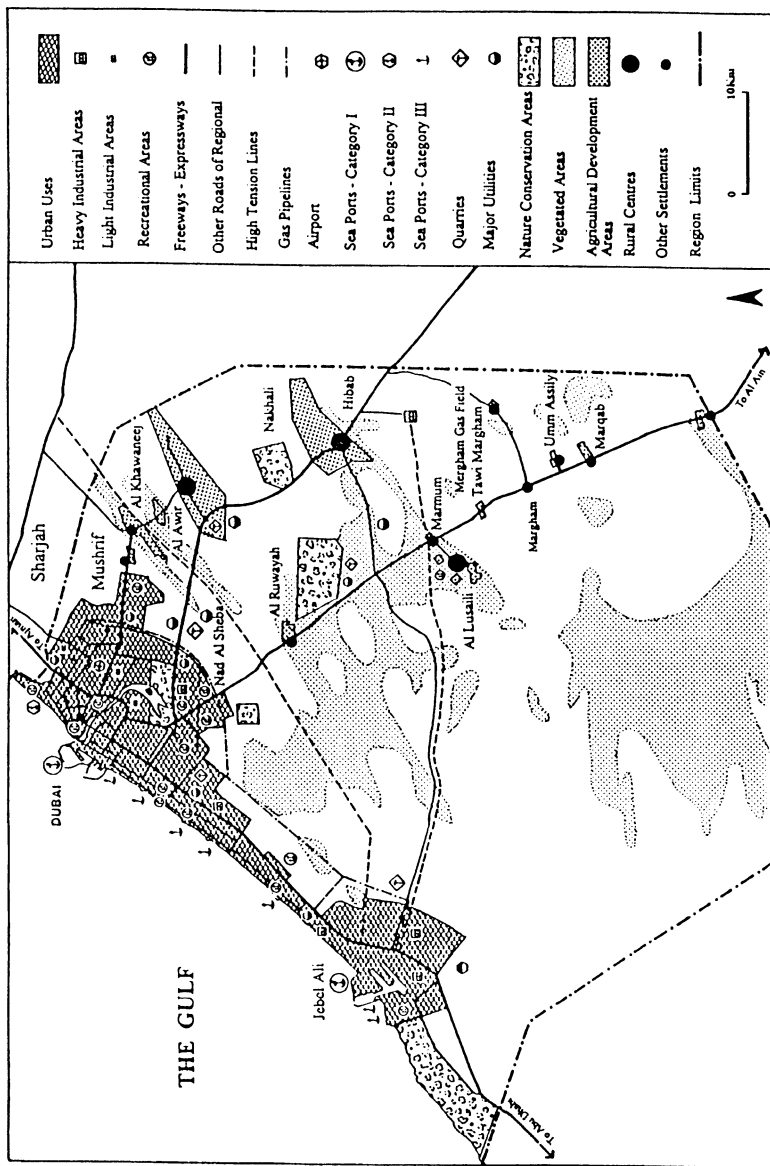


Figure 1.4 Urban Development Plan up to year 2005.

Lead levels range recorded from 0.70-1.22 ug/m³ in Baniyas Square and 0.42-0.69 ug/m³ in Al Maktoom St. Of course, the heavy density of traffic in the CBD is more than that out of it. On the other hand, Siddiqi (1992) has mentioned in his study that the lead concentration in roads is not only related to traffic density but also on the traffic signals where vehicles consume more fuel. Vehicles' fuel consumption is more when it starts, pickup in the top gear and get the speed, however, it consumes less fuel when running on the roads.

4.2 Noise pollution

The rapid economical growth made this Emirate a major commercial center in the Gulf. As an oil State, development processing creates 'unacceptable noises' for the people who lives in residential areas, and that leads to a lot of health problems. In Dubai, the urbanization development has greatly spread out in all directions and areas.

The main sources of noise are from transportation means: road traffic movement within the road network, which is the outcome of mechanical factors such as the engine, tires, exhaust and the condition of cars. In Dubai city, it might be said that there are two major sources of noise. Mainly the motor vehicles representing the traffic density on the roads, sound of exhaust, engines, hard accelerations; and secondly, the noise caused by the aircraft movement through the Dubai airport. All these comes part of the problem, but here is an attempt to focus the noise problem that comes from the transport means and the geographical dimension of that.

4.2.1 Road network

A survey has been carried out by the Dubai Municipality concerning the noise pollution in the city. It revealed that the noise levels inside the city are higher than those outside the city. This is due to the increased traffic in the city, and that is related to the location of business activities. Figure 1.5 shows the noise levels in the urban areas of Dubai. The movement of vehicles is mostly concentrated on the inner areas of the city (CBD) as highly populated areas.

That was recorded around 64.9 dba in Diera and 55.7 dba in Bur Dubai. On the other hand it is noticed that the areas located far from the major roads' have traffic noise average from 50 dba to 55 dba. In rural areas it has ranged from 44 dba to 49 dba. In terms of vehicles' movement on the urban area roads the highest movement is recorded on major external roads (highways) especially the section linking Dubai with Sharjah. The second highest movement is on the roads leading into the CBD. Consequently these movements are generating a lot of noise from the cars and heavy vehicles. The main point here is related to the land use specifically along with residential areas (see Figure 1.2 land use). The 'high traffic roads' located among the residential areas represent a significant environmental problem related to transport. For example, Rashid Seaport and the Dry Dock are both located in areas opposite of CBD's areas, the residential areas are located exactly behind the seaport. The traffic movement along the roads linking the seaport with other places cause high noise levels (58.1 dba) in

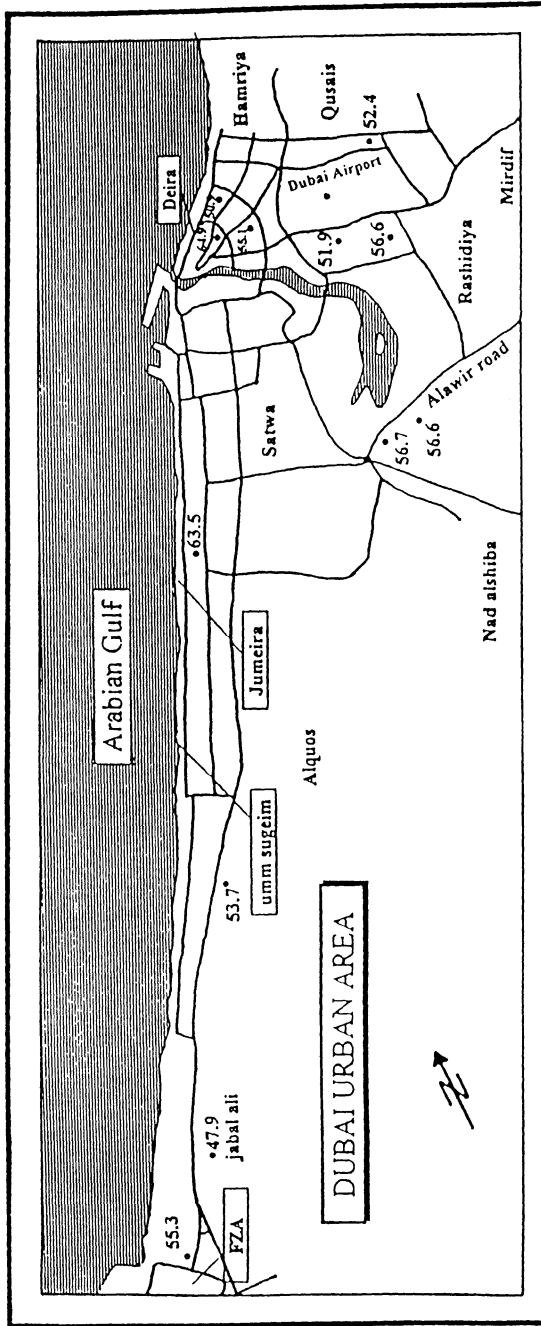


Figure 1.5 average noise level during daytime, dbA

SOURCE DUBAI MUNICIPALITY 1994



Karama area. See Figure 1.5. The most distinguished point is the CBD in respect of high level of noise and that is due to high movement of vehicles.

4.2.2 The Airport

We can say that the Airport is the second main source of noise problem in Dubai. As a result of the rapid development of Dubai's infrastructure, the air movement study shows a very high increase in both the passengers and cargo movements on Dubai Airport. The nature of air movement in Dubai is very active. The air traffic becomes more operative in during the night hours especially between 08:00pm to 7:00am.

About 120 aircraft land or take off in these counted hours. Figure 1.4 shows the location of the airport in the middle of the city. The path of the aircraft's' movement passes through many residential areas and that causes a sort of disturbance. there is no precise data which shows that levels of noise. Many interviews have been conducted and they indicate the complains of aircraft noise by affected population.

5. Forecasting of environmental problems in the future

The transport must be given more attention to reduce its environmental problems. The political authorities of many countries in the world have instituted the vehicle emission to control the air pollution caused by the transport. There is no doubt that Dubai is growing day by day, the business activities are increasing and this means more congestion, parking problems and environmental difficulties.

6. Conclusion

The conclusive main points regarding to the environmental problems in Dubai are:

- 1) As a result, for the long time we did not have a specialized unit or department to monitor environmental problems. Two years ago, the Dubai Municipality established few stations within urban areas of Dubai. the Municipality must set up more stations to monitor the emissions of vehicles particularly in the residential areas.
- 2) The transport/land use association in the urban areas is a very complicated issue. Dubai Authorities have approved several plans to regulate the development of urban areas in Dubai city. The transport system is one of the integral parts in the development; however, there is more congestion and the inappropriate location of some of commercial centres and a lack of parking the spaces in the very busy areas. Thus, we must be aware of all these issues when studying the plans of urban development.
- 3) The use of private transport has created a lot of problems in the urban areas such as using 54.9% of all modes of transport. However, public transport has a very tiny use by the community. To improve the environment and keep it clean and share of congestion must encourage the public transport system and make some sort of restriction on areas which face such problems.



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