Arab Republic of Egypt
Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency

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Egypt State of The Environment Report 2008

September 2009

Egypt State of Environment Report 2008

Acknowledgment

I would like to extend my thanks and appreciation to all who contributed in producing this report whether from the Ministry's staff, other ministries, institutions or experts who contributed to the preparation of various parts of this report as well as their distinguished efforts to finalize it.

Particular thanks go to

Prof. Dr Mustafa Kamal Tolba, president of the International Center for Environment and Development; Whom **EEAA Board of Directors** is honored with his membership; as well as for his valuable recommendations and supervision in the development of this report .

May God be our Guide,,,

Minister of State for Environmental Affairs

Eng. Maged George Elias

Foreword

It gives me great pleasure to foreword State of Environment Report -2008 of the Arab Republic of Egypt, which is issued for the fifth year successively as a significant step of the political environmental commitment of Government of Egypt "GoE". This comes in the framework of law no.4 /1994 on Environment and its amendment law no.9/2009, which stipulates in its Chapter Two on **developing an annual State of Environment Report to be submitted to the president of the Republic and the Cabinet** with a copy lodged in the People's Assembly ; as well as keenness of Egypt's political leadership to integrate environmental dimension in all fields to achieve sustainable development , which springs from its belief that protecting the environment **has become a necessary requirement to protect People's health** and increased production through the optimum utilization of resources .

The president of the Republic has vested great interest in environmental preservation issue, starting with his Excellency's words in his speech inaugurating People's Assembly session that " **preserving the environment has become a necessity not a luxury", It has become an issue on which the ability of Egyptian citizens relies to lead safe life and enjoy good health enabling them to produce and innovate. The President has crowned his support to environmental issues by his request to the People's Assembly to amend number of articles in the Egyptian Constitution so that the amended Constitution would incorporate an article stipulating environmental preservation.**

The amended constitution was issued in 2007 following People's Assembly approval in a public poll, including article no. 59 stipulating that **"Environment preservation is a national duty and that the law shall regulate needed measures to maintain sound environment".**

Stipulating in the **Egyptian Constitution** that environment preservation is a national duty would undoubtedly promote all of the state efforts represented in government agencies , NGO's , civil society and private sector towards achieving a sound environment for decent life for Egyptian citizens .

This report comes as an outcome of the exerted efforts by many competent experts and those concerned with the environment in Egypt , whether in concerned ministries , official or non official institutions who collectively collaborated in developing this report with the Ministry of State for Environmental Affairs (MSEA) and its Egyptian Environmental Affairs Agency (EEAA) .

The report addresses efforts exerted by all concerned ministries and institutions in the State during 2008 in the field of **Air Quality** , which led to significant improvement through the implementation of programs and projects adopted by Ministry of State for Environmental Affairs , including projects to reduce industrial pollution , use of natural gas in brick kiln industry , replace old taxis with new environmentally compatible, replace public transport buses with others operated with natural gas ;in addition to the integrated management of agriculture residues especially rice straw.

In the field of **Protection from noise**, 2008 witnessed reallocated of the National Noise Monitoring Networks 30 terminals to cover all districts of Cairo governorate with the purpose of establishing a noise database and an environmental noise map for the different districts of the governorate, which considered to be the reference and base upon which technical solutions and appropriate scientific plans for environmental noise reduction in the governorate will be proposed, to be publicized to the rest governorates in the future.

Due to the increasing rates of greenhouse gas emissions and emergence of **Climate Changes**' negative effects , the report refers to challenges faced by Egypt which include sea-level rise, shortage of water resources , lack of agriculture production and difficulty of cultivating some types of crops ; in addition to their adverse impacts on tourism industry, health and infrastructure, energy ,industry ,security as well as national economy as a whole .

The report pointed to the exerted efforts during 2008 to meet these challenges which include Clean Development Mechanism CDM aiming to implement projects to reduce greenhouse gases. They reach to about 52 projects achieving reduction in greenhouse gases of up to 0.9 million tons of CO_2 equivalent.

During 2008, 13 projects gained initial approval and in the international arena 4 projects had been registered so far, after CDM Executive Board approval.

In Keeping with provisions and decisions of Montreal Protocol on the progressive reduction of consuming Ozone Depleting Substances ODS , the report reflects Egypt's Commitment with its obligations in that respect by getting rid of ODS and their replacement with highly eco- friendly alternatives in different sectors : halon, medical aerosols, maintenance and repair of refrigeration equipments and methyl bromide sector .

The report addresses in details Freshwater and Coastal Zones being the main theme in 2008 report.

In Freshwater field, Egyptian government sets Water Resources National Plan which depends on water integrated management and achievement of sustainable development principles in light of the increase in population growth rate to an average of 2.1% /year with water resources stability of 55.5 milliard m^3/year ; accordingly reduce the current average per capita from water to 300 liter /day . The plan which involves all concerned ministries , bodies and institutions aims at developing water resources and improving efficiency of its use in addition to protect public health and environment through the protection of water resources from all forms of pollution .

In field of Coastal Zones:

Coastal Zones' part addresses Egypt's adoption of the integrated management principle for these zones since 1980s and ministry's efforts to prepare and coordinate national initiatives in that field because of coastal zones' containment of many natural resources with economic and environmental value which requires their perseverance and sustainability.

The report highlighted exerted efforts to reduce pressures against coastal zones which include beaches' erosions , degradation of water quality , irrational use of land , destruction of living organisms habitats , degradation of natural resources , climate changes and rise of sea level .

The report refers to works and activities supporting policies at local and regional levels. In addition to the integration of planning, sustainable development and environmental monitoring of coastal water quality in both Mediterranean and Red seas during 2008.

The report represents the most important changes that have occurred in the development of **Biological Diversity** during 2008 , extent of improvement compared to the previous year , taken actions and its affecting factors , exerted efforts to improve biological diversity conservation and achievement of global goal for 2010 to significantly reduce rate of biodiversity loss .

The report represents in details development and management activities of the established protected areas and declaration of new ones, finalizing estimation of biological diversity and supporting actions for its conservation which include institutional report, capacity building and sustainability of projects financed by development partners. .

The report addresses activities of **Afforestation, Green Belts, Landscaping** and plantation of timber forests by the safe usage of treated wastewater, which contributes to absorb amounts of carbon dioxide resulting from different development activities; thus reduce their negative environmental effects.

Ministry's efforts include continuing implementation of green belt project around Greater Cairo with length of 100 km and plantation of 5 million trees ; in addition to begin cultivation of 16984 Feddans in 27 forests distributed in 8 governorates during 2008.

During 2008 , 60 schools were provided with trees in context of developing schools' project in the most needy areas (El-Marg , El-Salam , El-Nahda and El-Zaitoun) ; as well as continuing cultivation of green landscapes in Suzane Mubarak Garden located in New Cairo (60 Feddan) and Peace Botanical Garden in Sharm El-Sheikh (32 Feddan) .

The report includes Ministry's efforts to improve environment quality and **Environmental Development of Slums** which includes programs to transfer and develop polluting activities in governorates to non-residential areas to reduce their environmental impacts, supporting and development program of small and medium sized industries affecting slums and environmental development for El-Masara , Ezbat Al-Walda and Ezbat Khair Allah .

The report highlighted Prime Minister's decree issued in 2008 concerning establishment of the Fund for slum areas' development which will greatly contribute in the elimination of sever problems experienced by slums dwellers .

In Energy Field the report pointed to the increasing demand for energy consumption with 4% in general and about 7% for electric power annually in particular, which necessitates application of the National Energy Strategy, that includes rationalization of energy consumption, improving its efficiency and maximizing utilization of new and renewable energy sources to reach to 20% from the total energy generated in 2020 .

Industry Part focuses on the importance of supporting industrial facilities to achieve environmental commitment .The Ministry is implementing the second phase of the Industrial Pollution Abatement Project which provides concessional financing package for companies to adjust their environmental conditions ;as well as support major ,medium and small sizes industries to commit with environmental laws through the Environment Protection Project for both private and public industrial sector .

The report clarifies exerted efforts during 2008 in the field of **Integrated Management of Solid Wastes** to reduce their negative effects ;including control over public landfills and participate in transferring pigs-raising activities outside residential areas and development of wastes management system in the most needy villages and some districts in Greater Cairo .

The report also includes exerted efforts during 2008 to **Control Hazardous Substances** from chemicals and pesticides and those related to reduce negative effects for agricultural and medical hazardous wastes; as well as the technical support which was submitted for the sound disposal of hazardous wastes found in some areas.

In the part of **Culture and Environmental Awareness** ,the report represents Ministry's exerted efforts during 2008 to spread environmental awareness among all segments of the society which includes convention of seminars ,continuous environmental campaigns and convoys to raise environmental awareness ;in addition to cooperation with various ministries and different institutions particularly Ministry of Education through the Program of Environmental awareness in schools , support implementation of radio and television programs and publishing specialized environment pages in newspapers .

The report points to the support provided to governmental and non-governmental institutions to integrate environmental issues within their various programs which led to positive results in increasing environmental awareness.

In context of financial support offered by the Ministry to governmental bodies, NGOs and private sector in environmental protection field, the pre-final part of the report includes activities of **Environment Protection Fund** which represent projects that were funded during 2008 by EPF or through participation with other financing entities .EPF activities included 40 projects in the field of improving air and water quality , rationalization of energy use and safe disposal of solid and hazardous medical wastes .

The final part briefly reviews some **Global Environmental Trends** such as subject of **Green Cities and Green Building** in context of keeping pace with these trends through which buildings and urban planning are designed with a manner preserves natural resources and contribute to rationalize energy consumption , optimize use of construction materials and good urban planning which leads to meet needs of present generation without prejudicing future generations rights .

It also addresses topics of **Green Chemistry** which is based on the key principle " **preventing pollution and not controlling pollution** " , through promotion of innovative chemical processes technology which seek to prevent or reduce inputs /outputs and emissions containing hazardous materials .This includes all phases : design , manufacture and use .

Finally, I would like to highlight that Ministry of State for Environmental Affairs is cooperating continuously with all ministries , agencies and stakeholders in the State ; as well as civil society organizations , private sectors and NGOs to achieve the integration while working in the environmental field without prejudicing rights of future generations in natural resources and wealth ,while implementing social and economical development plans pursuant to sustainable development principle .

Minister of State for Environmental Affairs
Eng. Maged George Elias

Methodology

Report Objectives:

Firstly: Implementing an important article of Environmental Law 4/1994, its Executive Regulation and amendment Law 9/2009

Secondly: Delineating a clear and accurate picture of an important element of the environment – water (fresh and coastal) while identifying their negative and positive changes, with a brief presentation of changes that took place in the other three elements - air , biodiversity and urban environment.

To achieve these objectives, the methodology pursued in developing this report on four fundamental principles:

I- principle:
Transparency: It is to this effect that the real image of environmental status in the Arab Republic of Egypt has been displayed using updated data available to MSEA-Egyptian Environmental Affairs Agency EEAA, in cooperation with all ministries, organizations and think–tankers. The State believes that this openness principle would allow the people to know the nature and magnitude of impacts the environment is exposed to as well as State's efforts to mitigate them.

II- Principle:
Participation: The report relied in its development and revision on the participation of experts, researchers and environment stakeholders representing various executive sectors such as line ministries, research centers, universities, and environmental information experts, representatives of private sector, non governmental organizations and associations.

III- principle:
Adoption of internationally recognized standards in developing State of the Environment Reports : towards this end , a scientific approach has been applied in writing this report including all fields : (sources , harmful impacts, environmental indicators , exerted efforts to reduce negative impacts and future vision).

IV- principle:

Necessity of linking between Egypt's international commitments in virtue of its ratification on international environmental agreements that affecting global environmental and national efforts to deal with national environmental issues , as it is difficult to detach between local and global environmental effects due to the fact that we are living in one planet (Earth).

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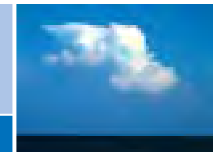
Part 1

Air

Chapter 1
Air quality



1-1 Introduction

Air pollution is one of the most important challenges and obstacles facing Egypt, which have a major impact on increasing rate of development in all fields. Over courses of history, air exposed to pollution through the exotic pollutants resulting from volcanic vent, burning of forests, dust and micro-organisms that cause diseases; but they were not quantitative enough to cause negative consequences, as human being was able to avoid or even tolerate. However, the problem had emerged with the significant increase in various manufacturing processes and its accompanied emissions all over the world, the terrible increase in population number in addition to the development and increase of vehicles' number operated with fossil fuel, which is considered the worst cause of air pollution despite the fact of their necessity to modern life; they emit large quantities of gases, such as toxic carbon monoxide, sulfur dioxide and nitrogen oxides that pollutes air and contribute in increasing ozone .

1-2 Networks for Monitoring Ambient Air Indicators

Environmental indicators and data that had been monitored over past years by the National Network for Monitoring Air Pollutants affiliated to Ministry of State for Environmental Affairs and Air Pollution Monitoring Stations affiliated to Ministry of Health were the most important and necessary mechanisms in environmental assessment field that used in monitoring sustainable development progress over years, as follows:

1. These indicators and data are used in preparing reports of the Integrated Environmental Assessment, Sustainable Development, and State of Environment.
2. The indicator is an important tool to identify, designate, analyze and evaluate environmental problems, in addition to identify priorities and monitor changes in environmental and sustainable development fields along different time.
3. The indicator is an important method to follow-up and measure performance of policies and improvement in achieving specific objectives.
4. The Indicator provides decision makers with obvious and clear facts about state and trends of environment and sustainable development.

Ministry of State for Environmental Affairs gives great interest to Air Pollutants Networks. By the end of 2008, a project had been carried out to rehabilitate network stations, update its devices and add 8 new monitoring stations to raise the efficiency of monitoring devices and ensure accuracy of the collected data. The following data clarify the most important results of air quality indicators collected during 2008, according to monitoring results compared to what had been monitored in previous years.

Table (1-1) :Geographical distribution of EEAA's National Network Stations for Monitoring Air Pollutants.

Site Type	Greater Cairo		Alexandria		Delta		Upper Egypt		Sinai and Canal Cities		Total	
	Established Sites	New Sites	Established Sites	New Sites	Established Sites	New Sites	Established Sites	New Sites	Established Sites	New Sites	Established Sites	New Sites
Industrial areas	7	1	3		3	1*	3			1*	16	3*
Urban areas	9		1		4		7				21	
Residential areas	4	1*	2		2		2				10	1*
Traffic dense areas	7	3*					1				8	3*
Remote areas	4		1		1		1		2		9	
mixed areas	10	2*	1		2		1				14	2*
total	41	7*	8		12	1*	15		2	1*	78	9*
	48		8		13		15		3		87	

- Sites establishment during October 2008

Map (1-1) Air Quality Monitoring Stations in Egypt

• **Source: EEAA.**

1-3 Air pollutants

Pollutants measured by Environmental Monitoring Networks of Egypt divided into main pollutants "primary ", which arise as a result of industrial production processes or traffic density, such as sulfur oxides, nitrogen oxides, suspended particles and carbon monoxide pollutants and "secondary" pollutants that appear as a result of the interaction among key pollutants or with certain chemical compounds in the atmosphere such as ozone.

1-3-1 Sulfur Dioxide (SO_2)

Sulfur dioxide is primarily generated as a result of sulfur residues oxidation in liquid petroleum fuels during combustion process in either stationary sources as energy generation stations and factories or mobile sources as vehicles, especially those operated with diesel fuel; and the use of diesel fuel in power plants and brick factories. The permitted annual limit in law 4/1994 is 60 µg/m3.

1-3-2 Nitrogen Dioxide (NO_2)

Nitrogen dioxide is generated as a product of all fuel combustion taking place at high temperatures; there is no annual limit for the concentration of nitrogen dioxide in the Executive Regulation of Law 4/1994, but World Health Organization's annual limit which is 40 µg/m3 is taken as a guide.

1-3-3 Inhaled Particles (PM_{10})

Inhaled particles are considered a major pollution problem in Egypt, especially in Greater Cairo due to the multiplicity and various sources of pollution. During recent years a focus has been conducted upon monitoring concentrations of suspended dust particles in the air with diameter less than 10 µm, which constitutes an imminent risk to public health as it is more inhaled and settled in lungs. The permitted annual average limit is 70 µg/m^3.

1-3-4 Lead (Pb)

Forms of human exposure to lead pollution are multiplied, either through inhalation of air, eating contaminated food with lead or one of its derivative products; the most important form represented in the inhalation of suspended particles in the air or dust, which leads to the accumulation of this toxic element in human blood through the respiratory system. Lead affects digestive system, immune system, kidney , liver and blood vessels; and it has been proved that children bodies absorb lead with higher rates than adults, which expose them to serious risks. The permissible limit is 0.5 µg/m^3.

1-3-5 Carbon Monoxide (CO)

Carbon monoxide emits from cars fuel exhausts, coal or wood combustion in heaters. It is one of the most dangerous types of air pollutants and the most toxic to humans and animals due to its combination with hemoglobin forming Carboxy hemoglobin which prevents oxygen from combining with hemoglobin and thus deprives body from accessing oxygen that causes internal suffocation.

Executive Regulation of Law4/1994 stipulates upon that maximum allowable exposure to carbon monoxide for one hour is 30 mg/m^3 and for 8 hours is 10 mg/ m^3, but it dose not specify any limits for the exposure along a period of 24 hours or a year.

1-3-6 Ozone (O_3)

Ozone consists in lower layers of the atmosphere from the interaction of volatile organic pollutants emitted by vehicles with nitrogen oxides in the presence of sunlight. Therefore, ground ozone concentrations increase during summer months than winter as a result of the increase in sunshine hours. Ozone constitutes a serious threat to human health and it leads to the occurrence of smog phenomenon when its concentrations increase greatly. Therefore Executive Regulation of law 4/1994 determines that highest environmental concentration of ozone gas must not exceed 200 μg/m^3 in one hour, while its limit during 8 hours must not exceed 120 μg/m^3.

1-4 State of ambient air quality during 2008

1-4-1 Sulfur Dioxide (SO_2)

Figure (1-1) shows the overall average concentrations of sulfur dioxide over the past five years (2004-2008) in Egypt, the average concentrations clarifies a steady improvement in concentrations measured since 2004, as the average concentrations monitored during 2008 were approximately 31 µg/m^3, while during 2006 and 2007were about 36.6 and 38 µg/m^3 respectively. It also clarifies the existence of a noticeable improvement in the annual average concentrations measured during the previous five years by 20-30% due to the exerted efforts by all concerned ministries with the support and coordination of the Ministry of State for Environmental Affairs to reduce pollutants.

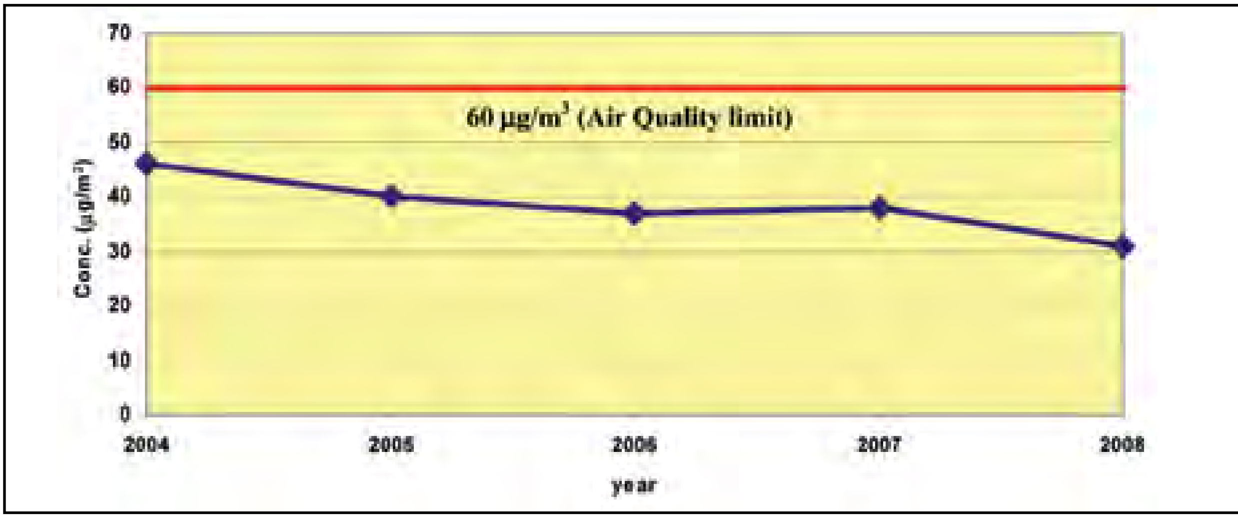


Fig (1-1): The annual average concentration of SO_2 (2004-2008) in Egypt

• **Source: EEAA.**

In general, studying air quality indicators measured during 2008 for sulfur dioxide shows that the annual average of measured concentrations did not exceed the permissible limits of Environment Law 4 /1994 , (60 µg/m^3/ year) ,in most monitoring stations in Cairo; with the exception of 3 monitoring areas only "Gomhoriya , Kolaly and Maadi" , which exceeded the permissible limits where their monitored annual average concentrations during 2008 were about 65 , 98 and 72 µg/m^3 respectively that is higher than the monitored concentrations during 2007, which were about 51 , 83 and 35 µg/m^3 respectively. This relative increase is due to the expansion and increase of economic growth and industrial activity, thus increasing fuel burning rate in these areas as well as the increase in vehicles numbers which had contributed greatly in increasing pollution rates.

Table (1-2) shows the annual average monitored concentrations of sulfur dioxide during 2007 and 2008 in all regions of Egypt, which shows the presence of a significant decrease in concentrations that were monitored during 2008 compared to 2007, since the annual average monitored concentrations in Greater Cairo during 2008 were approximately 39 µg/m^3, while during 2007 were about 49 µg/m^3. Whereas the annual average monitored concentrations in Delta during 2008 were about 15 µg/m^3 and during 2007 were about 18 µg/m^3. A relative stability in concentrations was monitored in Canal cities since its annual average monitored concentrations during 2007 and 2008 were about 12 µg/m^3.

Table (1-2): The annual average concentration of SO2 (µg/m3) during 2007-2008

Region	2007 (µg/m3	2008 (µg/m3
Greater Cairo	49	39
Delta Cities	18	15
Upper Egypt Cities	21	16
Canal Cities	12	12

The following figure (1-2) shows the annual average monitored concentrations of sulfur dioxide at different areas of Egypt during years 2007 and 2008. It shows the extent of improvement in 2008 measurements compared to 2007 in most monitoring areas. It is also noticeable that the overall annual average concentrations of sulfur dioxide in all areas did not exceed the permissible limit of Environment Protection Law 4/1994 during 2008.

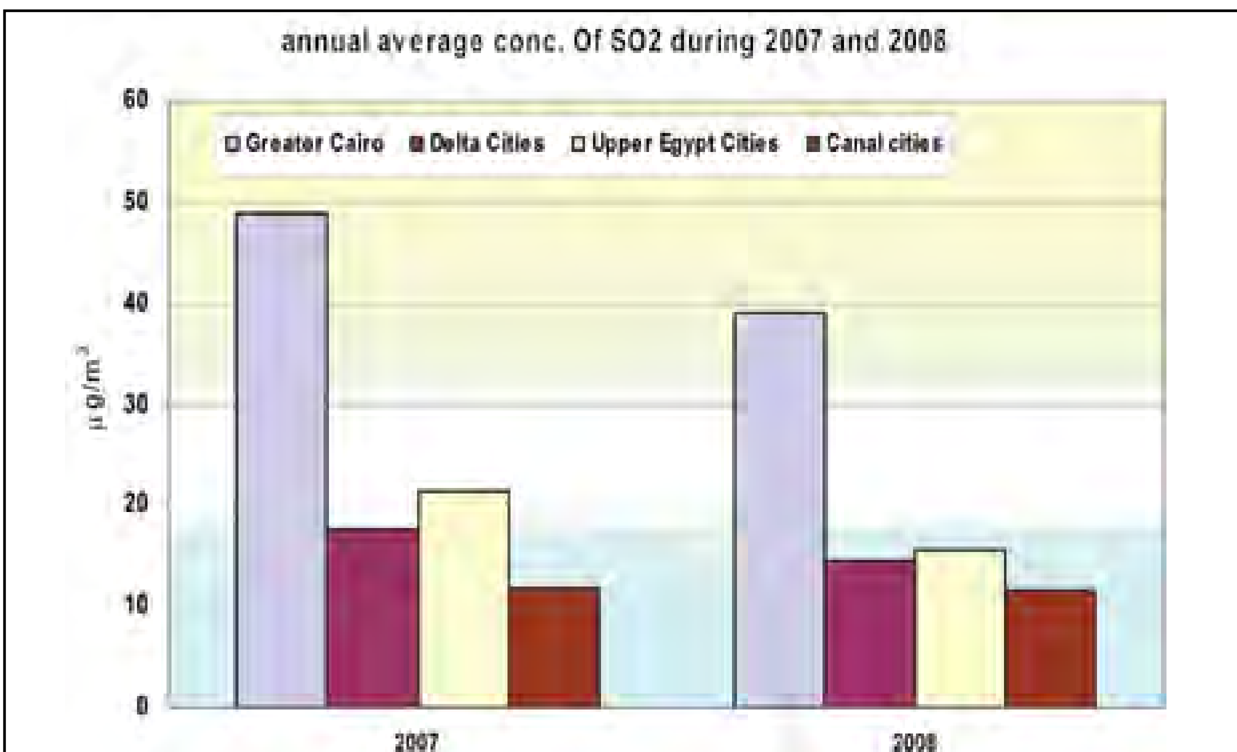


Fig (1-2): The annual average monitored concentration of sulfur dioxide during 2007 and 2008

• **Source: EEAA**

1-4-2 Nitrogen Dioxide (NO_2)

The most monitoring sites of nitrogen dioxide gas have exceeded the limit (40 µg/m^3) during 2008. It should be noted that the overall average concentrations of nitrogen oxides during the previous five years had exceeded the limit (Figure 1-3), the figure shows a noticeable increase in concentrations during 2008 than previous years, where the annual average concentration of 2008 was about 60.1 µg/m^3, while in 2007 was about 46.1 µg/m^3 with 30% increase approximately. It is noteworthy to clarify that this problem is not a new one , the increase in vehicles number during past years led to raise the average annual concentrations of nitrogen dioxide to exceed the limit allowed by World Health Organization (40 µg/m^3). Beside, the expansion in using natural gas either in industry, production of electricity or fuel for vehicles contribute in increasing nitrogen dioxide concentrations.

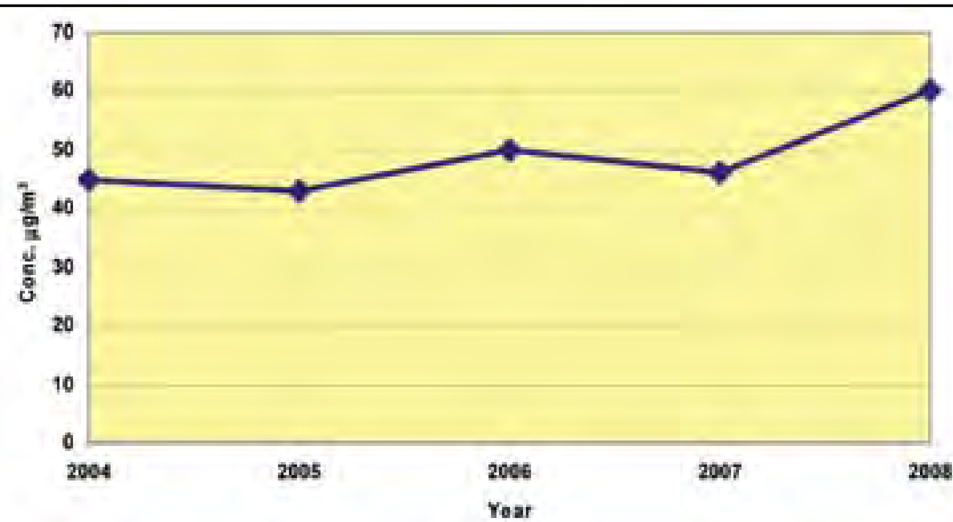


Fig (1-3): The annual average concentration of Nitrogen Dioxide (NO2) during the previous five years in Egypt

• **Source: EEAA**

Table (1-3): The annual average concentration of NO2 (µg/m3) during 2007 and 2008

Region	2007 (µg/m3)	2008 (µg/m3)
Greater Cairo	48	64
Delta Cities	38	37
Upper Egypt Cities	42	46
Canal Cities	48	60

By studying monitored concentrations over previous years, an increase in No2 concentrations was noticed during some days over the past year, especially in locations with highly dense traffic as a result of the increase in vehicles' exhausts, especially during traffic congestion periods. Fig. (1-4) shows the average annual concentrations of No2 in different monitoring locations during 2007-2008, that indicates a relative increase in 2008 measurements compared to 2007 in most monitoring locations, as monitored concentrations of Greater Cairo during 2008 were 64 ug/m3 and 48 ug/m3 during 2007.

But in general, we find that measured concentrations of nitrogen dioxide per an average hour do not exceed the permissible limit in the Executive Regulation of Egyptian Environmental Law 4 / 1994 (400 µg/m^3/ hour of exposure) during 99% of the year in most of the stations, which is a good sign; but we must be aware of the fact that the expand in using natural gas as fuel, either in industry or transport leads to increase concentrations of nitrogen dioxide, if we do not use equipments to reduce emissions of this gas (Low-NOx burners) ; therefore studies of environmental impact assessment for new industrial projects or projects to be converted to use natural gas must include the necessity of using such equipments in the process of burning natural gas to reduce nitrogen dioxide emissions .

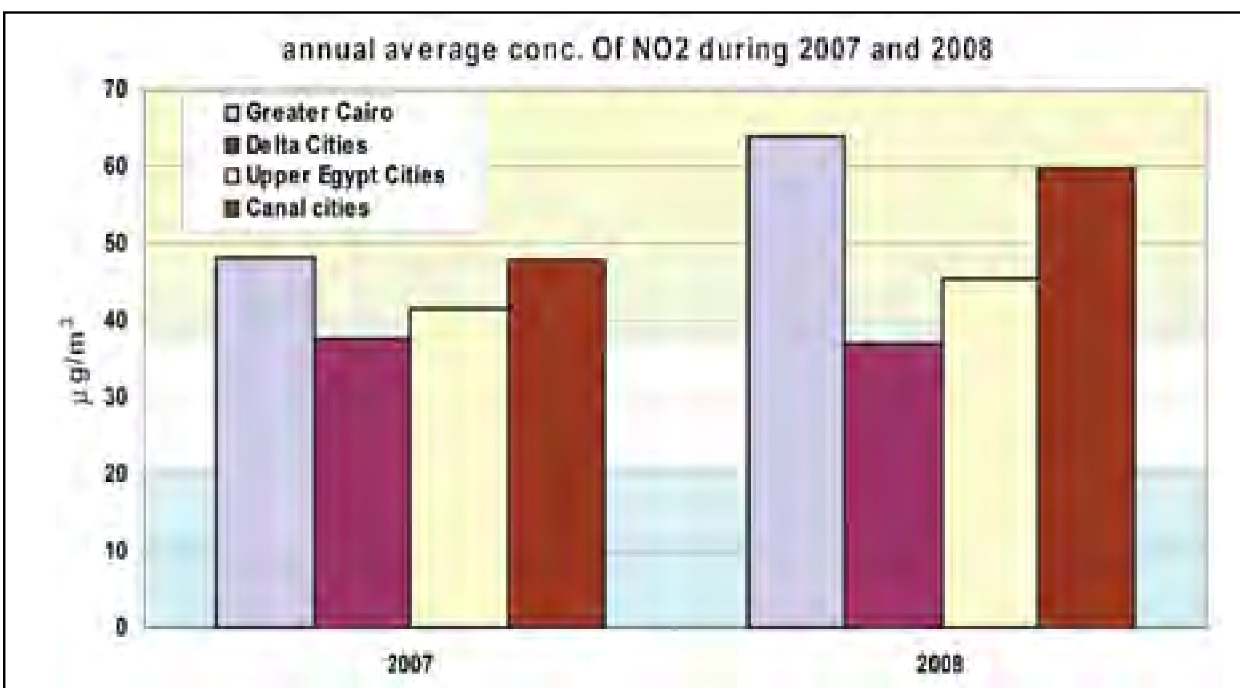


Fig (1-4): The annual average concentration of nitrogen dioxide in some locations during 2007 and 2008

Source: EEAA

1-4-3: Inhaled Particles (PM_{10})

The following figure (1-5) illustrates the annual inhaled particulates concentrations during the previous five years (2004-2008), and shows that despite the high average annual concentrations during 2008 which exceeds the annual average permissible limits of Environment Law (70 µg/m^3) , it is less than the annual average concentrations which were monitored during the previous years which were about 137 µg/m^3 during 2008 and 151 µg/m^3 during 2007.

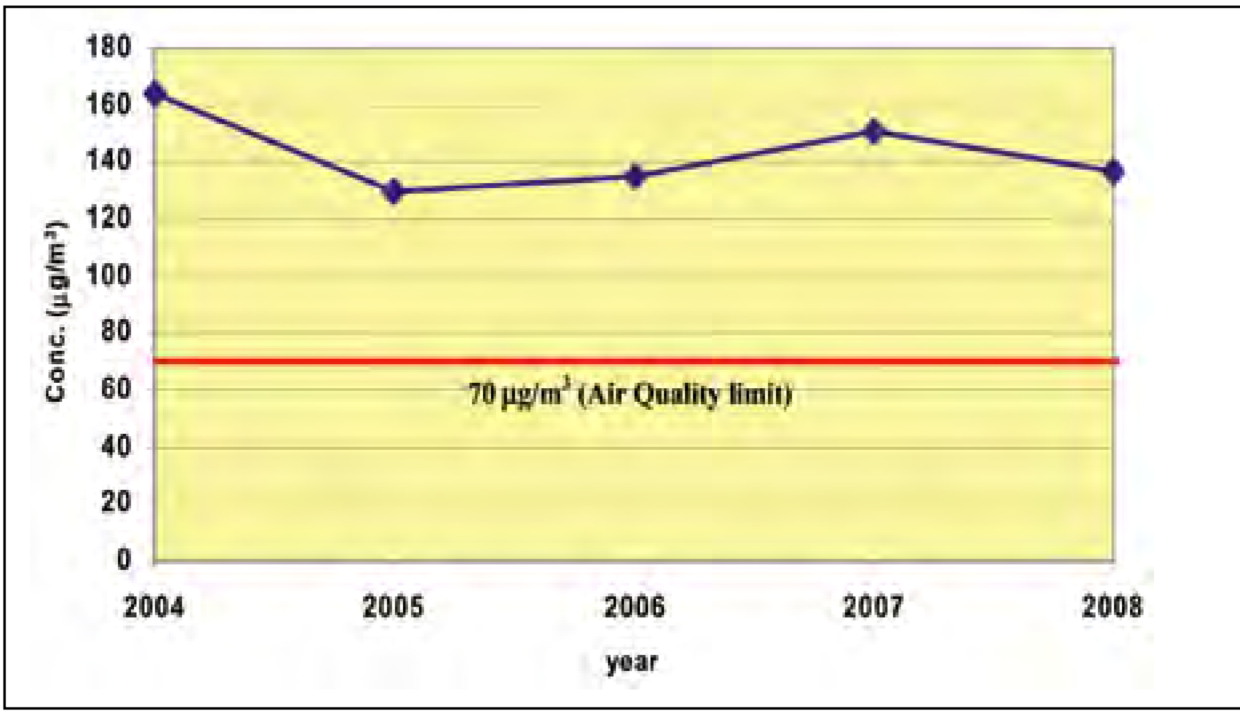


Fig (1-5): The annual average concentration of suspended particulates (PM_{10}) during the previous five years in Egypt

• **Source: EEAA**

Table (1- 4) illustrates the annual average concentrations of suspended particulates (PM10) in some sampling sites all over Egypt during 2007 and 2008. In general, comparing results of the monitored PM10 during 2008 and 2007 as it is shown in the following table clarifies a noticeable improvement in results of the monitored particulates in most areas ranging between 20-30% over the previous five years. Figure (1-6) marked a reduction in dust concentration in all monitoring stations measured during 2008 than the concentrations measured during 2007.

Table (1-4):The annual average concentration of suspended particulates (PM_{10}) in some monitoring sites in Greater Cairo during 2007 and 2008

Station	2007 (µg/m³)	2008 (µg/m³)
Kolaly	177	158
Kobry El-Koba	159	131
El-maadi	171	114
El-Giza	165	142
6Th October	135	113
Mokattam	140	119
Shoubra El-Khema	188	158
El-Sahel	152	158
Matrriya	146	130
El-Waily	144	154
Imbabia	134	125
Kaha	119	117
Basatten	161	115
Tahrir	139	112
Zamalek	144	129
Helwan	140	122
Massara	177	162
Helioplois	130	114
Abu Zabaal	195	131

It should be noted that monitoring of suspended dust is carried out by two ways. The first, by instantaneous monitoring equipments throughout the day and the second through sampling filters for 24 hours and analyzed in specialized laboratories to determine percentage of dust sticking to these filters. Air quality indicators of suspended particulates shows that, the annual average concentration of suspended dust with diameter less than 10 micrometers during 2008, is still recording high concentrations in large proportion of the monitoring and measurements sites all over the country.

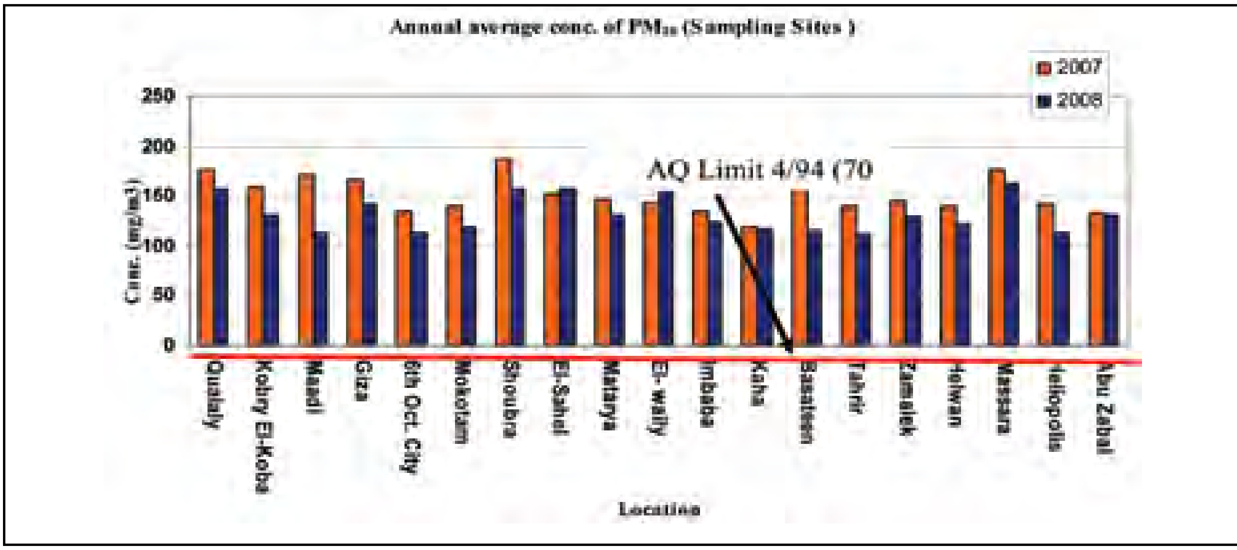


Fig (1-6): The annual average concentration of suspended particulates (PM10) at sampling stations in some locations of Greater Cairo during 2004 and 2008

• Source: EEAA

As for monitored concentrations with instantaneous measurement equipments; an obvious decrease was measured in the monitored average concentrations of some locations, such as Kolaly, Fum El-Khalig and Heliopolis in 2008 compared to those measured during 2006 and 2007 (Fig. 1-7).

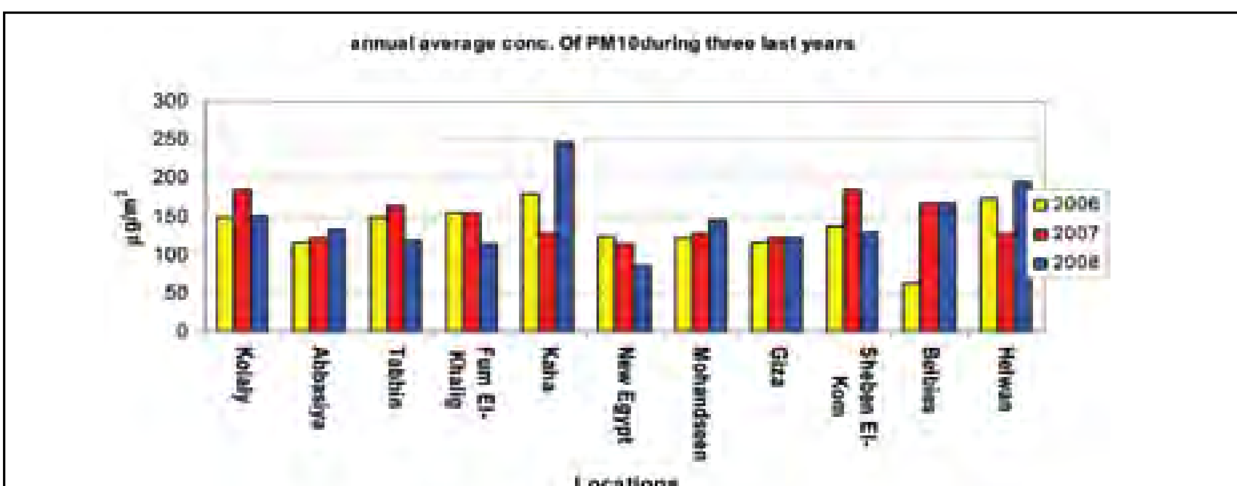


Fig (1-7): the annual average concentration of suspended particulates (PM_{10}) in some locations during the last three years (Instantaneous Measurement Stations)

• Source: EEAA

1-4-4: Lead (Pb)

Monitoring results of lead concentrations in Greater Cairo during previous years shows a significant decrease during 2007 and 2008, compared to concentrations observed during 2000 as a result of Ministry of State for Environmental Affairs exerted efforts to implement a National Program aimed at reducing lead pollution loads in Shoubra El-Khaimah area ,which began in 1998 and ended in March 2008 by a project to transfer foundries and cleaning lead-contaminated sites in Shoubra al-Khaimah ;as well as the expansion in producing unleaded gasoline by Ministry of Petroleum. These efforts had been accompanied with MSEA implementation of Executive Regulation of Environment Law 4 /1994 amendments with respect to the permissible limits of lead concentrations in air to become 0.5 µg/m^3 in residential areas and 1.5 µg/m^3 in industrial areas instead of 1 µg/m^3 in all areas, whether industrial or residential areas.

Figure (1-8) shows the annual average concentrations of lead during the last five years (2004 – 2008). It is observed that there is a decrease in the overall average concentrations of lead in Greater Cairo from 1.2 µg/m^3 during 2004 to 0.74 µg/m^3 during 2008 with 38.3% reduction, which is a good indicator of National Program success to reduce lead emissions.

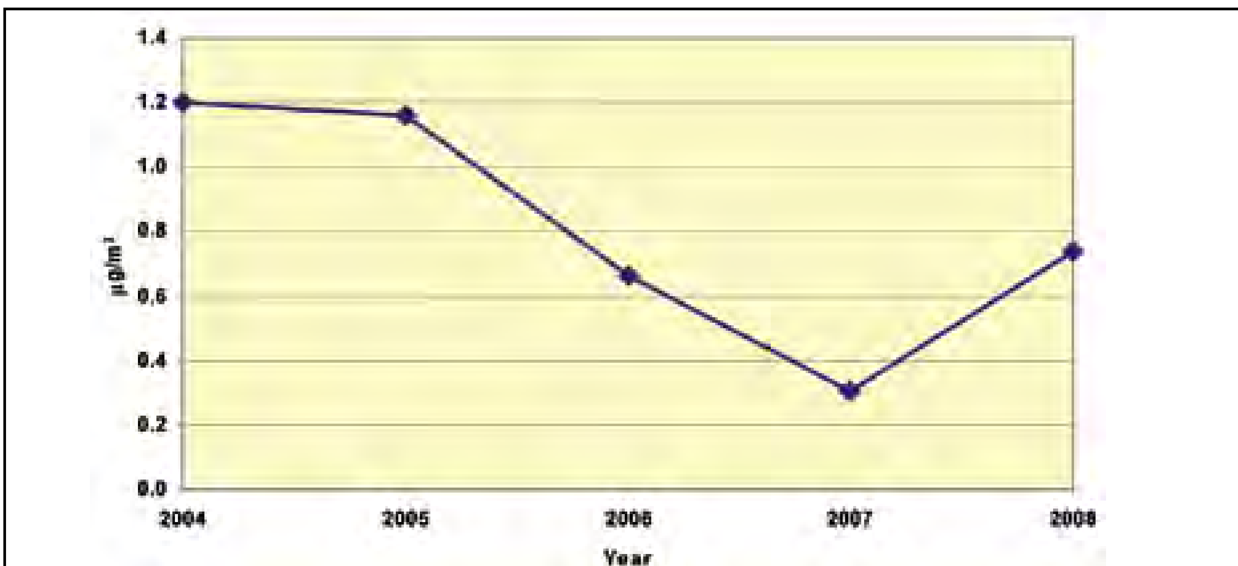


Figure (1-8): The annual average concentration of lead (Pb) from 2004-2008 in Egypt

• **Source: EEAA**

But despite this success, we note that lead concentrations observed during 2008 were significantly higher than its concentrations observed during 2007 in most stations, this can be traced to the return of non-licensed foundries to work in addition to the significant increase in consumption of gasoline 80 during the previous period as a result of the high price of other types of gasoline which lead owners of private vehicles to use this type of gasoline due to its competitive price. Abu Zaabal area recorded the highest concentrations of lead during 2008, due to the transfer of foundries to El-Safa area in Abu zabal, as shown in table (1-5).

Table (1-5) The annual average concentration of Lead (Pb) in some monitoring sites in Greater Cairo during 2007 and 2008

Station	2007	2008
Kolaly	0.27	0.63
Kobry El-Koba	0.41	0.70
El-maadi	0.35	0.46
El-Giza	0.38	0.62
6Th October	0.27	0.47
Mokattam	0.33	0.57
Shoubra	0.33	0.87
El-Sahel	1.04	1.14
Matrriya	0.26	0.54
El-Waily	0.28	0.68
Imbabia	0.23	0.50
Kaha	0.39	0.49
Basatten	0.27	0.51
Tahrir	0.26	0.65
Zamalek	0.26	0.80
Helwan	0.35	0.52
Massara	0.27	0.65
Heliooples	0.25	0.73
Abu Zabaal	1.20	2.49

By comparing the average concentrations observed during 2008, we find that lead concentration is about 0.5 μg/m^3 in residential areas, 1 μg/m^3 in industrial areas, and 0.6 μg/m^3 in traffic areas. Fig. (1-9) shows lead average annual concentrations during the previous five years. It clarifies a decrease in lead average concentrations in most of Greater Cairo; for example, monitored annual average concentrations during 2008 in Kolaly, Giza and Tahrir were about 0.36, 0.62 and 0.65 ug/m3, while concentrations during 2004 were 1.07, 1.09 and 1.08 ug/m3, respectively. This is a good indicator of the National Program of Lead Emissions Reduction Success.

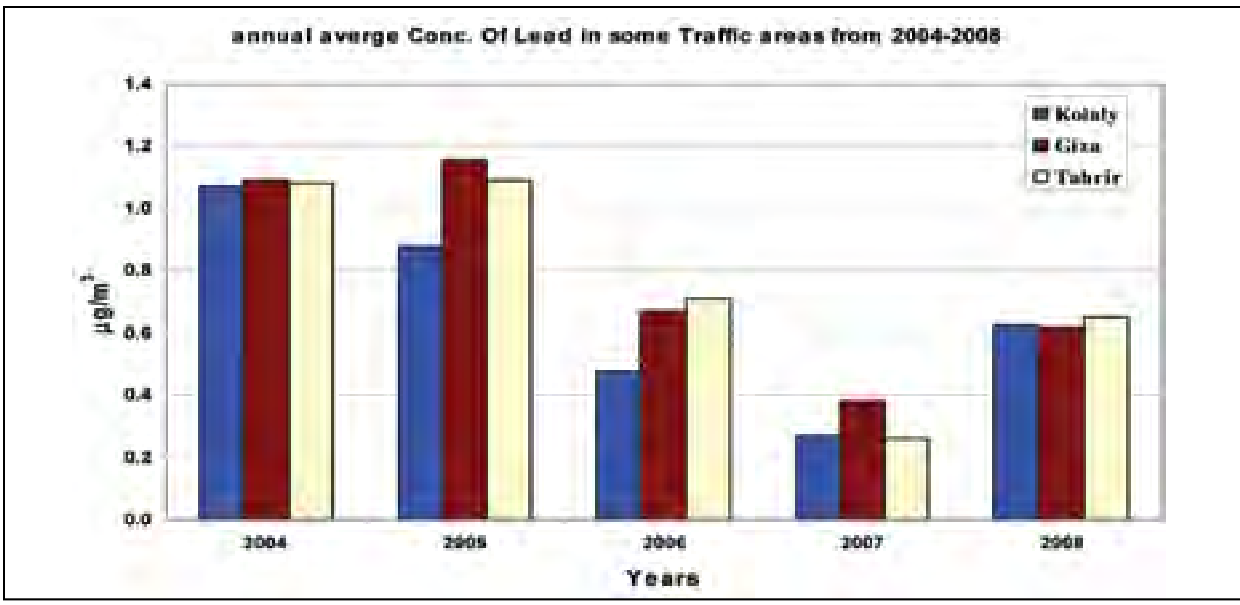


Fig (1-9): The annual average concentrations of lead in some traffic areas from (2004-2008)

• **Source: EEAA**

1-4-5: Carbon Monoxide (CO)

Figure (1-10) describes the annual average concentrations of carbon monoxide gas from 2004 to 2008, which shows an improvement in concentrations of carbon monoxide during 2008 than previous years. It should be noted that, although carbon monoxide concentrations for 8 hours exceeded the permissible limits in some cases, but it did not exceed the duration of exposure per hour at any time during 2008. This is due to EEAA exerted efforts in coordination with all stakeholders for the implementation of environmental-friendly projects, particularly taxis replacement project, which was adopted by Ministry of State for Environmental Affairs. This improvement is due to the efficiency of fuel used for power stations and industrial sector, reducing use of diesel fuel in this sector and carry out examination for vehicles exhaust on roads. It should be noted that EEAA is currently increasing number of stations that measure carbon monoxide, to accurately study its effect on human health.

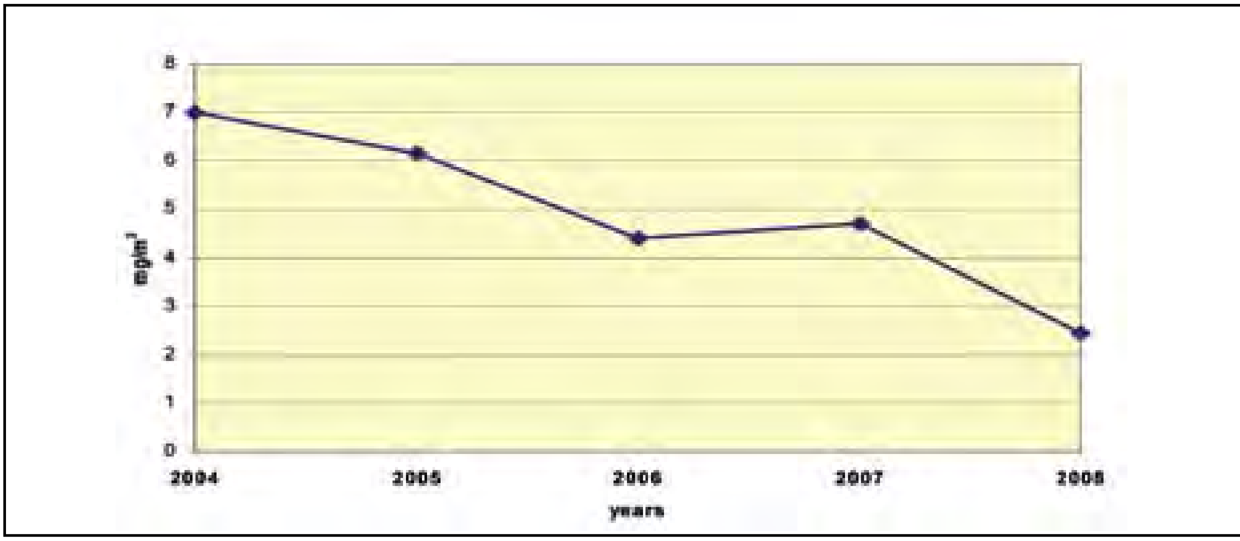


Fig (1-10): The annual average concentrations of Carbon Monoxide in Egypt from (2004-2008)

• **Source: EEAA**

1-4-6: Ozone (O3)

Figure (1-11) shows the annual average ozone concentrations from 2004 till 2008 where a decline in concentration of surface ozone observed during 2008 compared to the average concentrations observed during 2006 and 2007; since concentration during 2008 was about 50 µg/m^3 while its average concentration during 2006 and 2007 were about 62 and 68 µg/m^3 respectively.

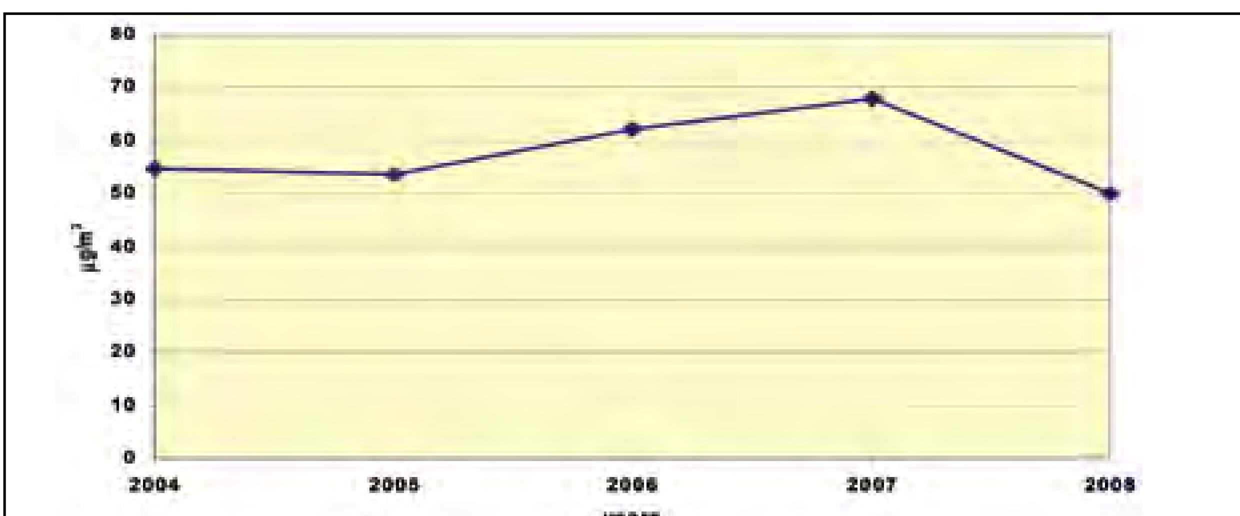


Fig (1-11): The annual average concentrations of Ozone in Egypt from (2004-2008)

• **Source: EEAA**

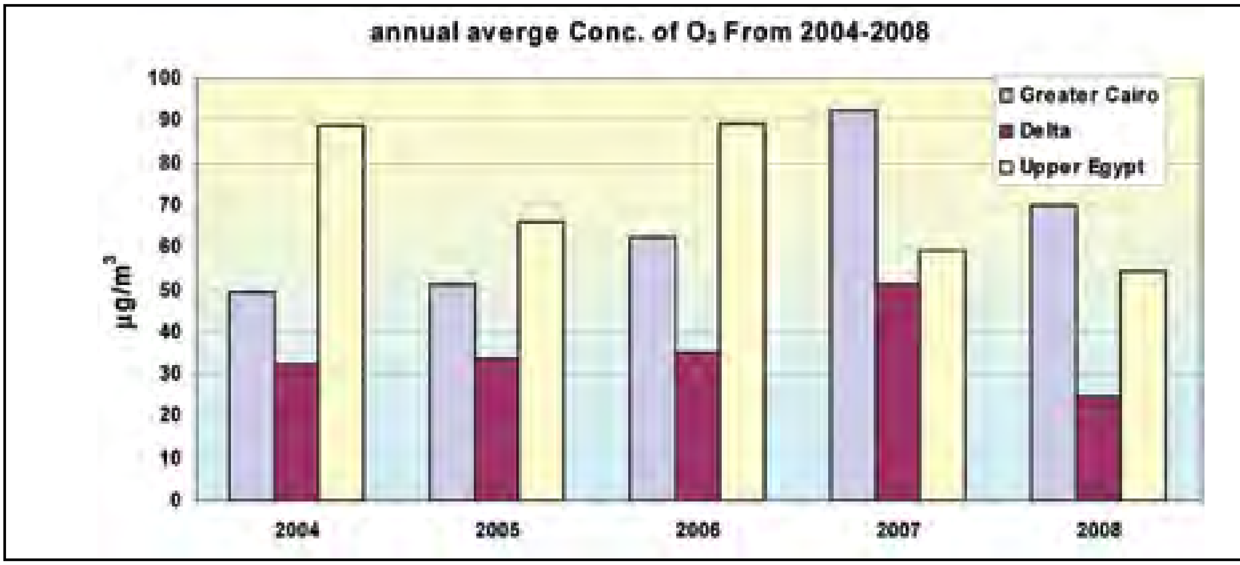


Fig (1-12): The annual average concentrations of Ozone (2004-2008) at some areas

• Source: EEAA

Figure (1-12) shows the annual average concentrations of Ozone gas from 2004 to 2008 in Egypt, which clarifies a clear improvement in Ozone concentrations in some areas. It should be noted that EEAA is currently increasing number of stations that measure Ozone to accurately study its effect on human health.

1-5 Air pollution episodes (Black Cloud)

Black cloud phenomenon is the most important chronic environmental phenomena that happen since 1999, especially in Greater Cairo sky. Its severity increase during night after sunset and early morning and varies from year to year; after studying and analyzing this phenomena by specialists and experts from EEAA and various research agencies ,it was found that dark cloud is caused due to the presence of the following key factors:

- High amounts of pollutants in Cairo air.
- Occurrences of a particular weather phenomenon known as the “reflection effect quote”.
- Topography of Cairo.
- Presence of many different sources that help in the pollution of Greater Cairo air, such as pollution resulting from industry, different means of transport and open burning of solid wastes.

Studying and analyzing indicators of air quality and monitoring main results during the acute episodes of pollution (from 15th September to 15th November) during 2008 by specialists and experts of EEAA and various research agencies, has shown the following:

1. In general, the average concentrations observed in Greater Cairo during the second half of September 2008 were lower than the average concentrations observed during the same period of the past two years, except two days " 22 and 25", as their concentrations were higher because of the bad weather
2. High concentrations occurred on 22^{nd} September were caused due to country exposure to an atmospheric stability continued for 8 hours, while on 25^{th} September due to the exciting dust wind that swept across Greater Cairo during this evening.
3. First half of October 2008 had been characterized with decrease in the observed average concentrations of suspended particulates during all monitoring hours compared to concentrations observed during the same period in previous two years.
4. Greater Cairo has been exposed to an increase in pollutants concentrations during 13th and 15^{th} October as a result of country exposure to the influence of a depression occurred in the western region that led to increase hours of air stability and wind calm for a long time during these two days.
5. Generally, concentrations observed during the first half of October 2008 were less than concentrations observed during the same period during previous two years.
6. Second half of October 2008 was marked with decrease in the observed average concentrations of suspended particulates during all monitoring hours compared to concentrations observed during that period in the previous two years, except on 18^{th} and 31^{st} October.
7. Concentrations were increased during 18^{th} and 31^{st} October in this year due to the increasing rates of rice straw open burning during these two days, which is reflected in reports of field follow-up and satellite images for Delta governorates.
8. Despite that, observed concentrations during the second half of October 2008 were generally less than the observed concentrations during the previous two years.
9. First half of November 2008, was characterized with a decrease in the observed average concentrations of inhaled particulates during all monitoring hours compared to concentrations observed during previous two years, with exception of 1^{st} November.
10. Average concentrations of all monitoring stations in Greater Cairo did not exceed warning limits during monitoring duration in 2008 except for only two hours on 1^{st} November, while they were 36 hours during 2007 and 21 hours during 2006.
11. There is a remarkable improvement in the daily average of sulfur dioxide concentrations in Greater Cairo, compared to previous years
12. It is noticeable that daily concentrations of sulfur dioxide were ranged between 20-40 µg/m^3 which is lower than the permissible daily average limits stated in the Executive Regulation of Environment Law 4 /1994 (150 µg/m^3).
13. There is a relative increase in daily average values of nitrogen dioxide concentrations in Greater Cairo, compared to previous years.
14. It is noticeable that daily concentrations of sulfur dioxide over the period were ranged between

60-90 µg/m^3 which is lower than the permissible daily average limits stated in the Executive Regulation of Environment Law 4 /1994 (150 µg/m^3).

15. This year higher concentrations of Nitrogen Dioxide during cloud period compared to last year is resulting from the increased rates of natural gas consumption which emits higher concentrations of nitrogen oxides in addition to increasing rates of emissions from industrial sources, overall nitrogen dioxide concentrations in Egypt during 2008 were about 60.1 µg/m^3 and 2007 were about 46.1 µg/m^3, with an approximate 30% increase.
16. There is a relative improvement in daily average values of suspended dust in Greater Cairo concentrations compared to previous years from 1st October till 15th November.
17. It is noticeable that daily concentrations of suspended particulates exceeded the permissible limit stated in the Executive Regulation of Environment Law 4 /1994 from 13th till 16th October 2008 and on 1st November 2008.
18. Maximum concentrations during 2008 were less than those observed during 2007, which noticed continuous high concentrations for long periods.
19. Decrease in number of hours that noticed an excess in concentrations of inhaled dust during 2008 compared to the previous two years.
20. Fum El-khalig Station noticed the largest decline rate in number of hours from 65 hours during 2007 to 22 hours only during 2008.
21. Kollay district noticed a decrease in number of hours from 123 hours during 2007 to 38 hours during 2008.
22. Heliopoles district noticed a decrease in number of hours from 43 hours during 2007 to 33 hours during 2008.

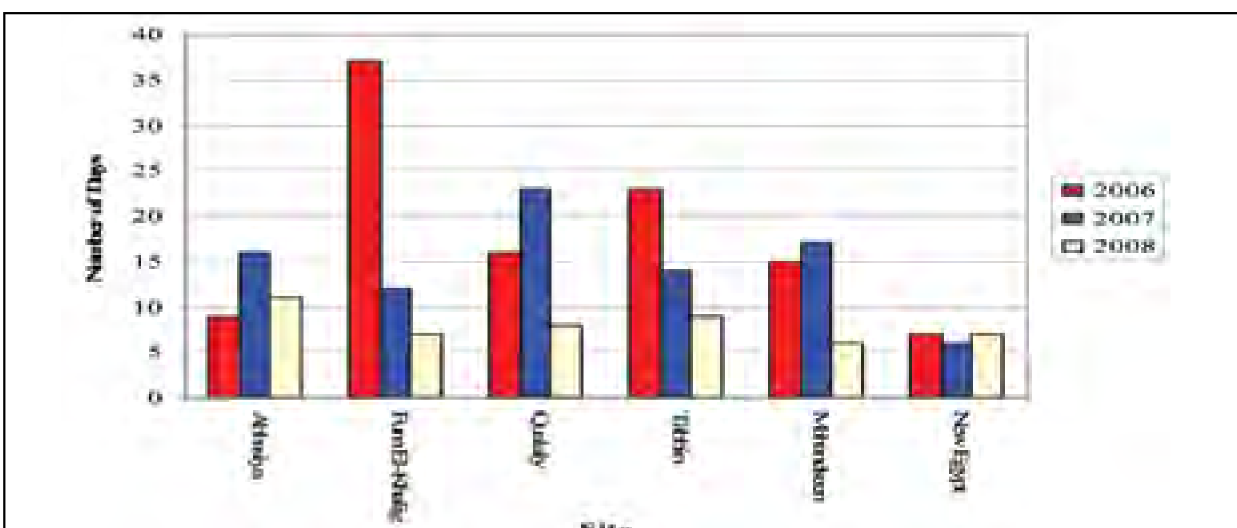


Fig (1-13): Total number of hours in which concentrations exceeded warning limits from 15th September till 15th November in (2006, 2007 and 2008).

- **Source: EEAA**

Table (1-6): The most important measuring results from 15^{th} September till 15^{th} November in 2007 and 2008

Indicator	2007	2008
Met. factors		
Wind Speed	1-6 m/s	1-7 m/s
Average WS during period	3.41 m/s	3.42 m/s
Number of Stability hours	160 hours	139 hours
Wind Direction	Approximately constant from North and East North direction	Changing between Eastern North and Western North direction
Thermal inversion thickness average	766 m	712 m
No. of Thermal inversion hours less than 100 m	61 hour	36 hour
Air Quality Indicators		
General average of PM_{10}	100-200 $\mu g/m^3$	35-180 $\mu g/m^3$
No. of hours > 300 $\mu g/m^3$	73	46
Abbassiya	123	38
Kolaly	65	22
Fum El-Khalig	97	58
Tebbin	43	33
Helioples	110	40
Mohandseen		
Maximum of hours number > 300 $\mu g/m^3$	123	58
Average of hours number > 300 $\mu g/m^3$	85	40

- **Source: EEAA**

23. It is noticeable that air pollutants concentrations did not refer to any abnormal increase in all monitoring stations from 15th September 2008 till 15th November 2008 with the exception of 5 days (22nd , 25th September; 12th , 13th October and 1st November) .

24. High concentrations of 25th September were due to the occurrence of dust storm on Greater Cairo and its continuity for several hours, after that the concentrations returned to their normal rates.

25. Number of hours that noticed an increase in concentrations over 300 µg/m^3 decreased from 85 hours during 2007 to 40 hours during 2008.

26. Number of days that noticed an increase in concentrations over 300 µg/m^3 decreased from 15 days during 2007 to 8 days during 2008 (Figure 1-14).

The above mentioned clarifies that exerted efforts by Ministry of State for Environmental Affairs in cooperation with different concerned ministries and authorities to face non-natural causes that lead to the appearance of air pollution episodes (Black Cloud), are moving towards the right direction . It also clarifies the importance of raising public awareness with the phenomenon and individuals' role to reduce its effects.

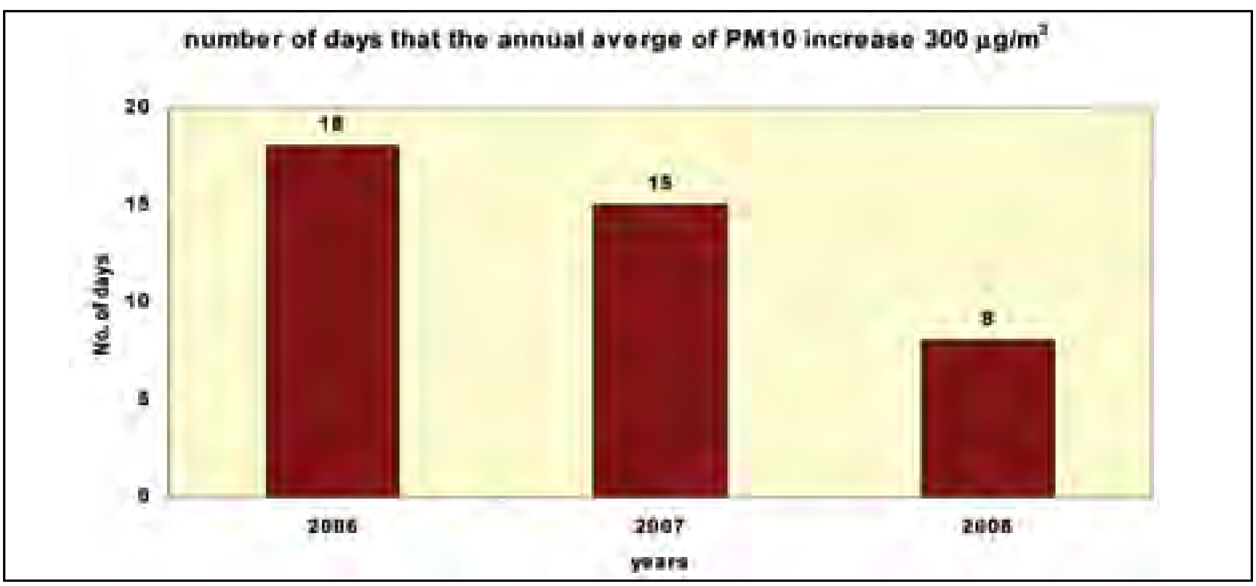


Fig (1-14): Number of days that witnessed an increase in the overall average concentrations of suspended particulates (PM_{10}) of 300 µg/m^3

- **Source: EEAA**

Relative distribution analysis of suspended dust concentrations over the past three years clarifies a decrease in hours that witnessed an increase over 300 µg/m^3 from 4 % during 2007 to 2% only during 2008.

1-6 Most important results of monitored indicators of ambient air quality

- 2008 noticed a remarkable improvement in sulfur dioxide concentrations compared to the same period during previous years ,whereas daily average concentrations were ranged between 20-40 $\mu g/m^3$ which is lower than the limit stated in the Executive Regulation of Environment Law 4 /1994 (150 $\mu g/m^3$).
- This improvement is due to the efficient use of fuel in power stations and industrial sector, reducing diesel fuel usage in these sectors and expands in natural gas usage.
- It is remarkable that there is an increase in nitrogen dioxide concentrations during 2008 compared to previous years in spite of the fact that these concentrations were still lower than the permissible limit stated in the Executive Regulation of Environment Law 4 /1994 which ranged between 60-90 $\mu g/m^3$ as daily averages, while the permissible limit is 150 $\mu g/m^3$.
- This increase is due to the increase in vehicles number during 2008 compared to last year; as they become 4.3 million vehicles compared to 4.1 million during 2007 which had led to the increase in traffic emissions in addition to the increase in industrial activities and accordingly industrial emissions.
- There is an improvement in suspended dust particulates concentrations in Greater Cairo, compared to previous years, particularly during the first half of November, which noticed a remarkable improvement compared to 2007; as the overall average of suspended dust particulates monitored during this period decreased from 183 $\mu g/m^3$ during 2007 to 132 $\mu g/m^3$ during 2008 with 28% reduction.
- It is remarkable that periods which referred to an increase in concentrations over than 300 $\mu g/m^3$ were decreased from 4% during 2007 to only 2% during 2008.
- Hours which noticed an increase in suspended dust particulates concentrations over than 300 $\mu g/m^3$ were decreased from 85 during 2007 to 40 hours during 2008 with 53% reduction.
- Days which noticed an increase in suspended dust particulates concentrations over than 300 $\mu g/m^3$ were decreased from 15 days during 2007 to 8 days during 2008 with 55% reduction .
- Measurements clarify that annual average of sulfur dioxide concentrations in different monitoring areas of Egypt during 2008 had been significantly improved compared with previous years. The overall average concentrations of sulfur dioxide in all areas did not exceed the permissible limit stated in Executive Regulation of Environment Law 4 /1994 during 2008.
- Concentrations of nitrogen oxides clarifies a remarkable increase in concentrations during 2008 from previous years, as its annual average concentration during 2008 were about 60.1 $\mu g/m^3$, while during 2007 were about 46.1 $\mu g/m^3$ with 30% increase . This is due to the significant and persistent increase in vehicles number during past years; this in turn led to a

remarkable increase in the average annual concentrations of nitrogen dioxide. Expansion in usage of natural gas as fuel, either in industry, production of electricity or fuel for vehicles contribute in increasing concentrations of nitrogen dioxide

1-7 Cement Industry Emissions

Due to the nature and size of this kind of industry, its multiple and intensified emissions; Ministry of State For Environmental Affairs has developed a system for monitoring industrial emissions to control the main source (chimneys) in cement industry, according to the implementation and activation of Article 20 of the Executive Regulations of Law No. 4 /1994 on the protection of environment, which stipulates upon EEAA supervision upon the establishment and operation of environmental monitoring networks .

Establishing a National Network to monitor emissions of cement factories has allowed the continuous and effective control of environmental emissions over 24 hours. This mechanism provides strict control over these chimneys and accordingly takes necessary legal procedures in case of violation, in comparison with its previous role which was restricted upon committees for periodic follow-up and verification that passes once a year, as provided for in Article 18 of the Executive Regulations of Law 4 / 1994.

Monitoring sites that had been followed and verified through the network during 2008 were about 72 self-monitoring site for the overall particulate matter emissions from chimneys in 16 cement companies located in Egypt.

Table (1-7) Monitoring Sites of overall particulate matter emissions from chimneys of cement factories.

Serial	Company	Self-Monitoring Sites	Serial	Company	Self-Monitoring Sites
1	National cement company	11	9	Alexandria Portland cement company	2
2	Portland Toura cement company	12	10	Elmenia cement company	2
3	Helwan cement company	10	11	Misr Quena cement company	2
4	El katamyia cement company	3	12	Egyptian cement company	4
5	Suez cement company	4	13	Sinai Portland cement company	2
6	Beni Suef cement company	3	14	Sinai White cement company	1
7	Misr Beni Suef cement company	3	15	El Ameriya cement company	4
8	Assuit cement company	6	16	Arabian cement company	3

Monitoring of overall particulate matters emissions from chimneys depends upon using special equipments for industrial processes emissions to estimate smog in emissions and then calculate values of overall concentration of particulate solid matters emissions.

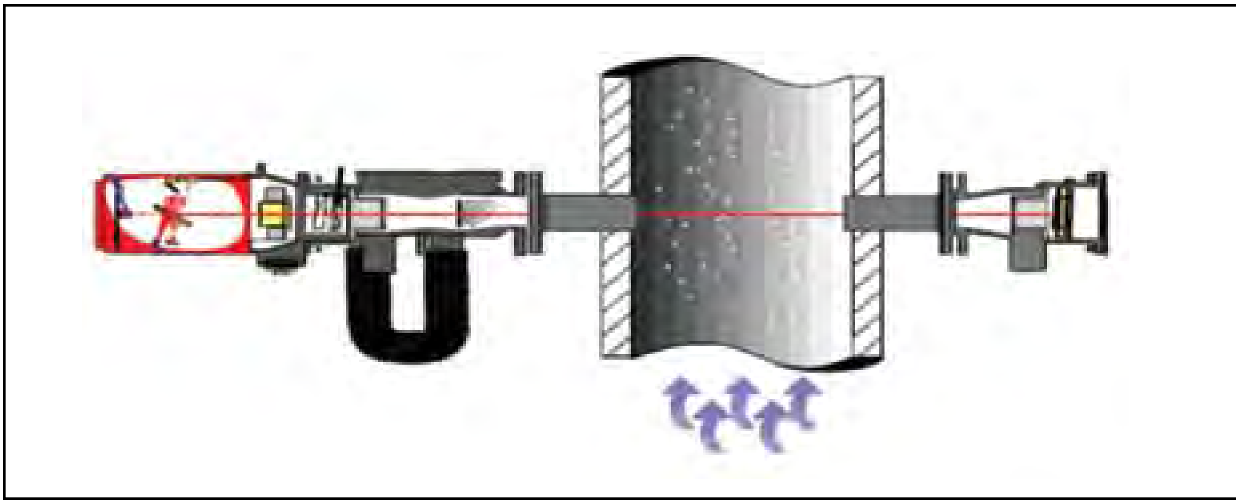


Fig (1-15) Self-monitoring instrument used in monitoring chimneys of cement factories and method of its operation.

During 2008, that system had been developed and modernized which allowed an accurate determination of diffraction values over the 24 hours; a database of emissions had been developed to provide an accurate statistical analysis of pollution sources and assess environmental loads; these efforts resulted in activation of the fourth item of Article 18 of Executive Regulation concerned with environmental compensation.

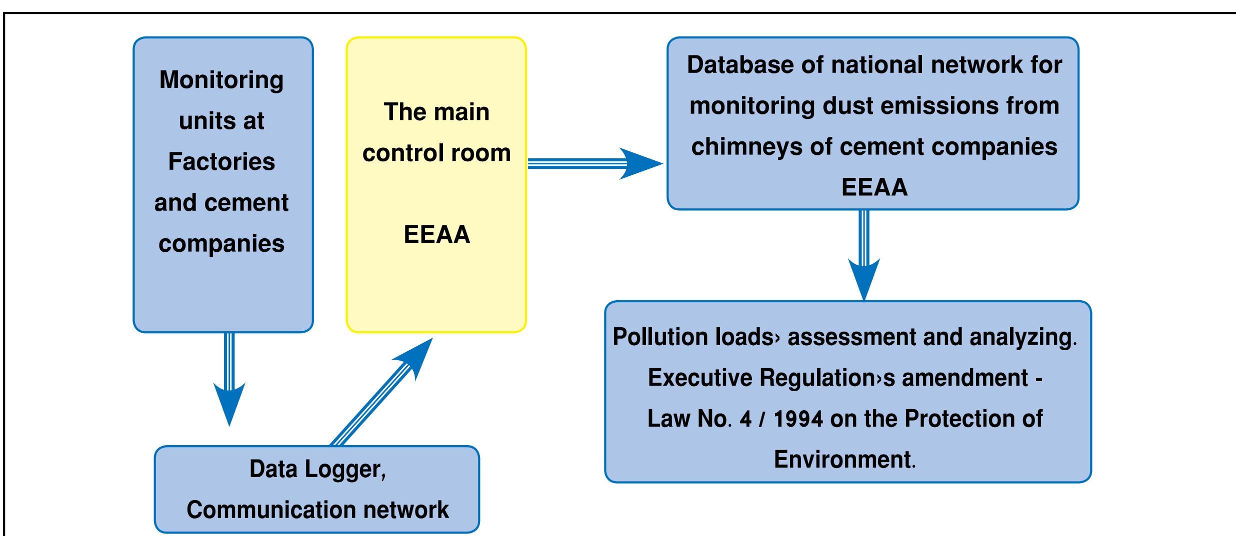


Fig (1-16) Network system after development.

Environmental Indicators of cement factories during 2008:

The following indicators had been deduced from the developed network and continuous monitoring over the 24 hours of the day to ascertain that emissions conform to the maximum limits stated in Law No. 4 / 1994:

- 92% of old factory's chimneys' emissions established before 1995 which is the issuance year of Executive Regulation of Law No. 4 / 1994 did not exceed the maximum permissible permit 300 mg / m ^{3}.
- 96.3% of new factory's chimneys' emissions established after 1995 which is the issuance year of Executive Regulation of Law No. 4 / 1994 did not exceed the maximum permissible permit 200 mg /m ^{3}.
- 98.4% of modern factory's chimneys' emissions established after 2005which is the issuance year of Executive Regulation's amendment of Law No. 4 / 1994 did not exceed the maximum permissible permit 100 mg / m 3.

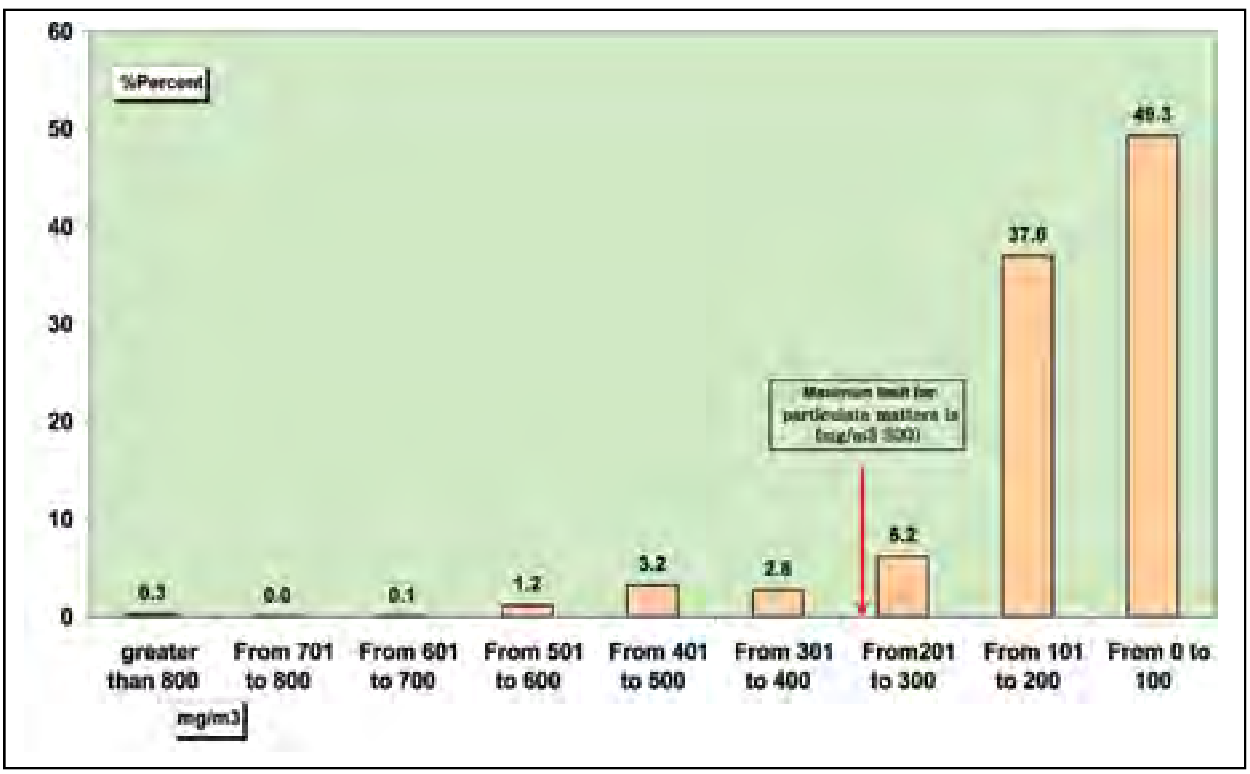


Fig (1-17): Repetitive distribution of the total particulate emitted from chimneys of cement companies established before1995 (old factories).

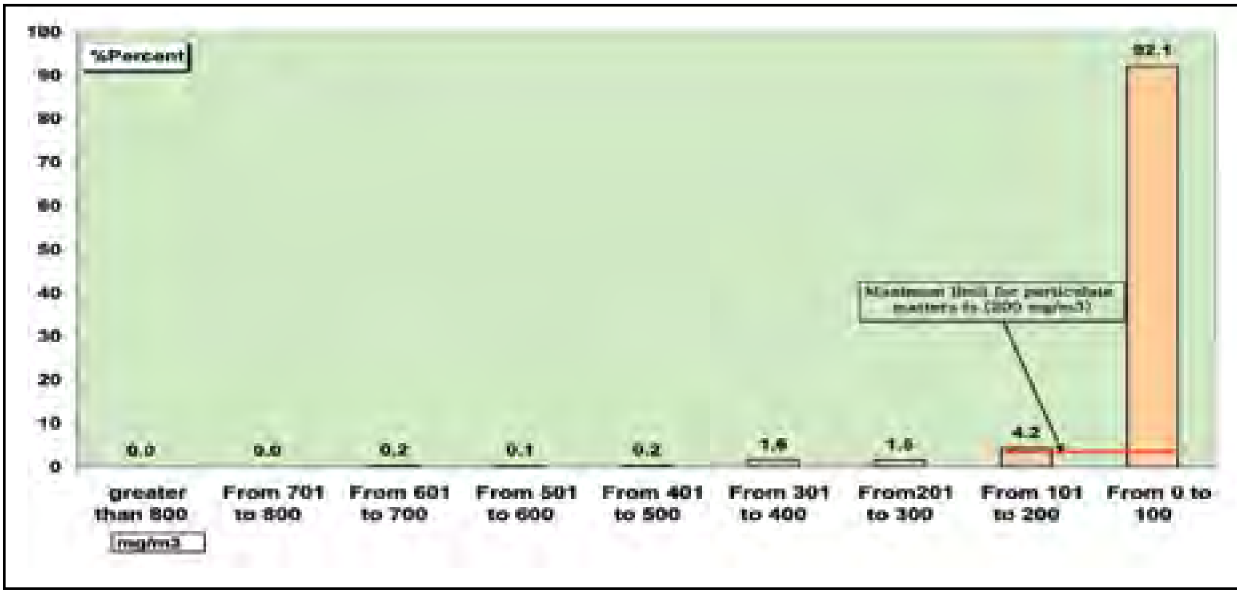


Fig (1-18): Repetitive distribution of the total particulate emitted from chimneys of cement companies established from1995-2005(new factories).

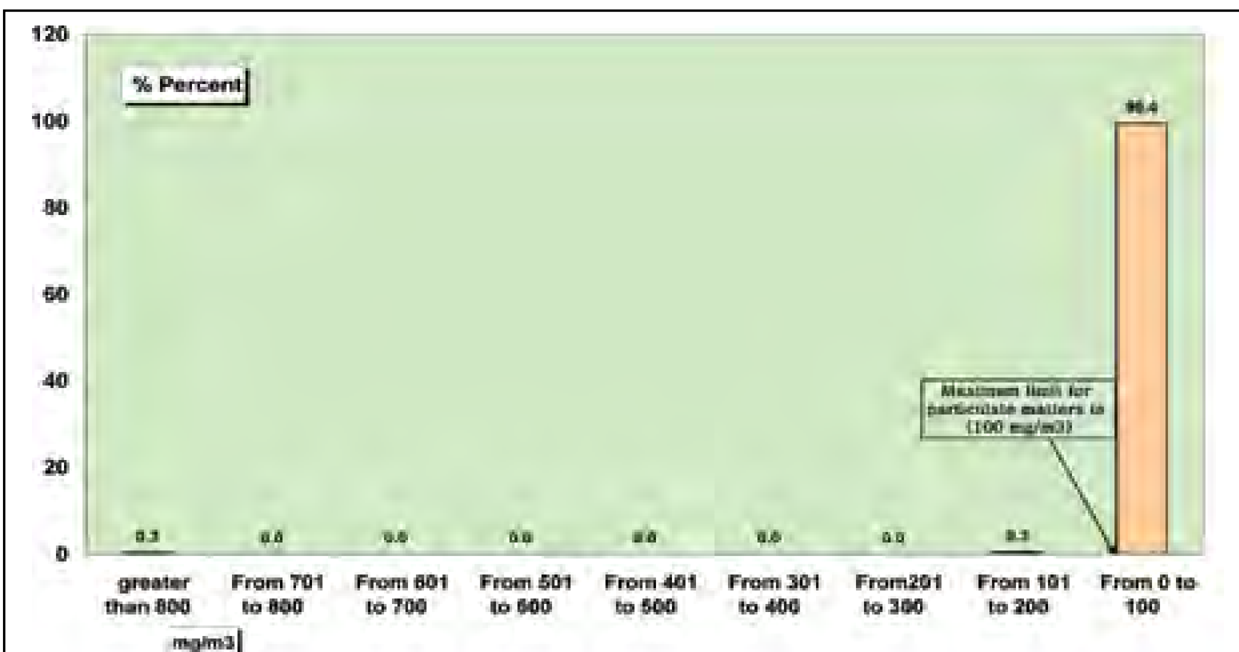


Fig (1-19) Repetitive distribution of the total particulate emitted from chimneys of cement companies established after 2005(modern factories).

- Statistical analysis of the total particulate emitted from major companies (National Company for Cement, Torah, Assiut , Ameriya and Helwan) shows 76%.

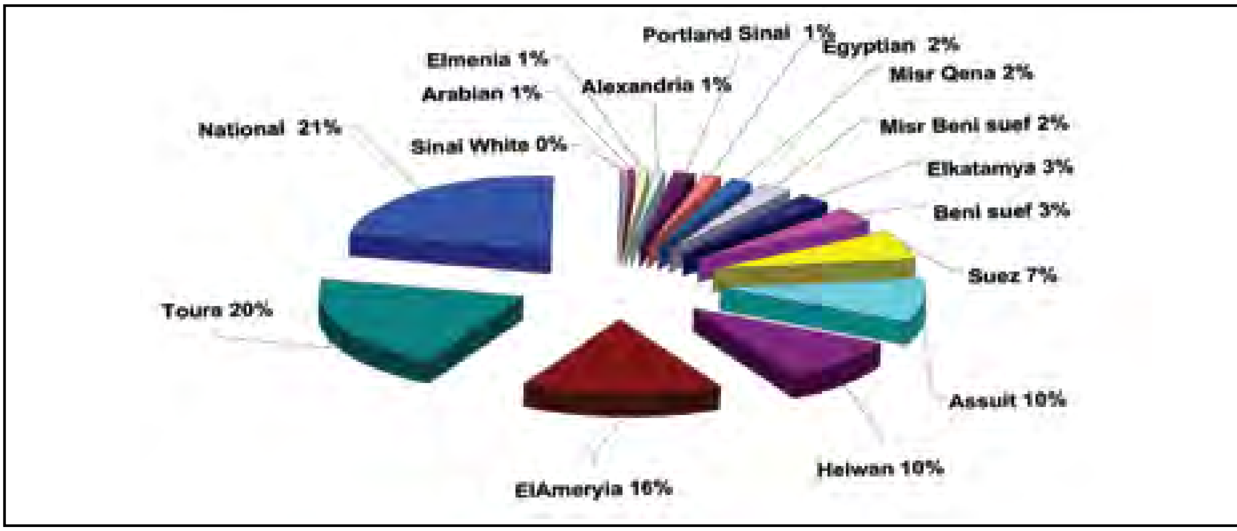


Fig (1-20): Percentage of companies' contribution in loads of total particulate's emission from chimneys during 2008.

- Statistical analysis of the total particles emitted from chimneys of raw mills shows 52%.

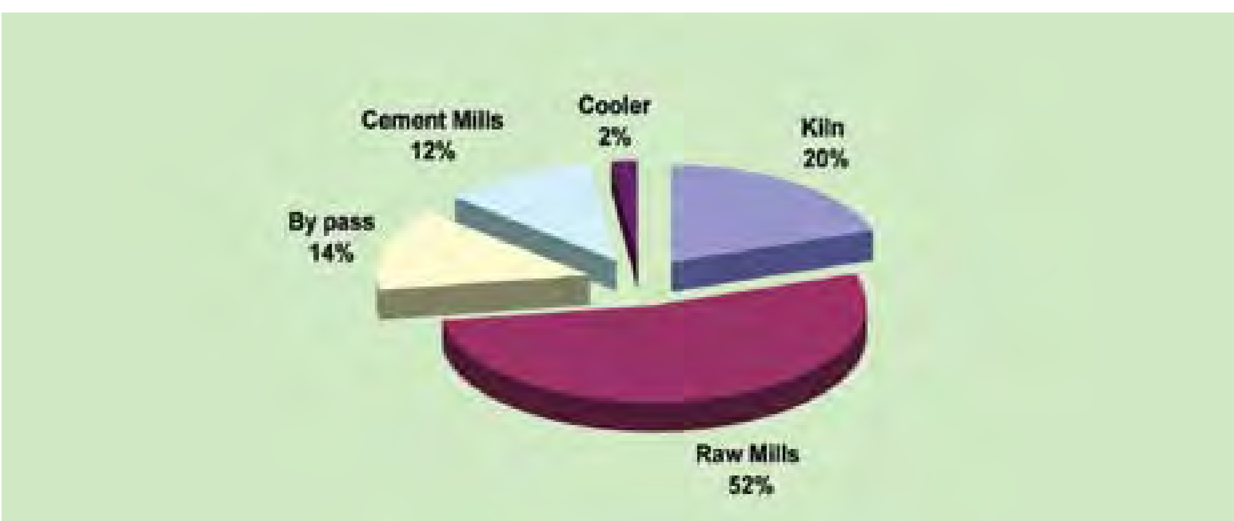


Fig (1-21): Relative distribution of total particulates from chimneys during 2008, according to the source.

Monitoring results of solid particulates' emissions from chimneys of cement companies shows an increase in conformity rates with maximum limits standards that had been included in Executive Regulation of Law No.4/1994 ;as a result of following these companies' activities and considering their old technical status through the gradual application to reach such conformity results .This application had been passed through two phases (Executive Regulation issued during 1995 and its amendment during 2005) ;these results qualify for preparing another phase of procedures' amendment during the next phase to reach to international standards (50 mg /m ^{3}) with a focus on improving efficiency of raw mills and controlling devices through environmental compliance projects .

Control of vehicles' exhausts emissions:

1. In the framework of MSEA's awareness with hazardous of vehicles' exhausts that represents a major source of pollution in major cities, particularly Greater Cairo ;it inaugurated an ambitious program to convert 5000 governmental vehicles to use natural gas instead of gasoline which resulted in the following indicators :

- Converting 2274 vehicles to operate with natural gas.
- Inventorying 2684 governmental vehicles for technical inspection in accordance with terms and conditions of their possibility to be converted to natural gas. It is expected to convert vehicles which their technical expiry had been proven during 2009.

1-8 Vehicles' emissions

- Vehicles emissions represent a major source of air pollution in mega cities with high traffic density, particularly Greater Cairo governorate which suffers from problems of traffic jams as a result of increasing vehicles' number. The study which carried out by National Institute for Transportation indicated that vehicle's average speed within Greater Cairo is about 11 km / hour.
- Studies carried out by Ministry of State for Environmental Affairs indicated that vehicles' emission contribute with 26% from total pollution loads with suspended particulate matter in Greater Cairo, more than 90% of total pollution loads with carbon monoxide, 90% of total pollution loads with hydrocarbons and 50% of total pollution loads with nitrogen oxides. These gases had harmful impacts on both environment and public health.

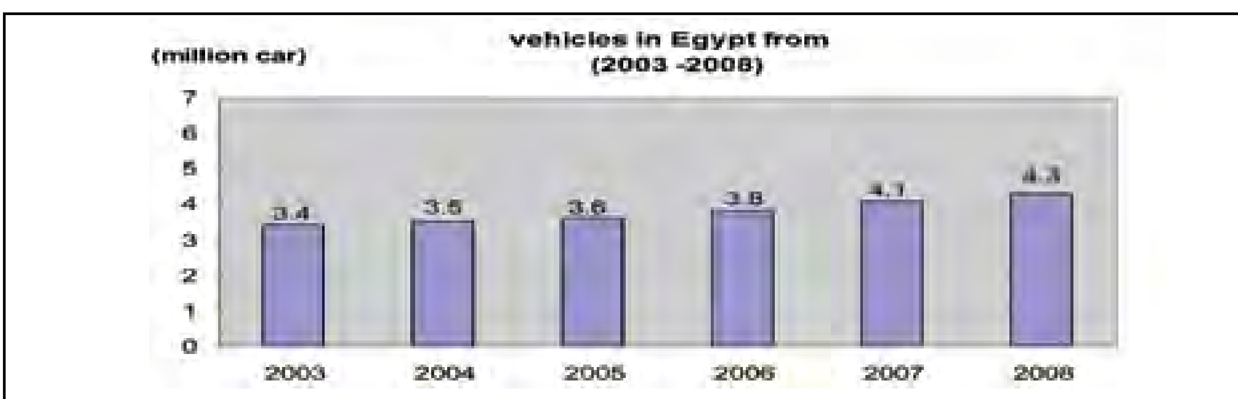


Fig (1-22) vehicles in Egypt from 2003-2008

- **Source: Traffic dept. ministry of interior**

Total number of licensed vehicles in Egypt

Vehicles› number were multiplied from 1993 to 2008, licensed vehicles were about 4.3 million during 2008 compared to 4.1 million vehicles during 2007, and 2.1million during 1993. Private vehicles represent 48% (2 million) from the total number of licensed vehicles followed by trucks about 19% (0.82 million), then motorcycles about 17% (0.72 million), and taxies about 8% (0.32 million) figure (1-23).

Fig (1-23) licensed vehicles in Egypt from 2007 - 2008

- During 2008, 63% from the total private vehicles were centralized in urban governorates, followed by Upper Egypt with about 21% from the total private vehicles, while border governorates did not exceed 1% fig (1-24).

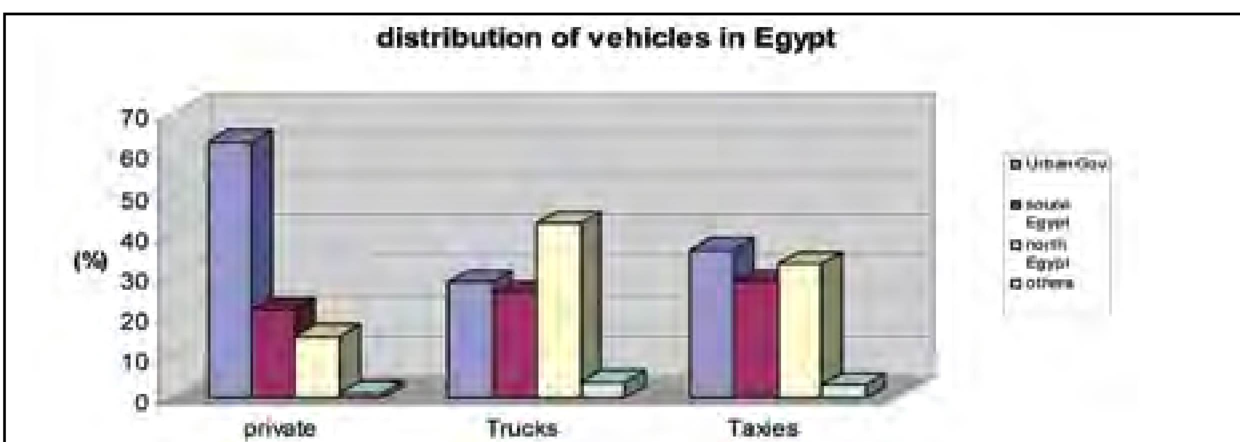


Fig (1-24): Relative distribution of vehicles in Egypt during 2008

- **Source: General traffic department, ministry of interior**

- 11% is percentage of old vehicles that their age exceeded 35 years from the total licensed vehicles in Egypt , while 21% is percentage of vehicles that their age are ranging between 25 and 35 years. These old vehicles are démodé and lack modern technologies applied in new vehicles, which increase efficient use of fuel and reduce their emissions. In addition to lack of efficiency in engines of old vehicles as a result of their operation form very long years beyond their supposed life span which deteriorate certain parts from their engines, figure (1-25).

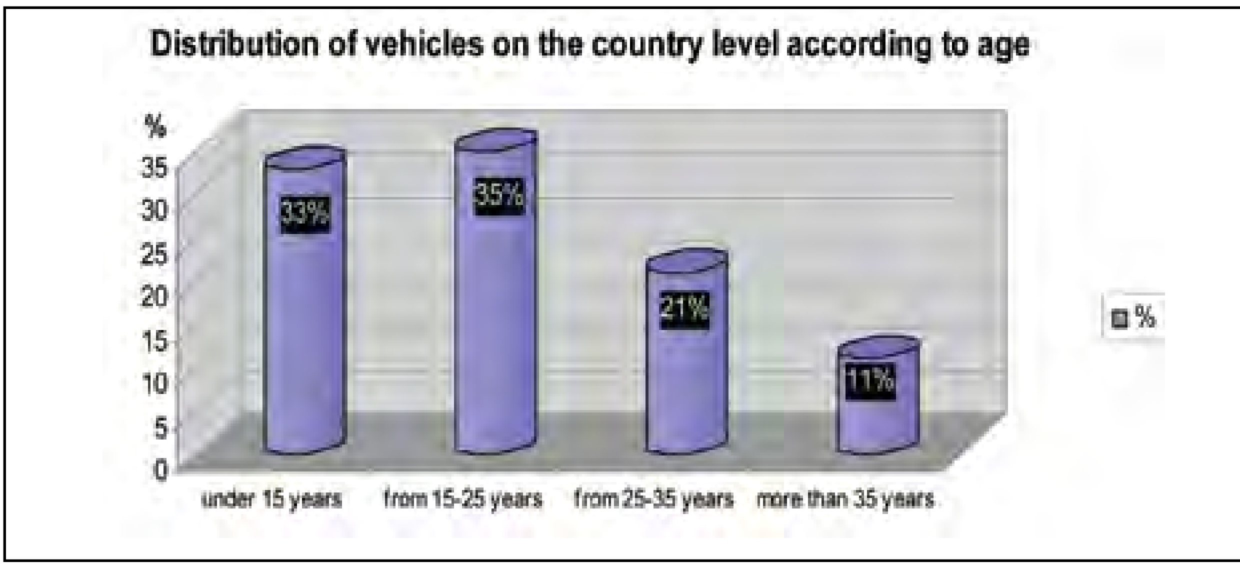


Fig (1-25) distribution of vehicles on the country level according to their age

- Alexandria ranked the first governorate in number of persons per vehicle which reached 11 persons per vehicle during 2006/2007, followed by Port Said with 15 persons per vehicle, Greater Cairo with 16 persons per vehicle; While the indicator in Upper Egypt governorates “Qena, Elmenya, and Sohag” was about 276 persons per vehicle, 231 persons per vehicle 197 persons per vehicle respectively, figure (1-26).

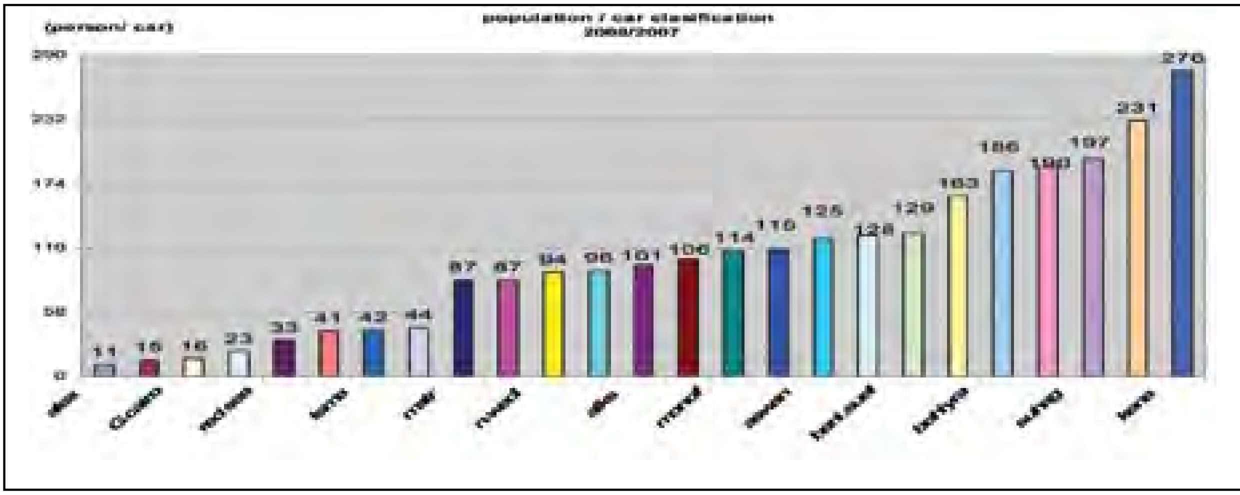


Fig (1-26): Average people›s number per vehicle in governorates during 2007-2008

- The study which was carried by EEAA in cooperation with Japanese International Cooperation Agency (JICA) in Greater Cairo governorates (Cairo - Giza - Qaliubiya) and in Delta governorates (Dakahliya - sharqiya - Monoufia - Gharbiya) on highways indicated that vehicles sector during 2007 emitted 74 thousand tons/year of particulate matter, 335 thousand tons/year of nitrogen dioxide, 1.3 thousand tons / year of sulfur oxides. While in 2008 percentage of emissions from vehicles sector increased to 82 thousand tons / year with 0.8 thousand tons of suspended particles, nitrogen dioxide 394 thousand tons/year, and sulfur oxides 1.4 thousand tons/year. This increase in vehicles emissions is due to the increase in licensed vehicles number in Egypt during 2008, figure (1-27).

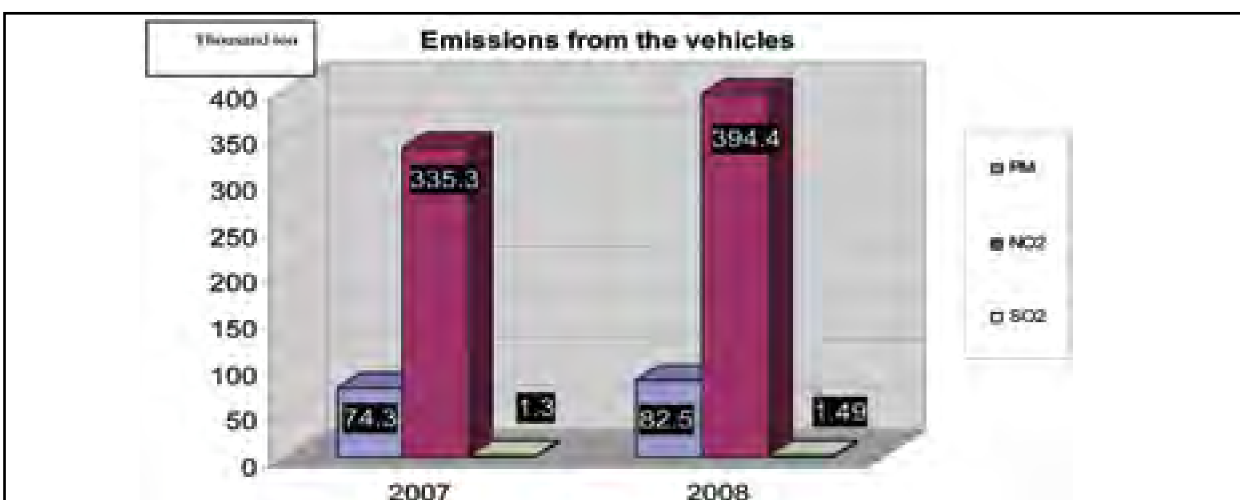


Fig (1-27) Vehicles ‘emissions.

- **source: EEAA**

1-9 Exerted efforts to improve air quality

It should be noted that in spite of the cooperation with all concerned ministries, there are some negative indicators in Egypt's air quality during 2008 compared to 2007, but the current implementation of adopted projects by MSEA will lead to further improvement in air quality in Egypt.

1-9-1 Industrial Pollution Abatement Project

Currently implemented in Helwan ,Shoubra El-khima & Alexanderia with more than 1200 million L.E , aiming to abate air pollution caused by major industries in these regions .

1-9-2 Switching Bricks factories located in Arab Abu Saed - South Tebbin (258 factories) to natural gas fuel

1- 50 brick factories in Arab Abu Saed were successfully converted to natural gas through the Initiative Conversion Project funded by CIDA as a pilot project in cooperation with EEAA with 27.284.100 LE.

2- The second phase which is currently under going aiming to convert 181 brick factories in Arab Abu Saed to natural gas with about 140 million LE through EPAP II, by providing them with 80% loan & 20% grant in cooperation with Town Gas Company & National Bank of Egypt (NBE). The project agreed upon the following:

- Each brick factory owner will bear costs of Pressure Reduction Station (PRS), burners and operation costs.
- EEAA will provide each factory with 20% as a grant from the total cost of the project through EPAP II, after its operation with natural gas.
- Estimated cost provided from Town Gas Company is provided for at least 200 brick factory.
- The preliminary estimation of costs conducted for the 200 brick factories shows that each brick factory will cost 700.000 LE.
- Supplying El-Saff region with natural gas will be the plan after finalizing conversion process in Arab Abu Saed region.

1-9-3 Private Sector participation in agriculture waste management, particularly, rice straw

MSEA in cooperation with private sector implemented many programs to realize economic benefits from agriculture waste (rice straw) such as:

- Compost factories, by establishing 4 factories in El-Sharquia & El-Dakhalia governorates.
- Factories producing untraditional fertilizers and fodder, which is a program implemented annually.
- Factories converting rice straw to an alternative for agricultural soil
- Units for converting rice straw to thermal gas.
- Solid Bio fuel project, which is implemented in cooperation with Czech Republic with 50.000 ton capacity in El-Sharqeya governorate.

1-9-4 Program of converting governmental vehicles to natural gas

Vehicle emissions represent a major source of pollution in Mega cities especially Greater Cairo, MSEA carried out an ambitious program to convert 5000 governmental vehicles to use natural gas instead of gasoline. The program succeeds in achieving the following:
- Converting 2274 gasoline governmental vehicles to natural gas.
- Inventorying 2684 governmental vehicles for their technical inspection according to the requirements, specifications and indication of their possibility to be converted to use natural gas. It is expected to carry out the conversion process for proven-technically vehicles during 2009.

1-9-5 Replacing old taxis' project

- The project aims to improve status of old taxis in Greater Cairo under an environmental framework to guarantee the safety limit of emissions exhausted from these vehicles in addition to costs' reduction .
- During 2007, MSEA carried out a pilot project to replace 100 old taxis which their manufacture date exceeds 35 years in Greater Cairo with other modern vehicles operated with natural gas. This project provided old cars' owners with 6-year loan to cover cost of the new one, with an annual 6% interest rate from Nasser Social Bank. As an incentive to stimulate old taxis' owners to scrap their old taxis and replace them with new vehicles; the Ministry covered value of the interest owed to the bank in addition to costs of converting new vehicles to work with natural gas.
- In light of the success this pilot project achieved and the huge number of old taxis› owners wanted to participate in it. 2008 witnessed completion of the first phase from the project by replacing 1000 old taxis (models from 1960 till 1979) in cooperation between Ministry of State for Environmental Affairs and Ministry of Finance through providing 10 thousand Egyptian pounds for each car as financial incentives. MSEA signed cooperation protocol with the Egyptian National Bank to fund this phase in addition to providing soft loans to owners of these taxies.

Pic (1-1) The replacement of new taxies

- Due to the importance of this national project ,MSEA prepared a study, in coordination with stakeholders in this field, to assess the environmental and economic benefits that will be achieved from the expansion of this project to include all old taxies which their manufacture date exceeds 28 years (models till 1979). Their numbers in Greater Cairo are about 40.000 taxis.
- In addition to the environmental, economic and social benefits which will be achieved from the implementation of this project; it is expected to promote auto market by increasing sales of new cars.
- Subordination of the national project for replacing old taxis had been moved to Ministry of Finance; as a fund with an independent juridical personality and special balance sheet affiliated to Ministry of Finance had been established concerned with providing loans to finance purchase of alternative transportation vehicles for trailers, taxis and passenger transport vehicles, which manufactured since 20 years ago.

1-9-6 Inspection Program of vehicles emissions as apart of vehicle licensing

- MSEA carried out this program to link vehicle test and measurement of its emitted exhausts with vehicle licensing.
- During 2008 implementation of fifth and final phase of the program began in Traffic Police Departments.
- Governorates of Monoufia, Port Said, Aswan and Ismailia that have not been implemented the program so far and which their licensed vehicles represent 4% from the total licensed vehicles in Egypt; procedures are going on to issue local councils› approval to carry out this program in their governorates.
- Ministry of State for Environmental Affairs coordinated with Ministry of Interior to inventory these governorates› needs from equipments; they were estimated with about

(56) equipments to test gasoline emissions and (56) equipments to test diesel vehicles with about 4.256.000 LE. According to the previous agreement with Ministry of Interior, MSEA contribution is about 50% from the total price which is about (2,128,000 LE).

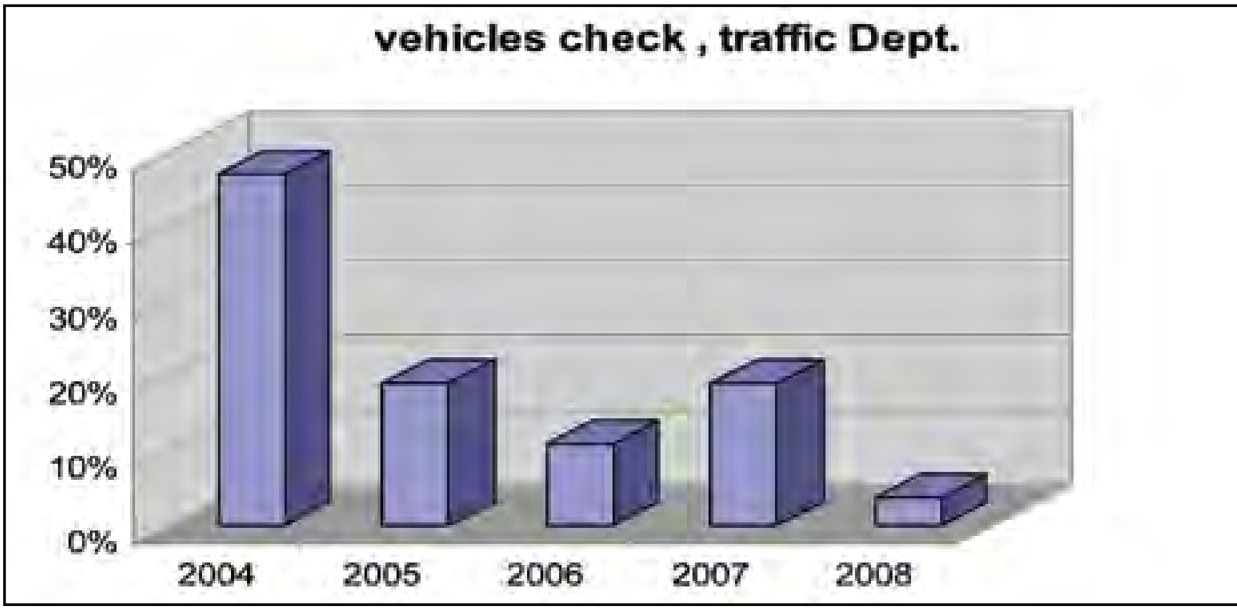


Fig (1-28) vehicles check, Traffic Police Dept.

1-9-7 Inspection program of vehicles' exhaust on- the road

- During 2008 technical inspection of vehicles' exhaust on-the rood was implemented in some districts of Greater Cairo for 45012 diesel and gasoline vehicles compared to about 50044 gasoline and diesel vehicles during 2007; through joint campaigns from Traffic Police Departments and EEAA. Test results showed the success of almost 70.8% of the inspected vehicles as shown in fig (1-29).
- Legal procedures are taken against drivers whom their vehicles fail to pass the inspection on the road. Vehicles' owners are obliged to visit technical center after required repairs is conducted to re-test their vehicles and ensure their conformity with standards of law No.4/1994 and make reconciliation with EEAA in case of passing the inspection test .

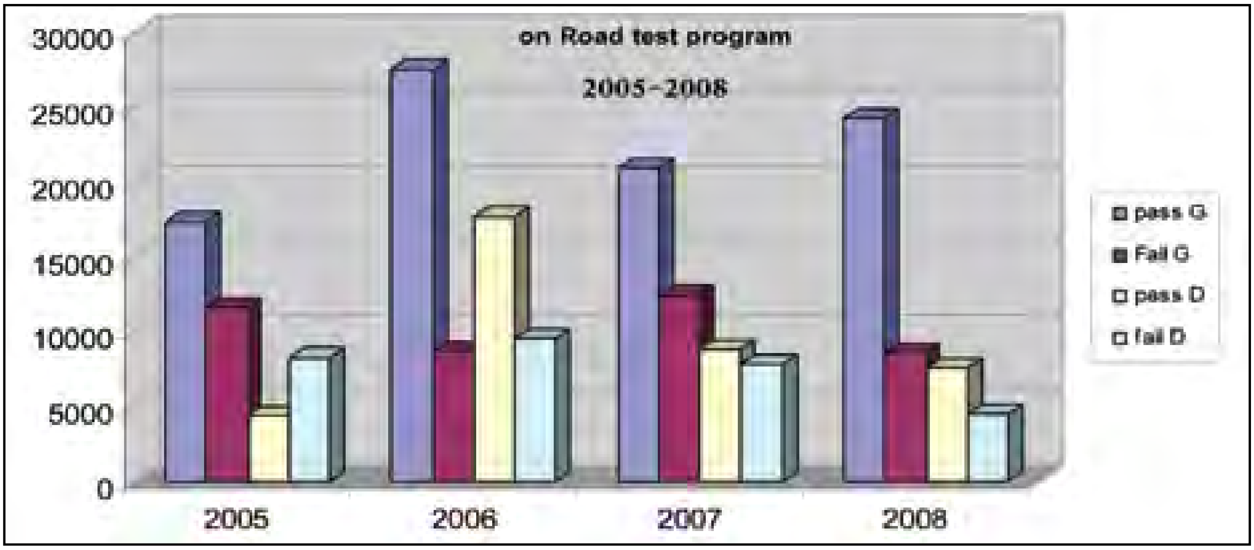


Fig (1-29) tests on road program 2005-2008

- **Source: Environmental Affairs Agency - Ministry of State for Environmental Affairs**

1-9-8 Inspection Program of Cairo Transport Authority (CTA) Buses

- The program was implemented to test public transportation busses in garages, about 4436 busses were tested during 2008 compared to 4672 buses during 2007. Results showed that about 43% from the total buses belonging to Public Transportation Authority and Greater Cairo Bus Company passed the inspection test, as shown in fig (1-30).
- Buses that failed to pass the inspection were about 57%, including 32% failed buses and 25% out of order buses in garages; Public Transportation Authority was notified with results of inspection and numbers of failed buses. A program will be prepared to re-test failed buses as soon as Public Transportation Authority notifies EEAA that all procedures of maintenance and re-operation are conducted, as shown in table (1-8).

Table (1-8) Results of Public Transport Buses› inspection

Buses test	2007	2008
test	3559	3316
pass	1603	1909
fail	1956	1407
Work fail	1113	1120
total	4672	4436

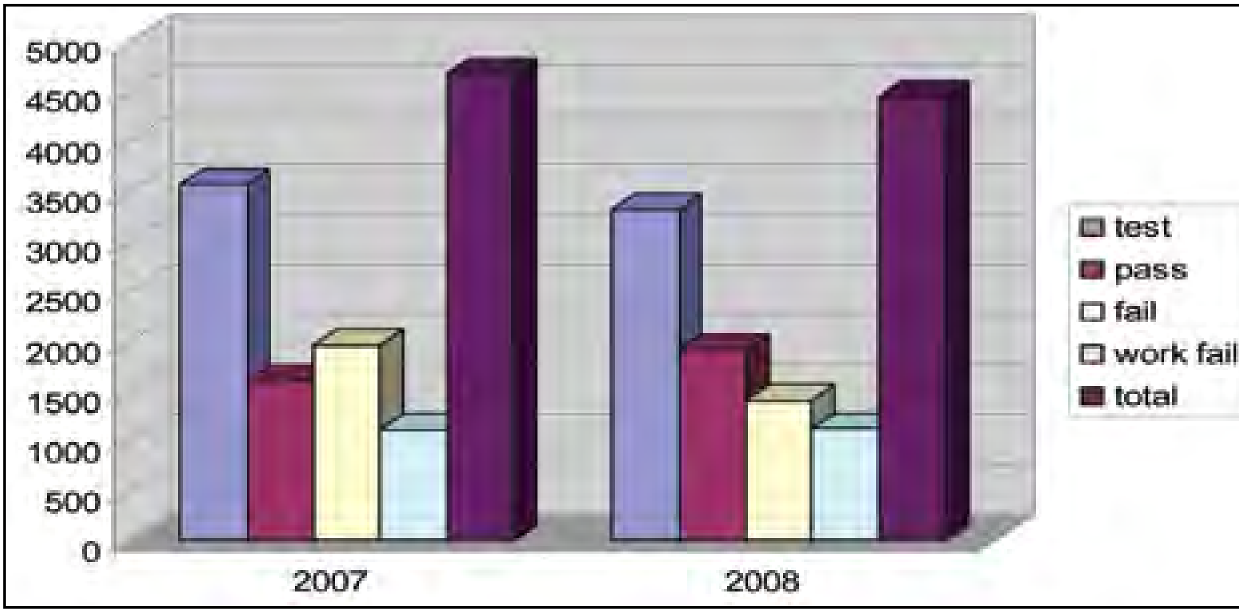


Fig (1-30) Inspection results of Public Transport Buses

Source: Egyptian Environmental Affairs Agency - Ministry of State for Environmental Affairs

1-9-9 Reduction program of motorcycles emission

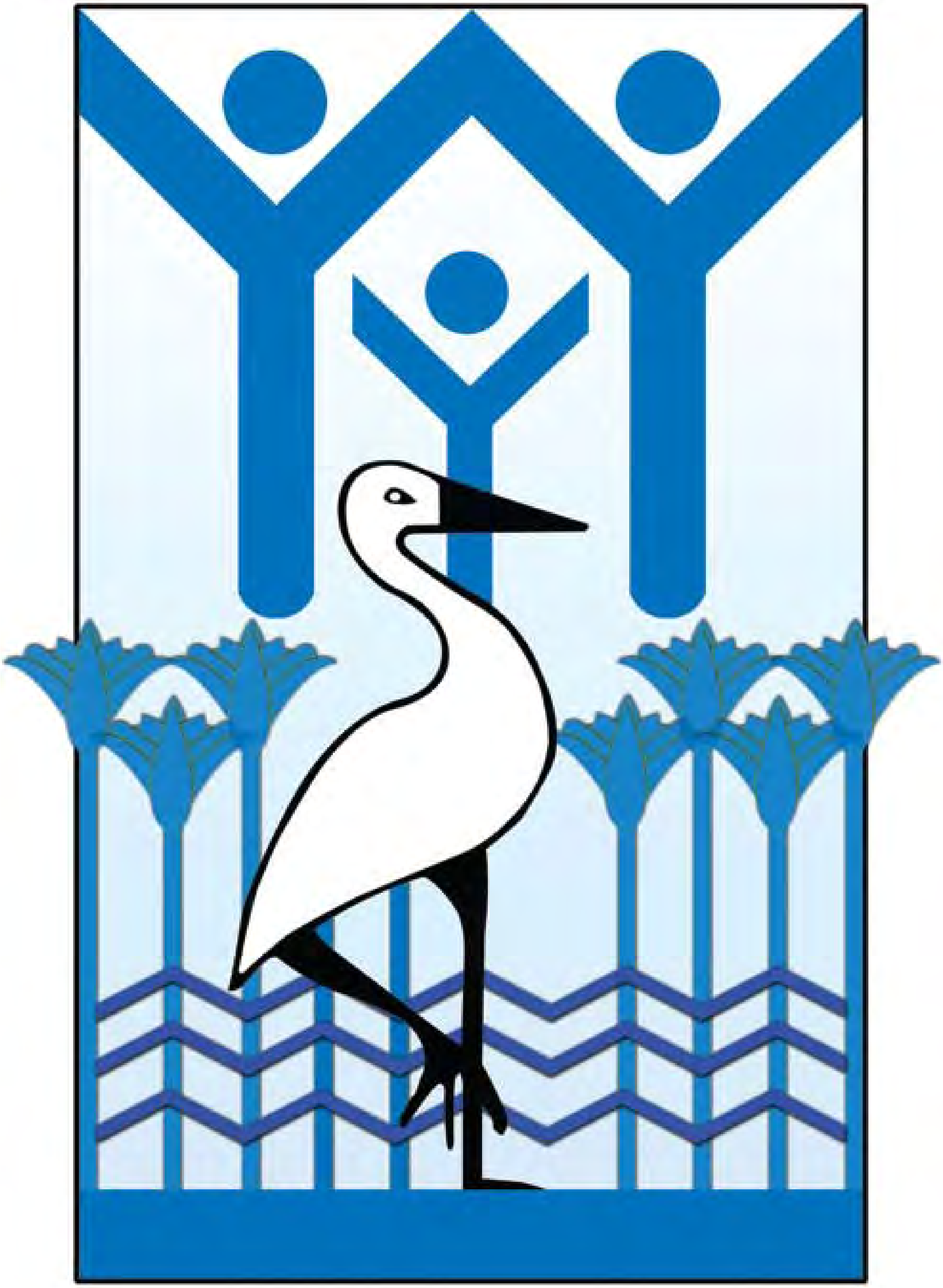
- Studies conducted worldwide clarified that hydrocarbons emitted from one motorcycle with two-stroke engines are equal to emissions from 10-15 gasoline operated vehicles. There are about 600.000 motorcycles in Egypt, among which two-stroke engines motorcycles represent more than 95%; about 200.000 motorcycles in Greater Cairo only emitting about 112 thousand tons of pollutants that seriously affect air quality.

- In the framework of exerted efforts to reduce emissions from motorcycles, production of motorcycles with two-stroke engines in all its forms, types and sizes were prohibited in Egypt starting from 31/12/2007 in accordance with Ministry of Commerce and Industry's decree No. 85 /2004.

- In addition to these efforts and according to Minister of Commerce and Industry's decree No. 23/2008 to stop importation of two-stroke engines motorcycles with all its forms, types and sizes starting from 11/1/2008.

References

1 - General Directorate of Traffic - Ministry of Interior
2 - Inspection program of vehicles' exhaust on- the road - EEAA
3 - Replacing old taxis' project - EEAA
4 - Inspection program of vehicles' exhaust on- the road - EEAA
5 - Program of converting governmental vehicles to natural gas
6 - Annual Report of the Industrial Emissions Monitoring Network
7 – Data of monitoring air pollutants stations - Ministry of State for Environmental Affairs
8 - Environmental Law No. 4 / 1994
9 - Report of Environmental Indicators for the year 2008
10 - Pollutants inventory study - Japanese International Cooperation Agency (JICA)



Chapter 2
Noise

2-1 Introduction

Sounds have many advantages as they provide us with pleasure and enjoyment through listening to music or bird's singing, as well as being a means of communication between all human beings, and a tool for warning and alerting in the form of door bells or sirens. In addition, sounds inform us if there is a deficiency somewhere such as cars' defects. However, unwanted sounds are considered a source of inconvenience and disturbance and they fall under the name of "noise."
Noise is one of pollution types surrounding us, and considered the most disturbing and harmful to health. Noise is no longer limited to a certain period of time but has become inherent to our lives day and night. Noise pollution is closely linked to the development sought by the human day by day. Egypt has witnessed an increasing development of new projects in addition to the increase of commercial activities and industrial establishments within residential areas especially in major cities without prior proper planning. Moreover, the high traffic density and the increase in vehicles number in recent years intensify the problem and led to the increase of environmental noise levels.

2-2 Noise main sources and health effects

The most important noise sources are:

1. Transportation means and roads inside cities, including vehicles, railways and aircrafts.
2. Commercial and human activities.
3. Loudspeakers, celebrations and wedding processions.
4. Service workshops and industrial establishments

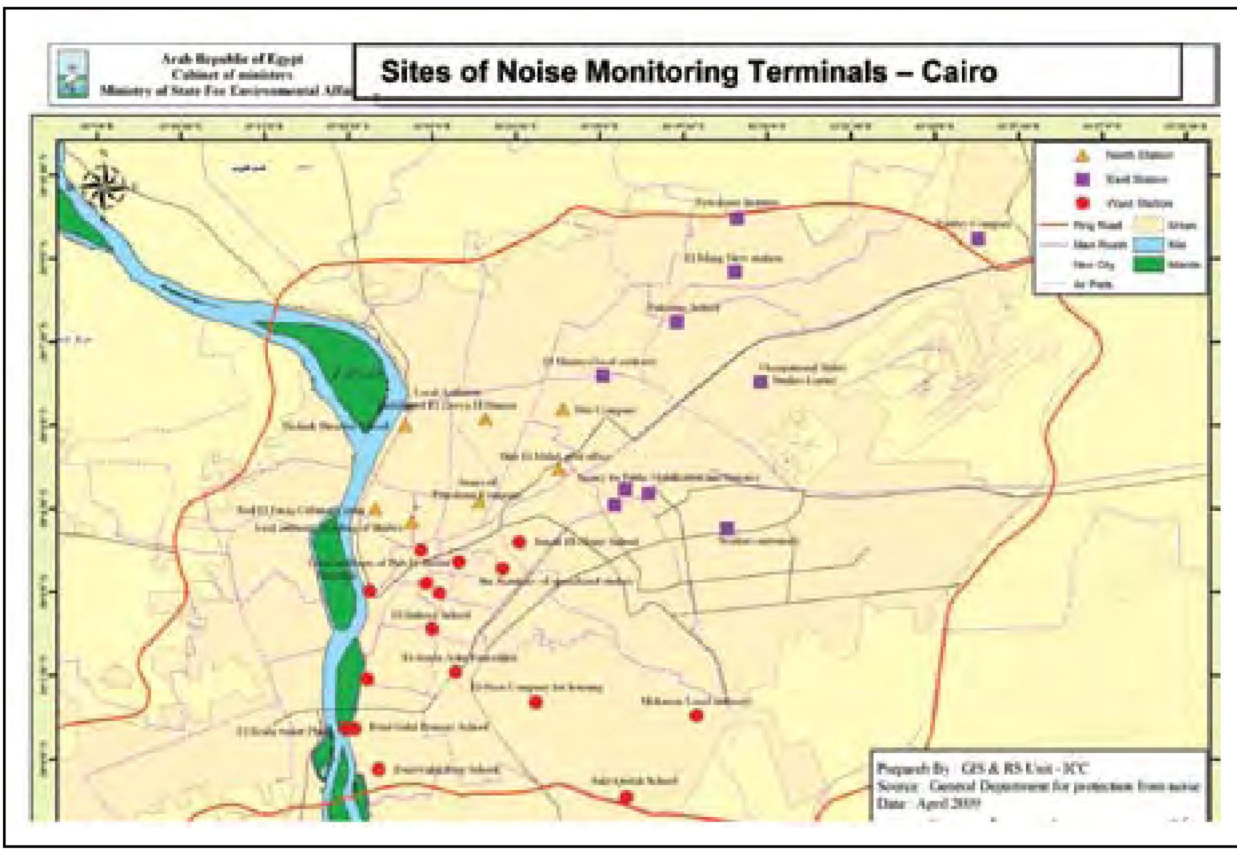
Noise could be described as one of the most dangerous diseases of the era. It adversely affects students' learning process, leads to hearing loss, high blood pressure, stomach ulcers, as well as lack of concentration which is the prime cause of increasing accidents rate.
Citizens are exposed to noise which affects man's psychological and nervous system leading to annoyance and restlessness. This is considered a violation of human rights to rest and quietness and a cause of sleep disturbance. The high tension of different vehicles› drivers and by passers in cities› roads is a great evident of these effects.

2-3 Noise Monitoring Network

EEAA has prepared the National Noise Reduction Plan in coordination with concerned ministries. In the framework of this plan EEAA is monitoring noise levels in Greater Cairo Governorates; the first phase of implementing the National Noise Monitoring Network in Cairo governorate has been completed and started its operation in March 2007. In this regard, noise levels have been monitored for main squares and south Cairo districts of which some districts are now subordinate to Helwan Governorate according to the updated administrative division of Greater Cairo Governorates.

In 2008 the network's 30 terminals have been reallocated to cover all districts of Cairo governorate with the purpose of establishing a noise database and an environmental noise map for the different districts of the governorate upon which technical solutions and appropriate scientific plans for environmental noise reduction in the governorate will be proposed. Year 2008 has been considered as a reference of the monitored noise levels indicators for the eastern, northern and western regions of Cairo Governorate.

Noise monitoring sites have been selected in areas suffering from noise to determine noise levels, identify sources and propose solutions for noise reduction. This does not mean that all parts of Cairo governorate suffer from the same noise levels.



Map (2-1) locations of Noise Monitoring Terminals in eastern, northern and western areas of Cairo Governorate.

Implementation was as follows:

1. Installing six noise monitoring terminals in six major squares of Cairo Governorate.
2. Monitoring noise levels in districts of Maadi, Helwan, El-Tebeen, and 15th May City has been completed in 2007. The terminals have been relocated and subsequently distributed in all

districts of Cairo Governorate to cover all regions (Western - Northern - Eastern), according to the updated administrative division approved in 2008 as shown in the map (2-1).

2-4 Noise indicators in Cairo governorate in 2008

2-4-1 Noise levels in main squares

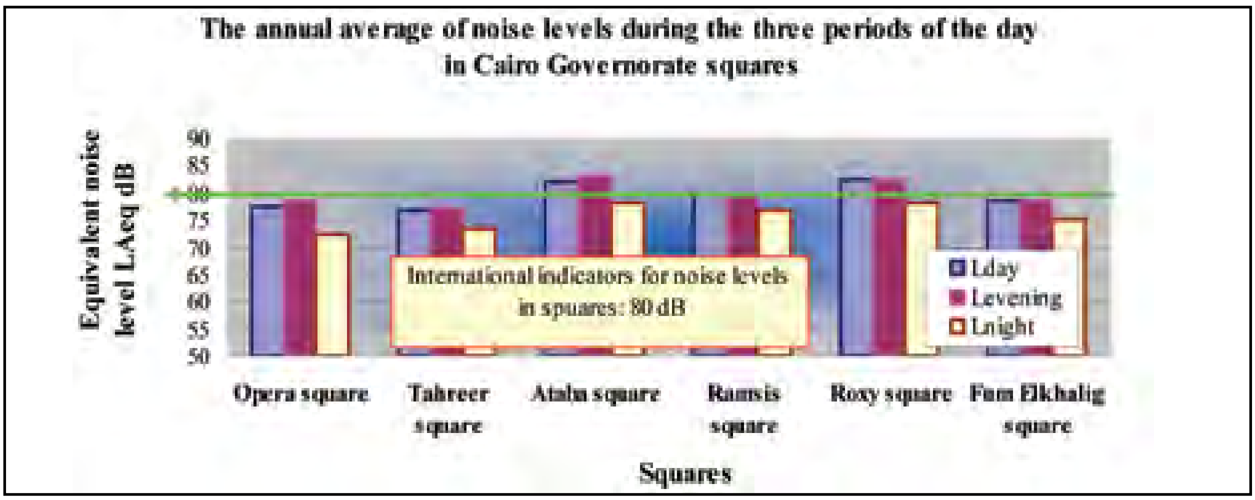


Fig (2-1) the equivalent noise levels of the three day periods for the main squares of Cairo Governorate

pic (2-1) the monitoring terminal located in Ramsis square

International indicators show that noise limits for roads and traffic are between 70-80 dB «3», as roads and squares are considered pass-by areas not for residence. Executive Regulation of the Environmental Law defines noise limits for different areas according to the activity of each area. Appropriate measures are taken to protect those areas from the impact of roads and traffic noise. These measures include establishment of noise barriers, implementing buffer zones to isolate roads from areas, or planting highly dense trees to prevent the noise from reaching those areas.

Figure (2-1) shows the monitored noise levels for the three day periods (day – evening- night) in six main squares in Cairo. It shows that noise levels in Roxy and Ataba squares were above 80 dB for the day and evening periods, while noise levels in Opera, Ramsis, Fum El-khalig and El-Tahreer squares were below 80 dB. El-Ataba square has recorded the highest noise levels for the three periods of the day during the monitoring period, while El-Tahreer square recorded the least noise levels due to the proper design of the square in terms of its area expansion which helps the air to absorb sound waves and reduce the effects of sounds reflections as well as the proper traffic flow.

2-4-2 Noise levels in industrial areas

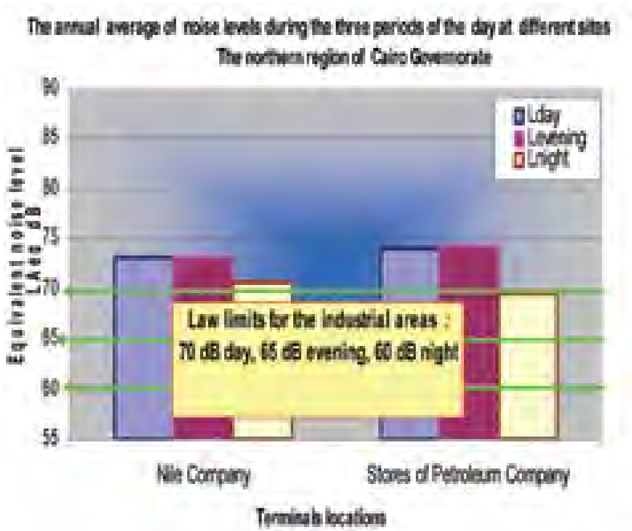


Fig (2-2) the equivalent noise levels for the three periods of the day in industrial areas in Cairo Governorate

pic (2-2) noise monitoring terminal located in an industrial area

Figure (2-2) shows the monitored noise levels for the three periods of the day in two industrial areas. It shows that noise levels in the industrial areas north of Cairo have exceeded the permissible limits set forth in the Executive Regulation of the Environmental Law, as they have reached about 74dB at day and 71dB at night in the Nile Company and the Stores of Petroleum Company locations. The major noise source was the traffic not the industrial establishments.

2-4-3 Noise levels in the commercial and administrative areas

Noise levels have exceeded the permissible limits set forth in the Executive Regulation of the Environmental Law at all locations of commercial and administrative areas monitored in the North, East and West of Cairo governorate as follows:

First: Northern region:

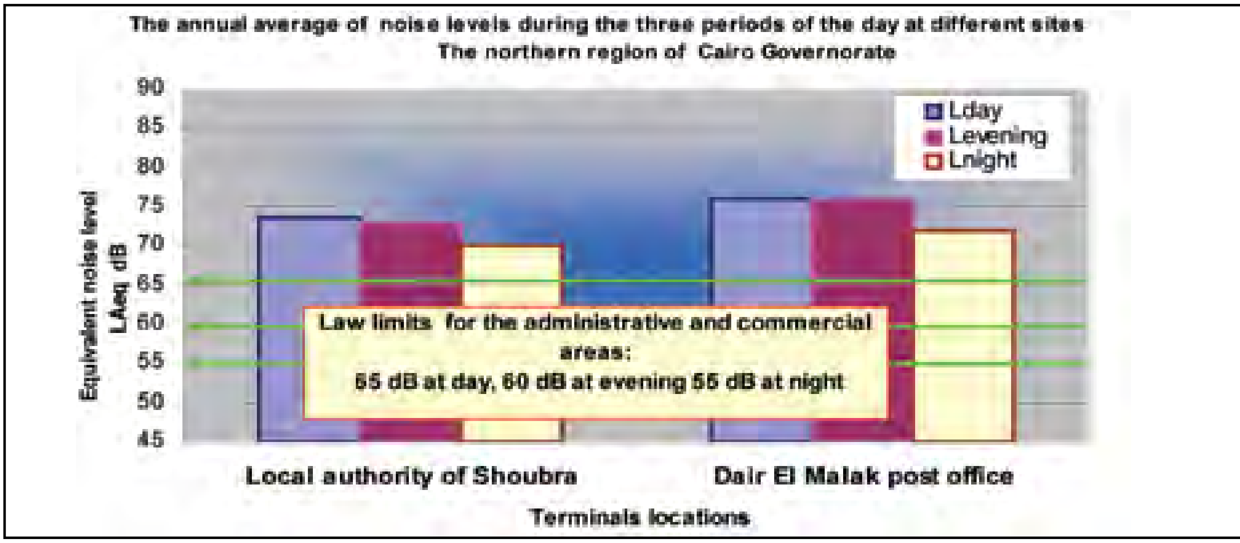


Fig (2-3) the equivalent noise levels for the three periods of the day at commercial and administrative areas in the north of Cairo governorate

Figure (2-3) shows that the noise levels at Shubra Local Authority Building and Dair El-Malak Post Office locations have exceeded the permissible limits set forth in the executive regulation of the law to range between (73-76) dB during the day and evening, and about 71 dB at night.

Second: Eastern region:

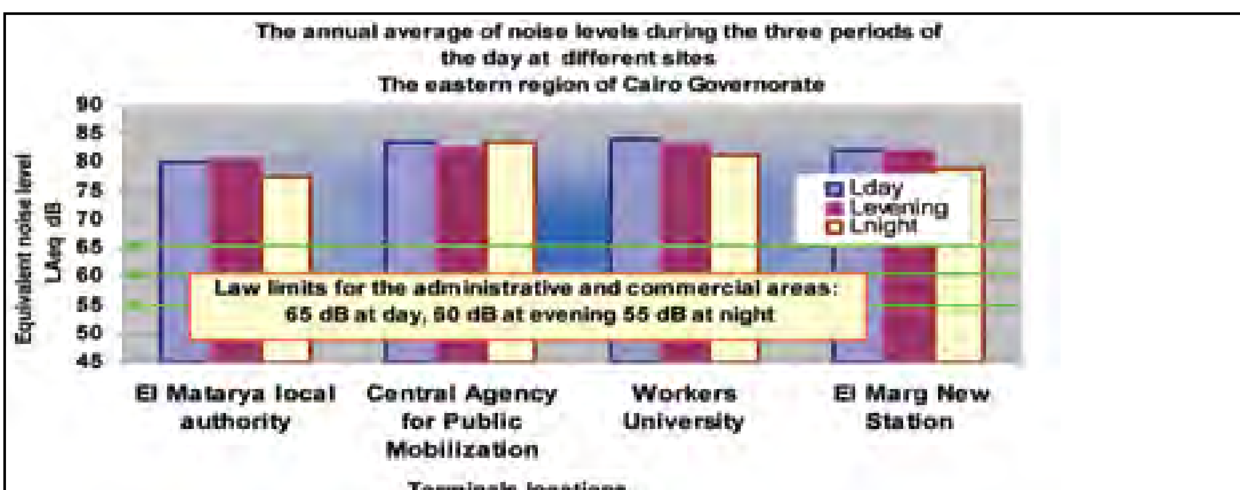


Fig (2-4) the equivalent noise levels for the three periods of the day at the commercial and administrative areas in the eastern region of Cairo governorate

Figure (2-4) shows that noise levels at the areas located on El-Nasr road, Salah Salem street, Cablat street, and El-Marg new station were higher than the permissible limits set forth in the Executive Regulation of the Law, as they have reached a range between (80-84) dB during the day and evening, and (77-84) dB at night. This is due to the presence of many administrative organizations combined with the high density of traffic and commercial activities at those locations, as well as the drivers' non compliance with speed limits inside cities.

Third: Western region:

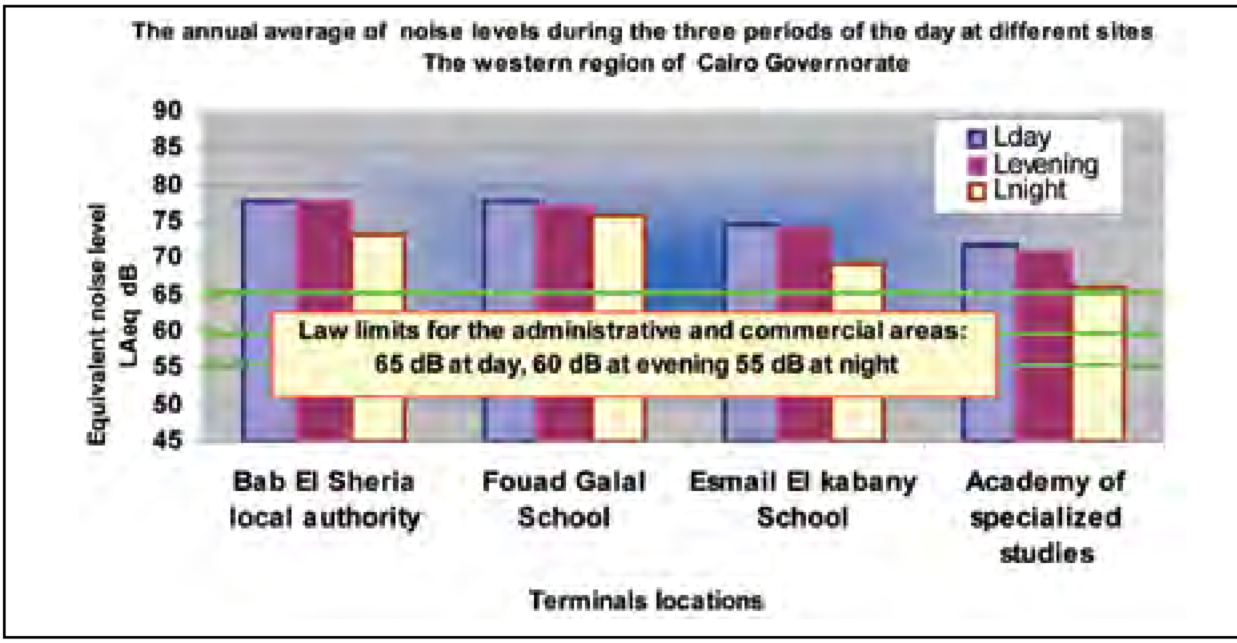


Fig (2-5) the equivalent noise levels for the three periods of the day at commercial and administrative areas in the western region of Cairo governorate

Figure (2-5) shows that the noise levels at the locations of Bab El-Sheria Local Authority building in Port Said street, Ismail El-Kabbani School in El-Abasia and the Academy of Specialized Studies in El-Darasa were higher than the permissible limits set forth in the executive regulation of the law as they range between (71-78) dB during the day and evening, and (66 -76) dB at night.

2-4-4 Noise levels in areas located on main roads

Noise levels have exceeded the permissible limits set forth in the Environmental Law in all monitored sites located on the main roads in each of the northern, eastern and western regions of Cairo Governorate, as follows:

First: Northern region:

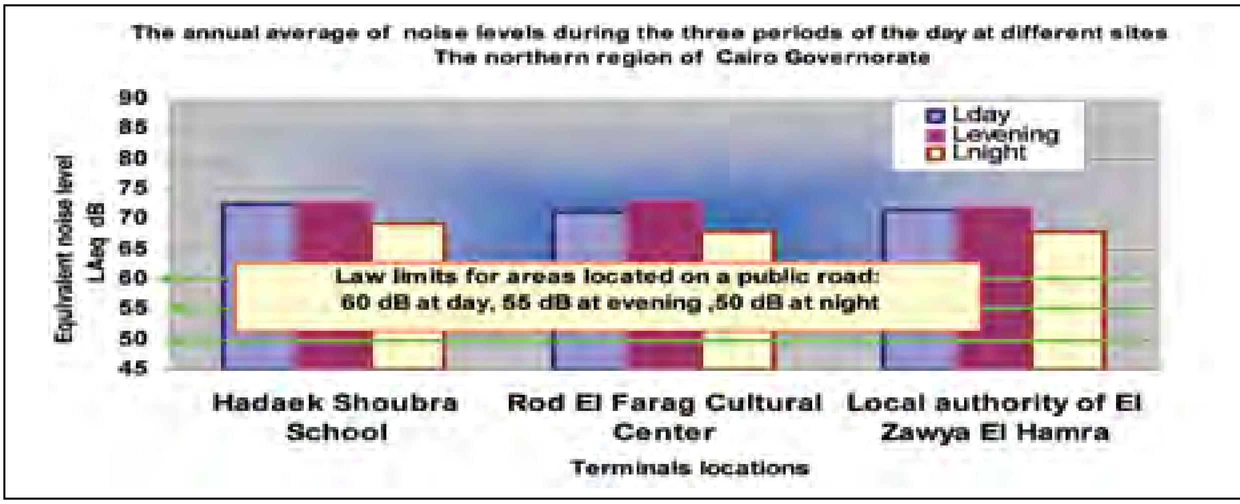


Fig (2-6) the equivalent noise levels for the three periods of the day at the sites of commercial activities, workshops or located on a public road in the northern region of Cairo governorate.

Figure (2-6) shows that the noise levels at all monitored sites through the terminals located in each of Hadaek Shoubra School, Rod El-Farag Cultural Center, and El-Zawya El-Hamra Local Authority building were higher than the permissible limits set forth in the Executive Regulation of the Law. Levels have reached a range of (71 - 73) dB during the day and evening and about 69 dB at night. This is due to the traffic high density in these sites as well as the presence of commercial facilities that open till very late night hours.

Second: Eastern region:

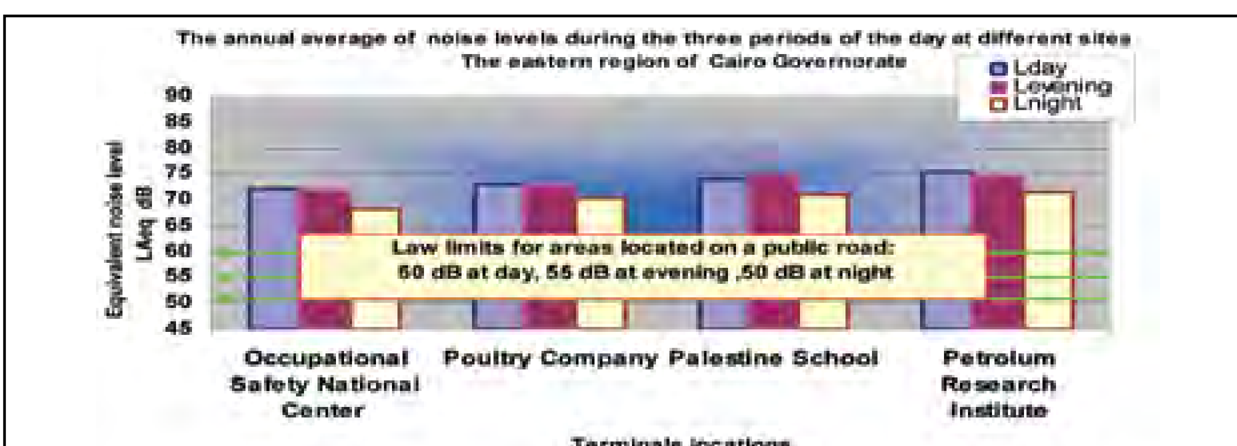


Fig (2-7) the equivalent noise levels for the three periods of the day at the sites of commercial activities, workshops or located on a public road in the eastern region of Cairo governorate

pic (2-3) the monitoring terminal at the Occupational Safety National Center- Heliopolis

Figure (2-7) shows that the noise levels monitored at all sites in each of the Occupational Safety National Center, Poultry Company, Petroleum Research Institute, Palestine School, were also higher than the permissible limits set forth in the Executive Regulation of the Law. Levels have reached a range between (71-74) dB during the day and evening and between (68-71) dB at night. This is due to the fact of terminals being located on main roads. On the other hand, Palestine School terminal witnessed high noise levels due to the interference of slums in this area lacking a proper traffic plan, in addition to the presence of many workshops.

Third: Western Region:

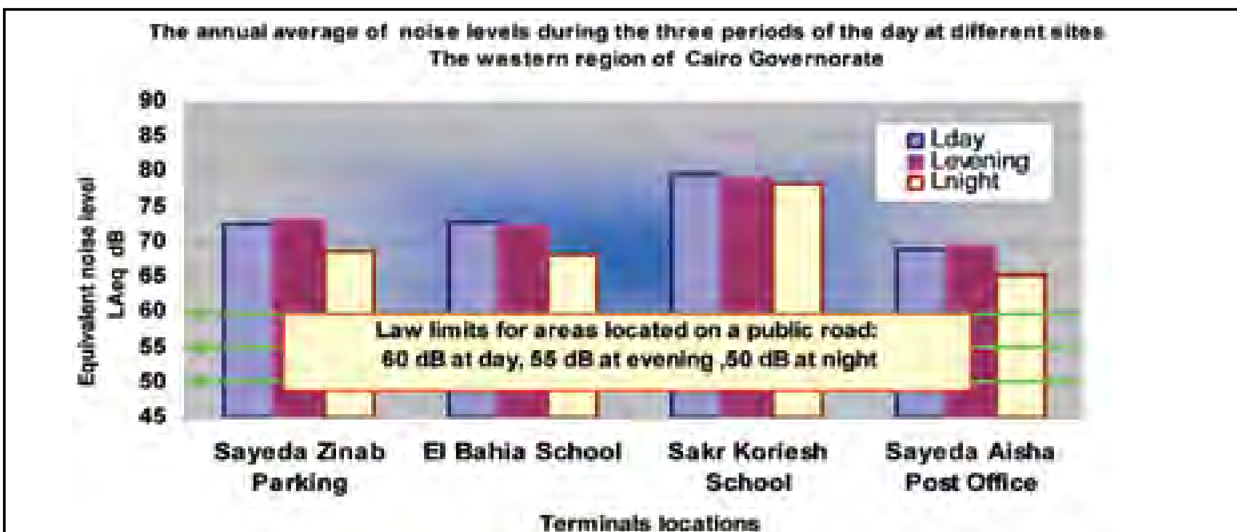


Fig (2-8) the equivalent noise levels for the three periods of the day at the sites of commercial activities, workshops or located on a public road in the western region of Cairo governorate

Figure (2-8) shows that the noise levels monitored through the terminals located in Sakr Koriesh School located on Autostrad Road, El-Bahia school in Port Said street , Sayeda Aisha post office and Sayeda Zinab parking were higher than the permissible limits as levels have reached a range between (68-80) dB during the day and evening, and between (65-78) dB at night. Also it has been

noticed that the terminal located in Sakr Koriesh School recorded the highest noise levels, 80 dB during the day, 79 dB in the evening, and 78 dB at night. This is due to the traffic high density on the Autostrad road combined with the passage of heavy trucks, in addition to the terminal location in the vicinity of the ring road, and lack of implementing any noise reduction techniques and measures for areas exposed to roads' noise especially for Sakr Koriesh School.

2-4-5 Noise levels in residential areas

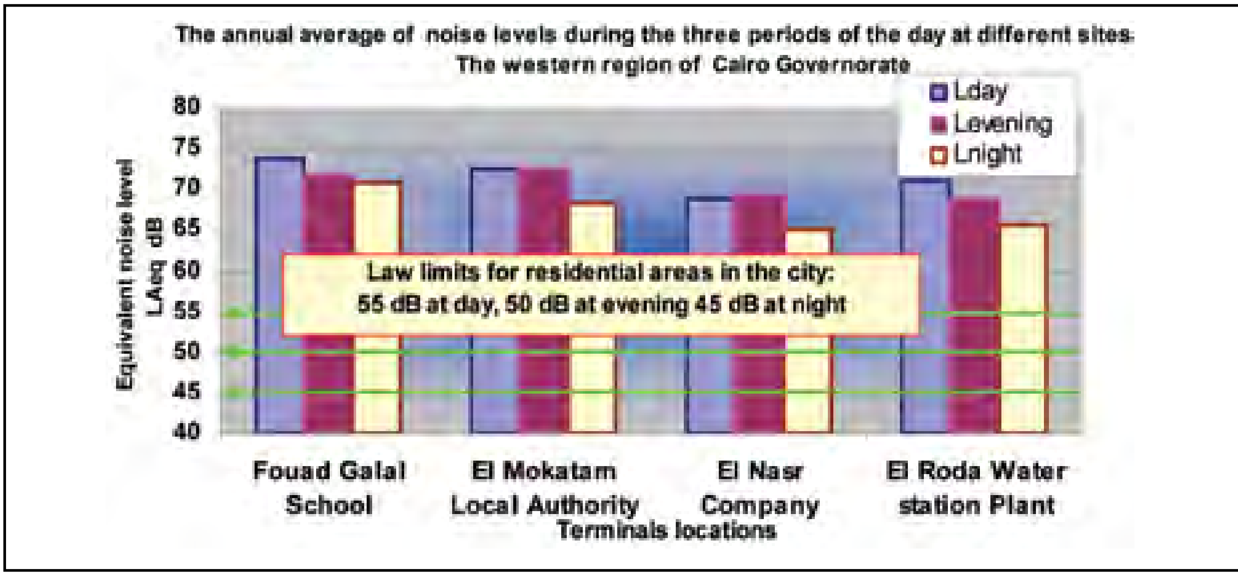


Fig (2-9) the equivalent noise levels for the three periods of the day at the residential areas in Cairo Governorate

pic (2-4) the monitoring terminal located at El-Mokatam Local Authority building

Figure (2-9) shows that the noise levels recorded by the terminals located in the western region of Cairo governorate (EL- Mokatam Local Authority–El-Nasr Housing Company – Fouad Galal School – El Roda water plant), were higher than the permissible limits set forth in the Law at all monitored sites. They have reached a range between (69-73) dB during the day and evening and between (65-71) dB at night.

2-4-6 Noise levels at landing, taking-off zones and residential areas around Cairo Airport from July till December 2008

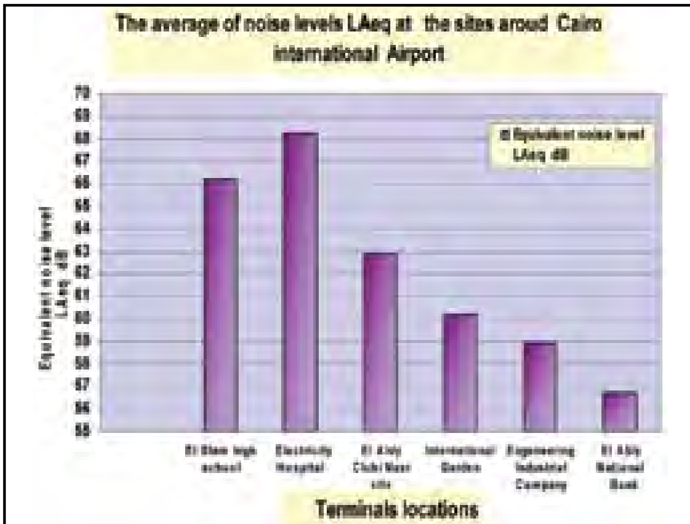


Fig (2-10) the average equivalent noise levels at the locations around Cairo International Airport

Source of data: Ministry of Civil Aviation

Figure (2-10) shows the average equivalent noise levels in the residential areas around Cairo Airport resulted from aircrafts taking-off and landing which have reached a range between (57- 68) dB. It has been noticed that the highest noise levels recorded at the location of the Electricity Hospital since it represents an essential point in the way of aircrafts landing.

2-4-7 Noise levels of various activities in the occupational environment (industrial - commercial - tourism) in governorates of Egypt

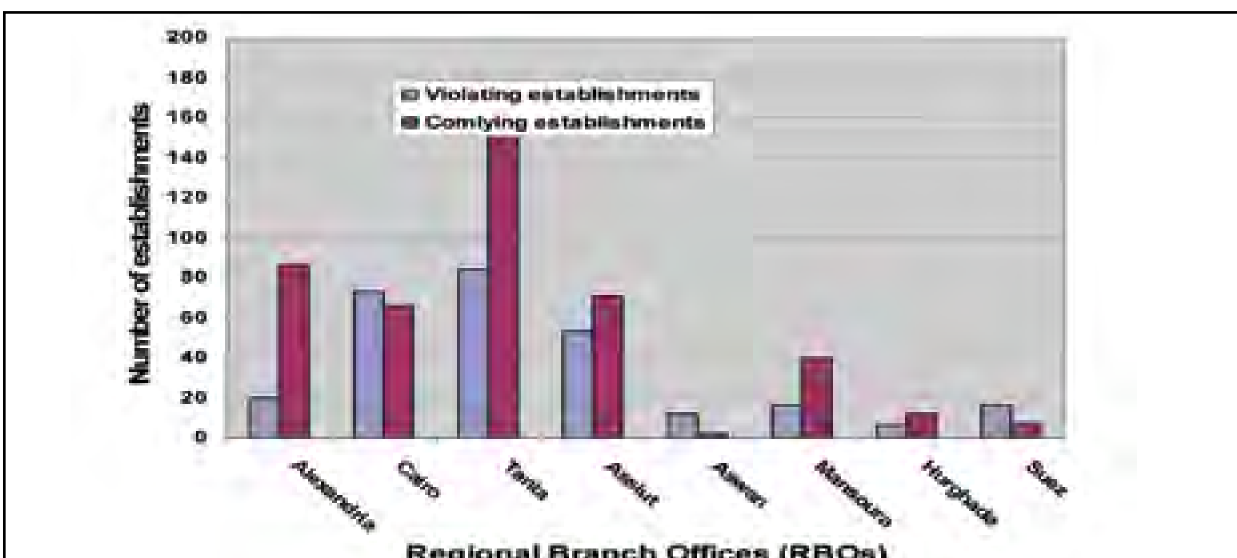


Fig (2-11) number of various establishments which have been inspected in 2008 at the level of (departments – branches) of EEAA

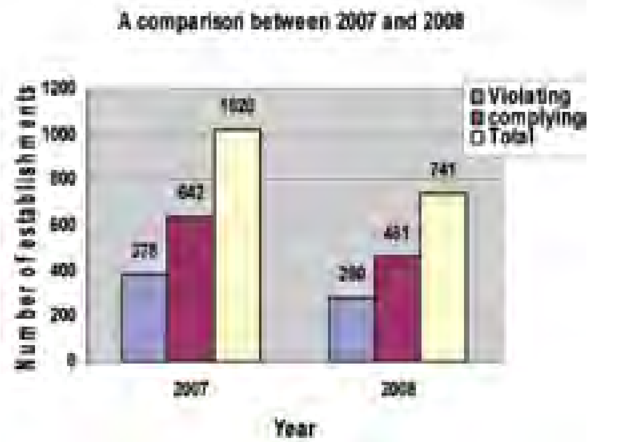


Fig (2-12) the comparison of noise measurements results in the establishments for years 2007 & 2008

Source of data: Ministry of Interior (General Directorate of Traffic Police)

Previous results show that total number of establishments inspected (regarding noise violations) by the Regional Branch Offices (RBOs) of EEAA in 2008 was 741 distributed as shown in figure (2-11). The ratio of complying establishments was 62%, and the ratio of the violating ones whose noise levels exceeded the limits set forth in the Executive Regulation of Law 4/94 was 38% of the total. Necessary legal measures have been taken towards violating establishments. The above mentioned ratios are lower than those recorded for the violating establishments in 2007 (Figure 2-12).

2-4-8 The noise of vehicles:

Fig (2-13) the traffic violations for noise in 2007, 2008

Source of data: Ministry of Interior (General Directorate of Traffic Police)

Figure (2-13) shows that traffic violations have been decreased regarding violating car horns and disturbing high volume recorders, due to the activation of Traffic Law for these kinds of violations, as well as the increasing of citizens' awareness in reducing their usage of car horns. However, violations regarding wedding processions where higher in 2008 than those recorded in 2007.

2-5 Main results of noise indicators for 2008

Results show that the main noise source was the noise emitted from roads traffic. Buildings located on roads or near them are exposed to high noise levels. Noise levels in most of the different areas are alike due to activities interference.

By analyzing the monitoring results during 2008 for the main squares of Cairo governorate and comparing them to those of 2007, it has been noticed that:

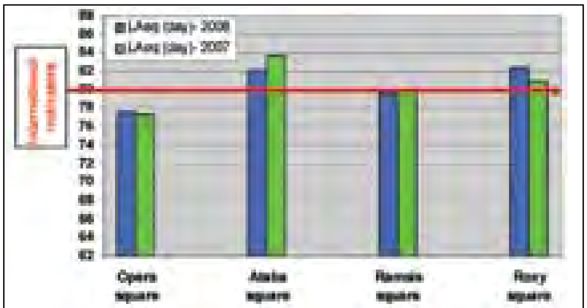


Fig (2-14) the comparison between the annual averages of equivalent noise levels for the day in main squares of Cairo Governorate

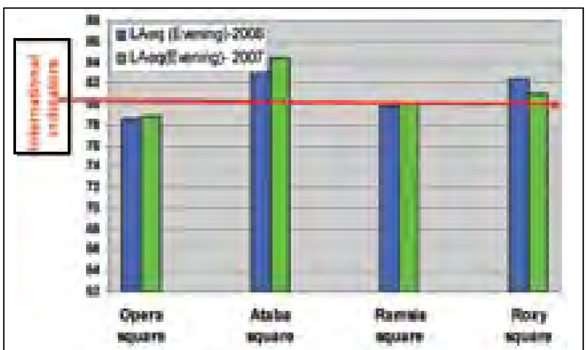


Fig (2-15) the comparison between the annual averages of equivalent noise levels for the evening in main squares of Cairo Governorate

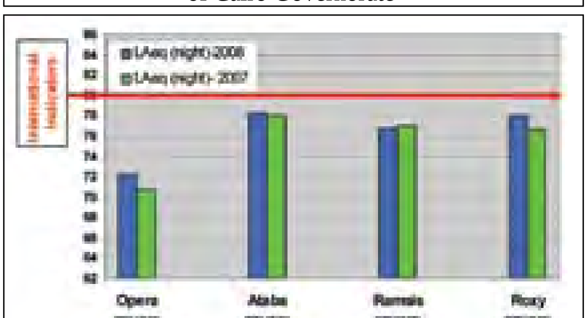


Fig (2-16) the comparison between the annual averages of equivalent noise levels for the night in main squares of Cairo Governorate

1. There have been no significant changes in the results of 2008 comparing to the previous year regarding the equivalent noise levels in all three periods of the day in Opera and Ramsis squares.
2. Equivalent noise levels of the day and evening periods in 2008 have been reduced by 1.65dB and 1.25dB respectively in Ataba square comparing to the previous year. This reduction is due to the Governor's decision of preventing the passage of trucks down town from eight o'clock a.m. till eight o'clock p.m., which decreases the traffic volume and commercial activities in the square during day and evening periods.
3. In Roxy square, noise levels of the day and evening periods have increased in 2008 by 1.4dB, 1.5dB respectively comparing to the previous year. This is a result of the traffic volume and commercial activities increase; as the General Directorate of Traffic Police indicates that the licensed vehicles in Egypt are increasing annually by 15% and most of this increase is concentrated in Heliopolis and Nasr City districts.
4. Also noise levels in the night period in Roxy and Opera squares have increased by approx 1.4dB. This is due to traffic volume increase during the night. In this regard there were no significant changes in other squares.

2-6 Recommendations for noise reduction in Cairo governorate

The First Annual Report of Noise Monitoring Network in Cairo governorate for year 2007 has been issued and sent to Cairo Governor who formed an experts committee to implement report's recommendations in order to reduce noise levels in the framework of National Noise Reduction Plan. Recommendations included the following:

1. Strengthening the implementation of noise regulations included in the Traffic Law, and place guiding signboards to define sensitive areas to noise, such as (hospitals - schools).
2. Controlling and finding out suitable places for peddlers and prohibit issuing permits for them to use loudspeakers.
3. Activating environmental impact assessment studies for roads, following up their implementation and re-planning traffic for areas suffering from traffic congestions.
4. Establishing noise barriers on some of the main roads that pass through residential areas, schools, and hospitals. Consider buffer zones when planning for new main roads and high ways, tree-planting of road platforms and medians to reduce noise levels.
5. Obliging commercial shops and restaurants in residential areas to close at maximum hour of 10 o'clock pm, due to the unacceptable noise levels in these areas at night.
6. Locating and defining clear infantry lines in roads.

2-7 Future Plan

Future plan for noise reduction includes the following measures:

1. Developing and upgrading Environmental Noise Monitoring Network, increasing number of mobile terminals to cover monitoring process in Giza and Qaliubeya as second and third phases. Developing and preparing technical plans to control noise based on monitoring results to be submitted to decision makers.
2. Extending noise monitoring process to cover other governorates of the Republic.
3. Following up implementation of the National Noise Reduction Plan approved by representatives of the concerned ministries to activate procedures and regulations of noise reduction and source control through abiding by respective role of each ministry .
4. Coordinating with governorates on tree planting of road platform ,medians and fixing noise barriers on highways passing through residential and sensitive areas (such as hospitals - schools - public libraries-parks) so as to reduce noise produced by traffic on the roads.
5. Upgrading and continuing cooperation plans with Traffic Police, Environmental and water police, intensifying inspection campaigns on noise-producing facilities, and taking legal measures against violators.
6. Reviewing noise limits set forth in the Executive Regulation in light of the amended Environmental Law no.9/2009. Preparing regulations and guidelines for noise produced by traffic, railways and airports to control noise source within urban planning.

2-8 Terminologies

Noise: Unwanted sounds

Environmental noise: harmful, unwanted sounds produced by all human activities including noise generated from transportation means, airports, industrial activities, and any other activities in the surrounding environment.

L_{Aeq}: continuous equivalent noise level during an interval time at the measurement level A.

L_{day} : continuous equivalent noise level during day time.

$L_{evening}$: continuous equivalent noise level during evening time.

L_{night} : continuous equivalent noise level during night time.

dB: noise measurement unit

A-weighted (Curve): represents the method of human being auditory system response to pure tones.

References:

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2- Environmental Noise, Bruel & Kjaer www.b&ksv.com

3- Berglund B.&Lindvall.T.Schewela,D.(2000)**"Guidelines for community noise" WHO**

4- Environmental law no.4/1994 and its executive regulations

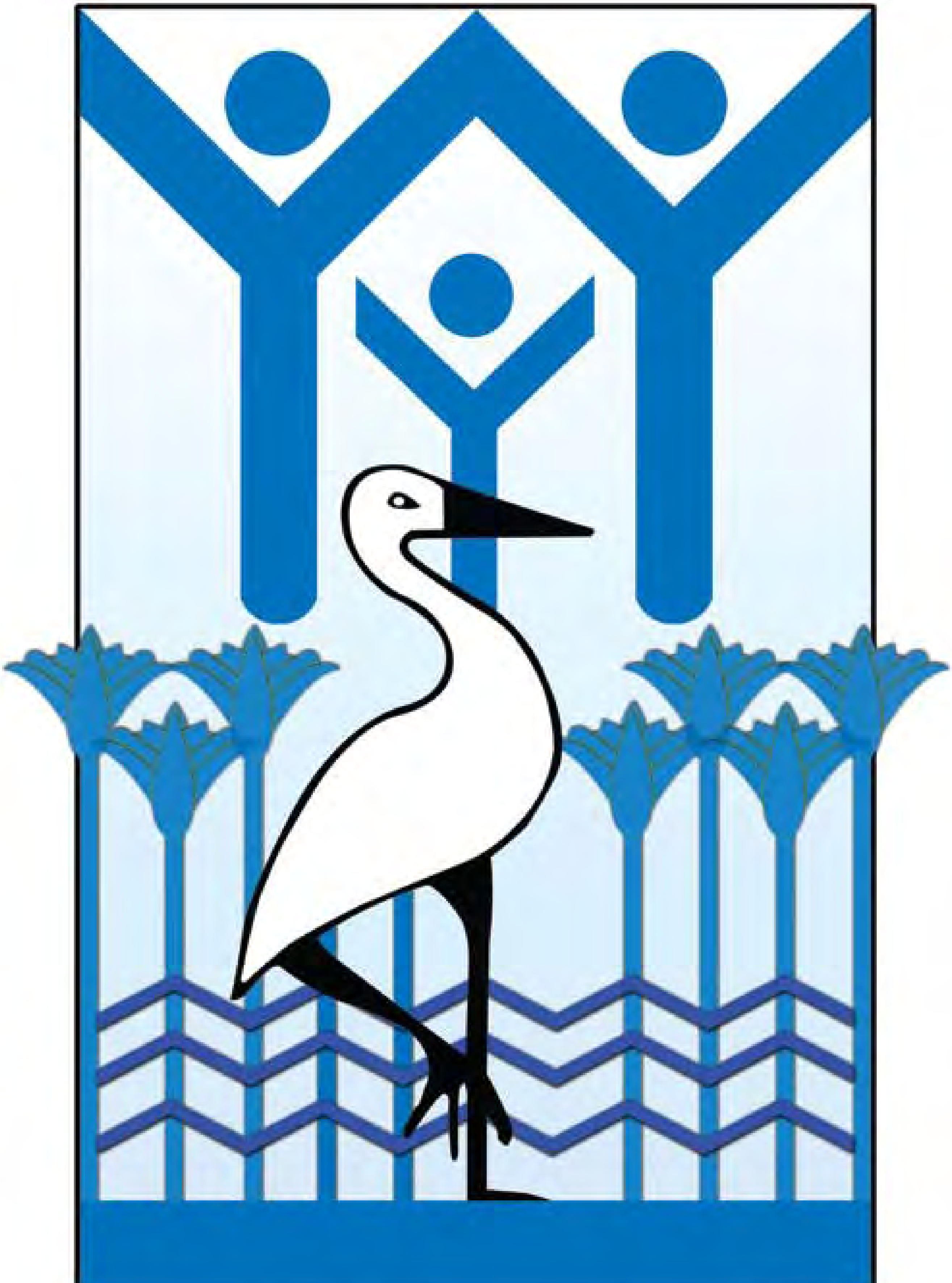
Data Source:

1- Noise Monitoring Network, EEAA

2- Regional Branch Offices (RBOs), EEAA

3- Ministry of Civil Aviation

4- Ministry of Interior (General Directorate of Traffic Police)



Chapter 3
Climate Change

3-1 Introduction

Climate Change means imbalance in the prevailing climatic conditions such as temperature, wind patterns and rainfall distributions distinguishing each region on the Earth surface, which affects the prevailing vital systems on the long run. The recorded temperature of the Earth's surface has increased steadily during the past hundred years, ranging between 0.5 - 0.7 degrees Celsius. There is no doubt that threats and risks of Climate Change is an unequivocal fact, as human activities of industrial and technological revolution led to the increasing rate of greenhouse gas emissions and increasing their concentrations in the atmosphere. This caused a greater capacity for the lower layers of the atmosphere to absorb long wavelength radiations, which led to the phenomenon of Global Warming, causing the start of global Climate Change. It is well known that the phenomenon of Climate Change, is a global phenomenon but its effects vary from place to place on the earth.

3-2 Pollution Sources

Main Greenhouse Gases (GHG) are:

1- Carbon dioxide CO_2,
2- Methane CH_4,
3- Nitrous oxide N_2O,
4- Perfluorocarbons PFCs,
5- Hydrofluorocarbons HFCs,
6- Sulphur hexafluoride SF_6.

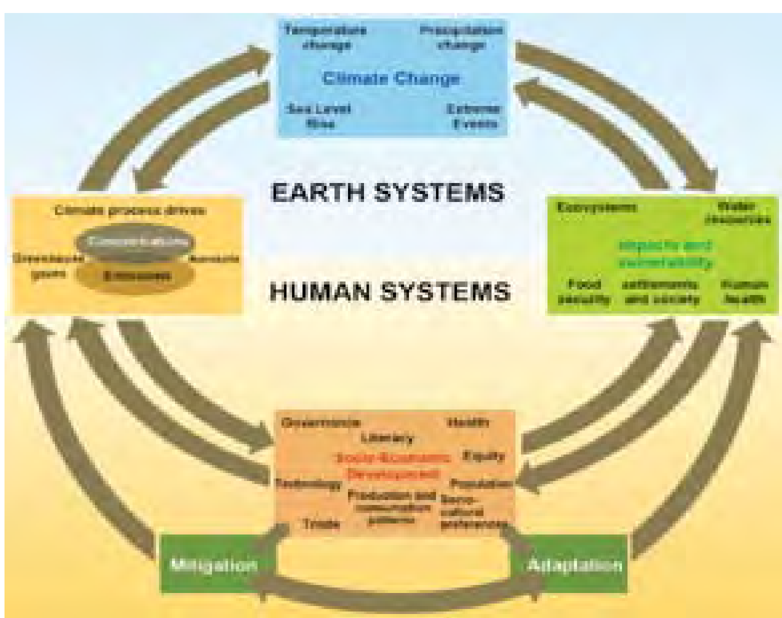


Fig. (3-1) Schematic framework representing anthropogenic drives, impacts of and responses to climate change, and their linkages (AR4 – IPCC)

Figure 3-1 represents the schematic framework of the anthropogenic drivers, impacts and responses to climate change, and their linkages. At the time of the Third Assessment Report (TAR) in 2001, information was mainly available to describe the linkages clockwise, i.e. to derive climatic changes and impacts from socio-economic information and emissions. With increased understanding of these linkages, it is now possible to assess the linkages also counterclockwise, i.e. to evaluate possible development pathways and global emissions constraints that would reduce the risk of future impacts that society may wish to avoid.

3-3 Climate Change Adverse Impacts on Egypt

Main Climate Change challenges facing Egypt, which affected Energy, Industry, Security and National Economy sectors are the Sea-Level Rise, lack of Water Resources, decrease of Agricultural Productivity, difficulties to cultivate some types of crops and the effect on Tourism Industry as well as Health and Infrastructure.

3-3-1 Impact on Water Resources

- Population growth and the increase in consumption rate, particularly agriculture and industry sectors, in addition to the increasing pressure on water sources.
- Change in amounts, places and patterns of rainfall; some studies indicate a divergence in periods of rainfall with increase in precipitation rate, leading to increase floods and droughts.
- Some studies show that Nile flow may decrease by approximately 60%.
- Saltiness of coastal aquifers due to the increase in seawater intrusion

3-3-2 Impact on Agriculture, Livestock and Food Resources

- Decrease in the productivity of agricultural crops.
- Change in the geographical distribution of agriculture yields patterns.
- Negative impacts on the marginal agriculture and increased desertification rates.
- Increased water demand due to high temperatures and evaporation.
- Negative impacts on agriculture due to the change in rates and seasons of heat waves (such as blossom in the citrus)
- Social and economic impacts.
- High temperature increases rates of soil erosion and reduces the possibility of cultivating marginal lands.

3-3-3 Impact on Coastal Zones

- Drowning of some low-lying areas in northern Delta and other coastal zones.
- Increasing rates of beach erosion, penetration of salty water to soil, intrusion of sea water with underground water and decreased agricultural production.
- Impact on fish production due to the change in coastal zones ecosystem, and increase of sea water temperature
- Social and economic impacts resulted.

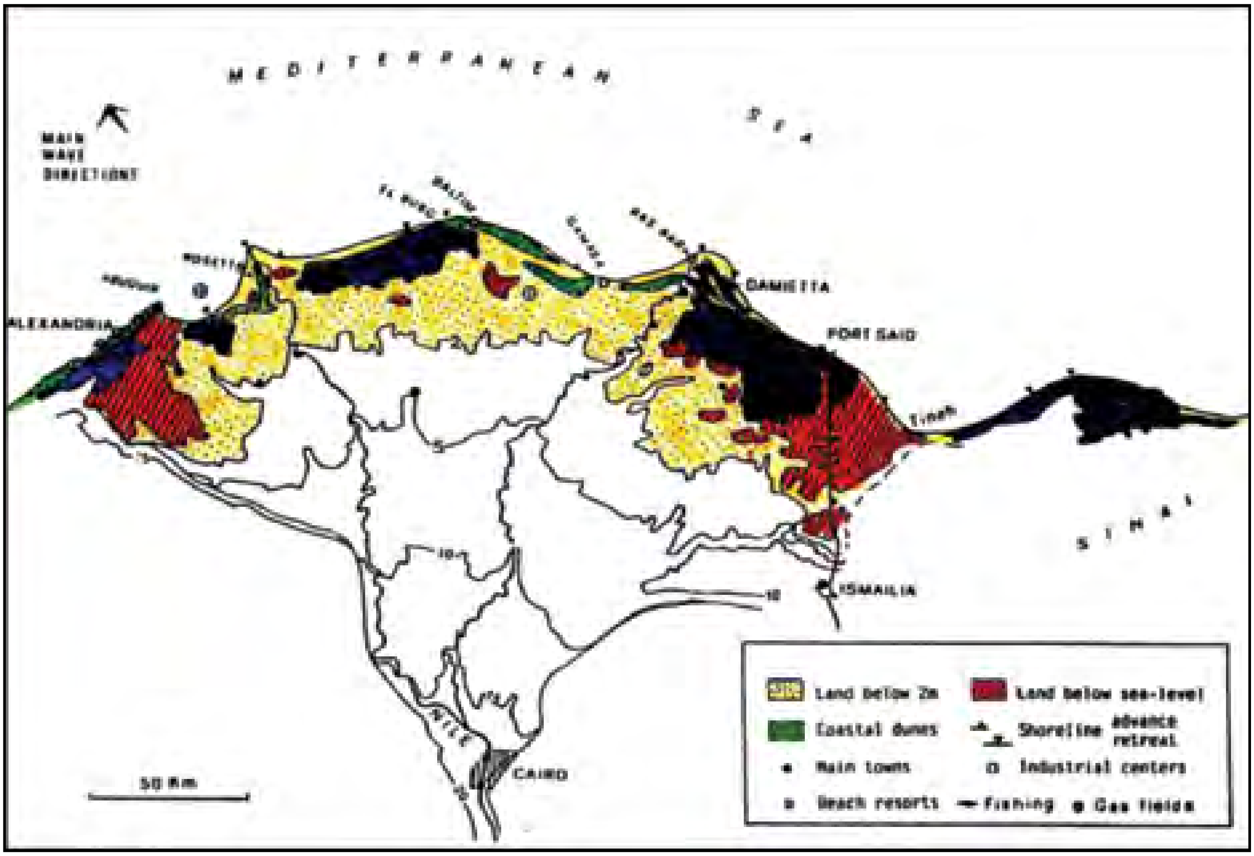


Fig. (3-2) Topography of the Egyptian Delta, contour lines shows the different regions of the high and low Delta areas ,red areas indicate Delta areas located beneath sea surface which is prevented by sand dunes, dam walls built.

3-3-4 Impact on Tourism

- Rapid deterioration of the cultural monuments at the high temperature and variable weather conditions.
- Increased pressure on investments areas located on the costs of Red and Mediterranean seas.
- Decreased numbers of safe beaches will negatively effect tourism services, lead to rapid degradation and consequently lower rates of tourism and increase unemployment rates
- High temperatures will lead to bleach coral reefs which are considered to be a natural wealth attracts tourists.

Pic.(3-1) Bleaching of Coral Reefs

3-3-5 Impacts on Health

- Spread of common vector, borne diseases such as malaria and dengue; as well as other major killers such as malnutrition and diarrhea.
- Health effects resulting from water shortage, high temperature, humidity and the increasing intensity of heat and cold waves.
- Increasing in mortality rate among children and the old due to high temperature.

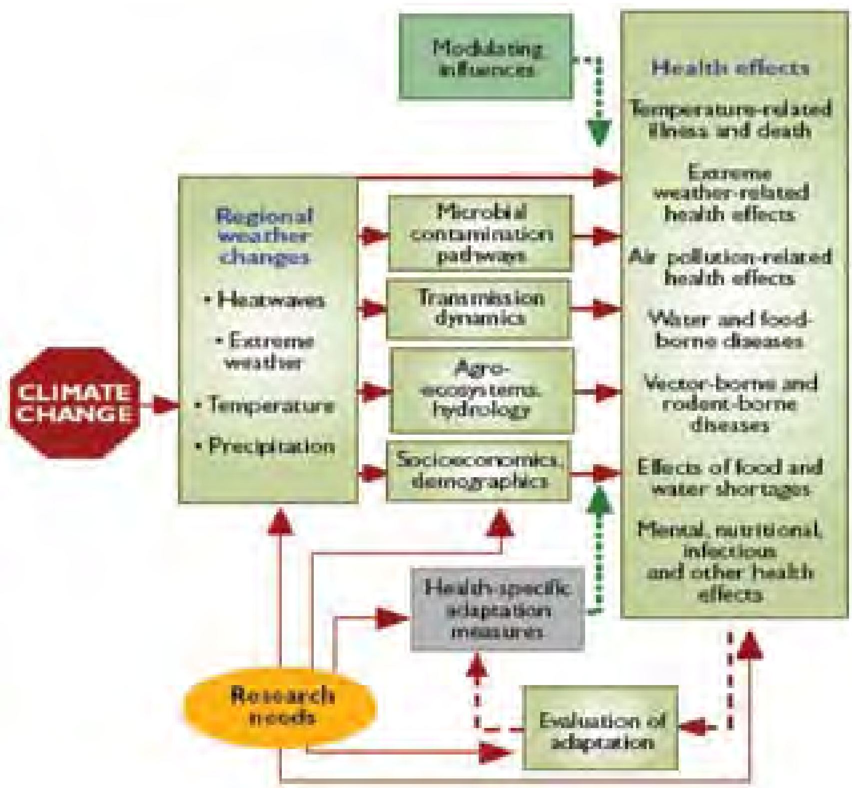


Fig. (3-3): the relationship between Climate Change and Human Health (WHO, 2008)

3-4 Environmental Indicators

Table (3-1): GHG Emissions (CO_2eq) in Egypt ***

Year	Emissions Mt CO_2 - eq	Global Yearly Emissions %
1990	116.608 *	0.35
2008	225.628 **	0.96

Table (3-2): CO_2 Emission in Egypt

Year	Emissions CO2 (Mt)
1990	84.46 *
2008	158.47 **

Table (3-3): CO_2 Emission per Capita ***

Year	1990	2008
CO_2 Emission per Capita (ton/ year)	1.9 *	2.93 **

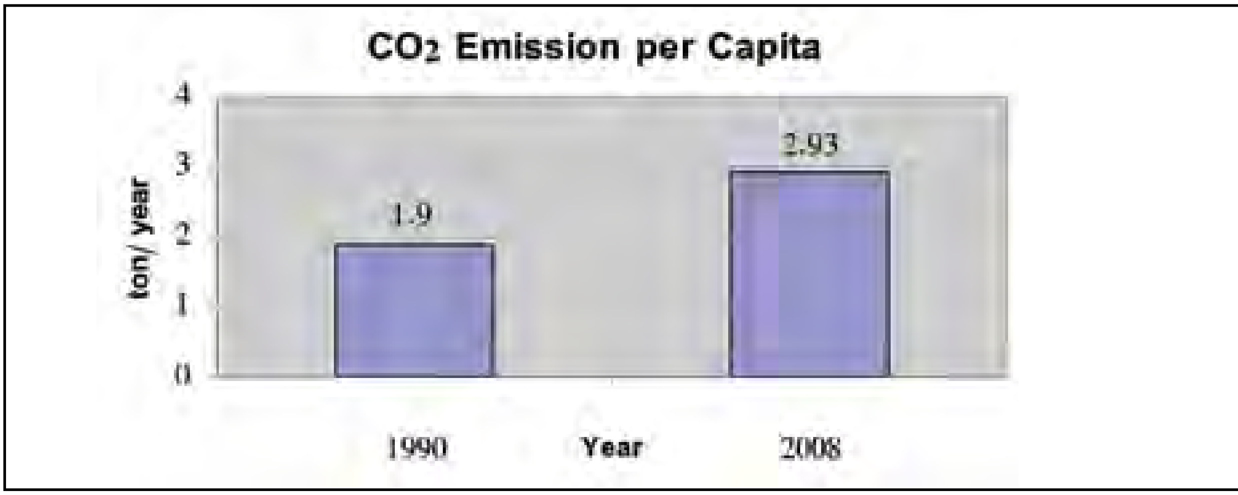


Fig. (3-4): CO_2 Emission per Capita in Egypt ***

* Initial National Communication 1999
** Arithmetic Result – not checked yet (Second National Communication – under preparation)
*** EEAA – Climate Change Unit

3-5 Egyptian efforts to mitigate negative impacts

Clean Development Mechanism (CDM)

CDM is one of Kyoto Protocol three mechanisms which include Joint Implementation and Emissions Trading. CDM application is aiming at implement projects reducing GHG emissions from different sectors such as industry, waste recycling, transport, and afforestation to absorb GHG. These projects contribute to achieving sustainable development goals, create job opportunities, and produce additional financial return from selling carbon reduction certificates.

During 2008, National Climate Change Committee held 4 meetings (2 for the Egyptian Bureau for CDM (EB-CDM) and 2 for the Egyptian Council for CDM (EC-CDM)). 13 CDM projects have

been approved initially and Letters of No-Objection (LoN) have been issued (first phase of project approval). Such projects include:

1. Fuel Switching to Alternative Fuel in Kattamya and Helwan Cement Plants (Suez Co.)
2. 15 MW Waste Heat Recovery Based Cogeneration Project in Abu Zaabal Fertilizer & Chemicals Co.
3. Fuel Switching from Mazout to Natural Gas in General Co. for Paper Industry (RAKTA)
4. Fuel Switching to Cleaner Fuel in Middle East for Paper (SIMO) Manufacturing Co.
5. Waste Heat Recovery in Delta Steel Co.
6. Fuel Switching to Cleaner Fuel in the Egyptian Starch & Glucose Manufacturing Co. (Tourah Plant)
7. Egypt household CFL project
8. Power generation by utilizing coke oven in Al-Nasr Co. for Coke & Chemicals
9. Waste heat recovery project by using gas turbine generators in the Egyptian Operating Co. for Natural Gas Liquefaction
10. Fuel switching from mazout to natural gas in the Egyptian Sugar and Integrated Industries co.
11. Flared gas recovery system in the Egyptian Operating Co. for Natural Gas Liquefaction
12. Methane capture and flaring in Belbis landfill
13. Methane reduction by composting in Khatatba landfill

The Committee had granted final approval for 3 projects, letters of Approval & Letters of Authorization (LoA) had been issued; this is the second and final phase of CDM's approval procedures for projects. 12 projects have been approved since the Committee started its activities in 2005:

1. Assiut Cement Plant Mazot Partial Replacement With Biomass Fuel.
2. 15 MW Waste Heat Recovery Based Cogeneration Project by Abu Zaabal Fertilizer & Chemicals Co.
3. Zafarana 80 MW Wind Power Plant Project, Germany

CDM Projects, which had been approved during 2008, have an investment cost up to $ 66 million USD. They reduce greenhouse gases emission up to about 0.9 million tons of carbon dioxide equivalent. These projects are working in Fuel Switching, Waste Recycling and Energy Efficiency's sectors.

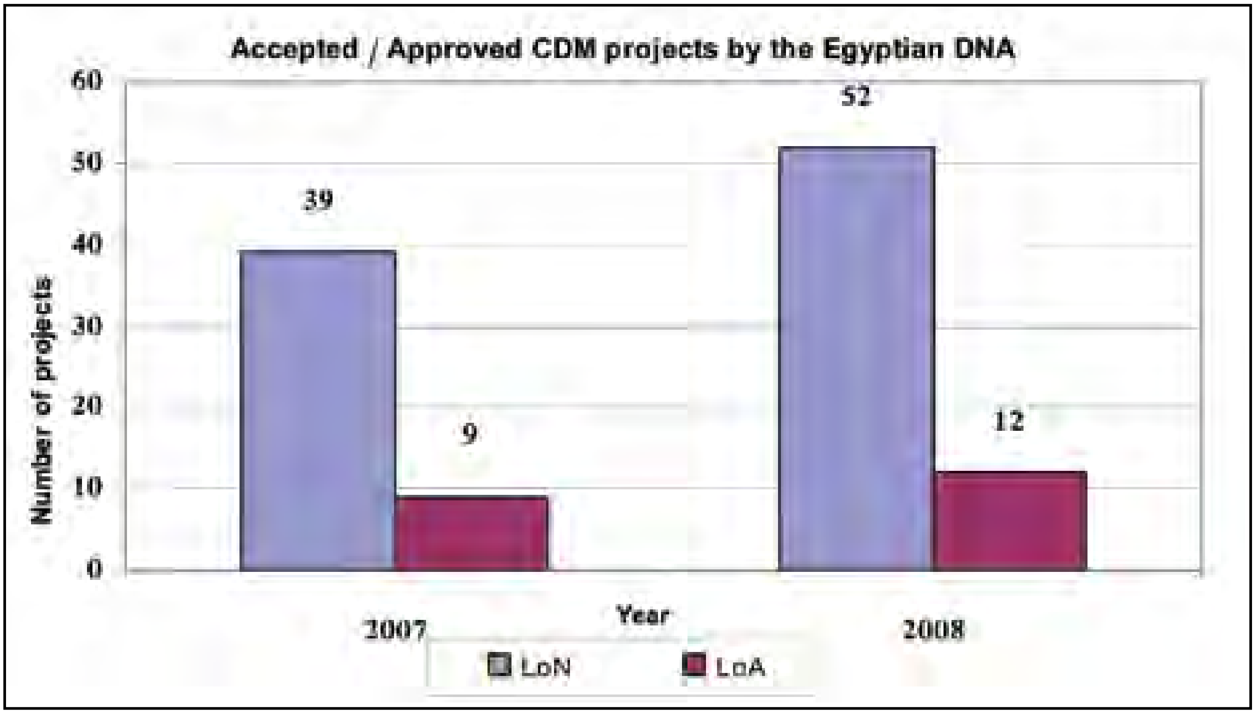


Fig. (3-5): Comparative between number of Accepted CDM projects (LoN)/ Approved CDM projects (LoA) by the Egyptian DNA 2007 & 2008

Concerning the international situation of CDM projects in Egypt, CDM Executive Board had approved to register 1 Egyptian CDM project in 2008; thus number of internationally registered Egyptian projects is 4. The registered project is "Waste Gas-based Cogeneration in Alexandria Carbon Black Co.". The Executive Board had also enlisted 4 Egyptian CDM projects in the validation stage (preceding registration), so that 8 projects are currently under the international validation stage. These 4 projects are:

1. Assiut Cement Plant Biomass Fuel Switching Project.
2. Zafarana 80 MW Wind Power Plant Project
3. Abu Zaabal Landfill Gas Capture and Flaring
4. Zafarana 85 MW Wind Power Plant Project

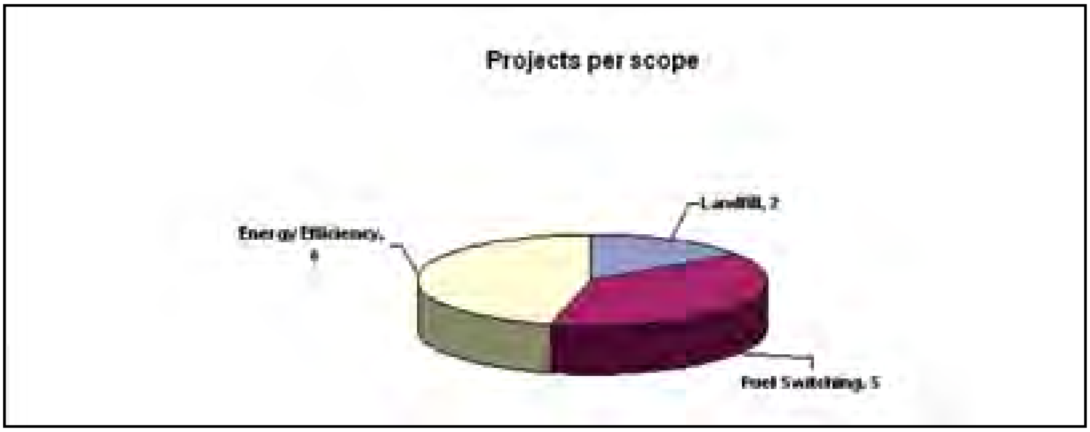


Fig (3-6): Distribution of Accepted CDM Projects from DNA during 2008 (13)

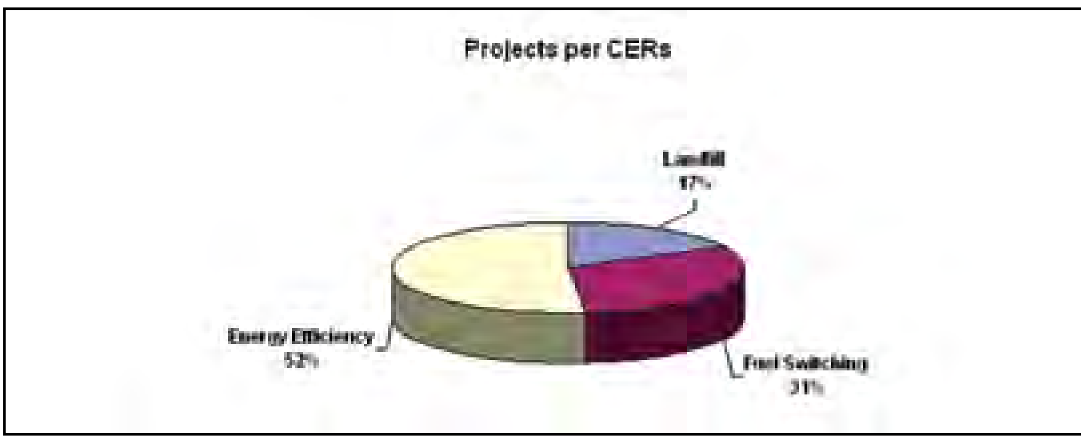
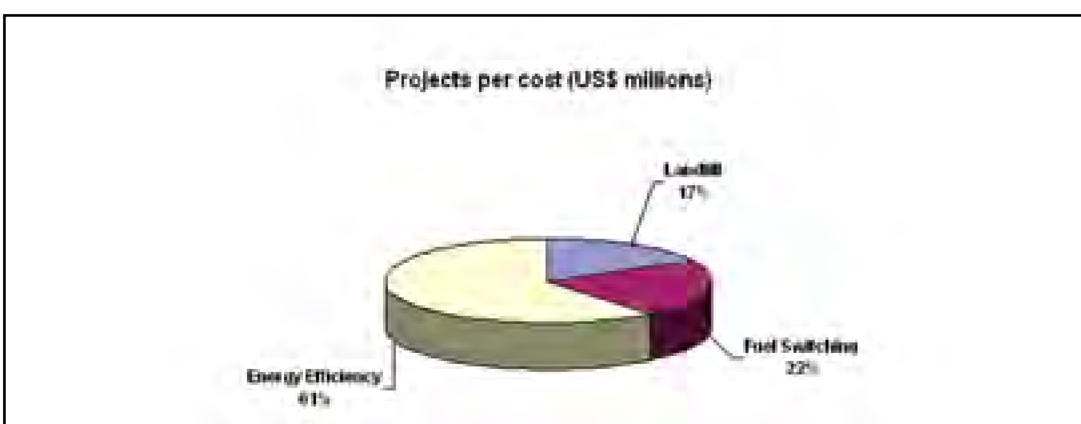


Fig (3-7) Distribution of projects costs in 2008 (approx. $ 66 million).



Fig(3-8) Distribution of the reduction percentage in GHG in 2008 (0.9 million ton CO2 equivalent)

Regarding capacity building, many achievements had been realized. On 6th June 2008, on the occasion of celebrating World Environmental Day by Ministry of State for Environmental Affairs, a National Forum on Climate Change and CDM had been organized.

Egypt had participated in the Arab Countries Exporting Petroleum's Meeting held in Cairo, Subsidiary Body meetings of the UNFCCC held in Germany and the Conference of Parties COP14 held in Poznan - Poland. To promote for CDM projects, EEAA participated in Carbon Expo Forum held in Cologne, Germany.

3-6 The Future Vision

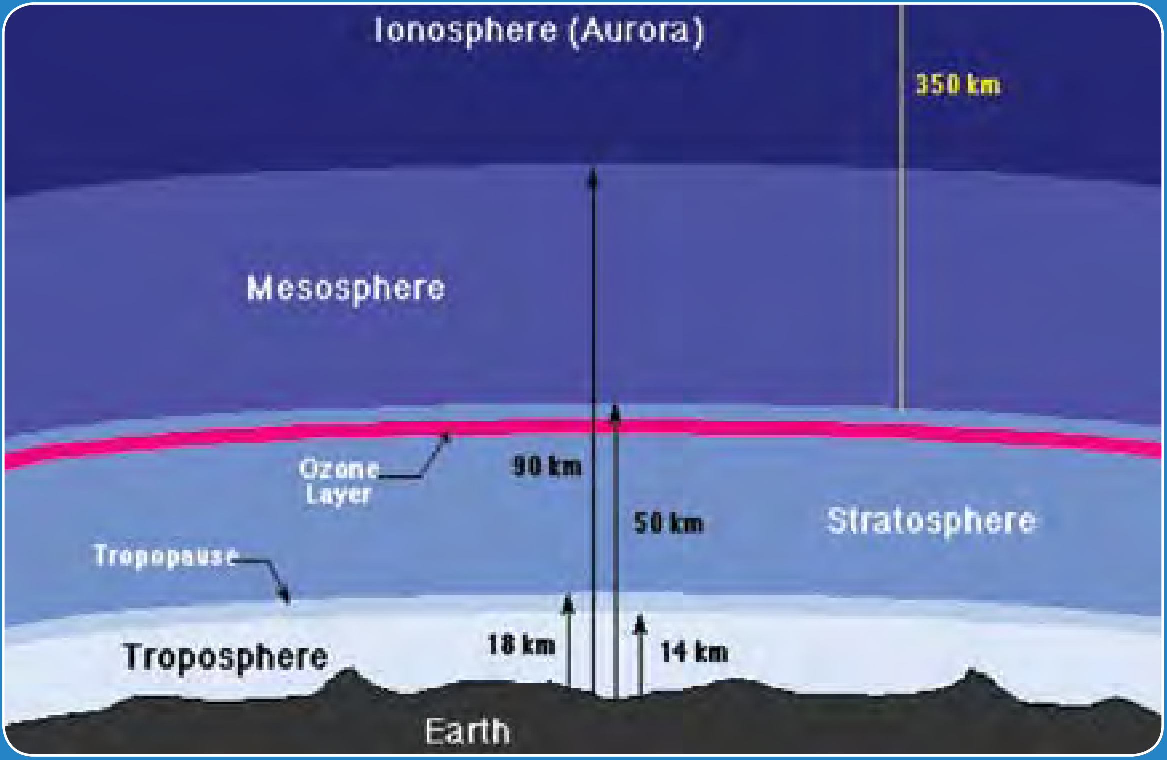
- Developing a National Strategy to address challenges caused by climate change and potential threats on Water Resources and Irrigation, Agriculture, Tourism and Public Health.

- According to the Fourth Assessment Report (AR4) published in 2007: "Adaptation can reduce vulnerability in the short-and long-term"; for that Egypt gives priority to Adaptation to climate change; as it seeks to prepare proposals for adaptation projects in the areas of Water Resources, Coastal Zones, Agriculture and Tourism to be funded by the Adaptation Fund

- Egypt seeks to establish a hypothetical National Center for Climate Change Research Studies, which aims to coordinate among various research institutes in Egypt, as well as collect all results of National studies and researches in order to evaluate them for the sake of taking appropriate decisions and to set national plans and policies.

- Increase public awareness regarding risks of climate change among different segments of the Egyptian society, in addition to the necessity of unifying national / international agencies to address and adapt with problems caused by climate change.

Chapter 4
Ozone Layer Protection



4-1 Introduction

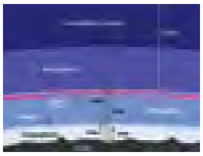
Ozone (O_3) is a triatomic allotrope of oxygen, composed naturally through a process called photochemical analysis, where the sunlight has an impact on oxygen molecules, the ozone exists throughout the year over the equatorial belt, and moves toward the polar regions by the movements of air in the stratosphere that is filled by ozone on the altitudes ranging from 20 to 35 kilometers, Its thickness ranges between 2 to 8 kms.

Ozone layer is the natural filter and preventive shield surrounding Earth to protect all creatures against harmful UV-B rays. Which affects the global climate change; hence, threatening human health and environment safety.

Source of threat comes from the introduction of man-made chemicals that have led to increased use of ozone-depleting substances.

Ozone in the atmosphere is in the status of a natural dynamic balance, where exposed to continuous, balanced and equal construction and disintegration operations, to allow the stability of life on earth.

A group of chemicals has emerged, due to the development of industry that significantly changed this natural balance and led to Ozone Layer shrinking. Table (4-1) shows the most important of these chemicals as defined by international agreements (Montreal - Vienna) and others.



4-2 Chemicals depleting Ozone Layer

Table (4-1): usage of Ozone-Depleting Substance, Ozone Depleting Potential and Global Warming Potential.

Substances	Usage	ODP	GWP
Chlorofluorocarbons CFC›s	Refrigerators, cleaning solvents, aerosols, and foam products industry	0.6 - 1	4670 - 10720
Halon 1211 CF_2BrCl Halon 1301 CF_3Br	Fire fighting equipments and systems	3 - 10	1620 - 7030
Methyl chloroform $C_2H_3CL_3$	Production of CFC›s (inter-median substance) solvents, inhibitors, fire fighting equipments	1.1	1380
Carbon tetrachloride CCl_4	Cleaning solvents, ink, and corrector pen.	0.1	144
Methyl bromide CH_3Br	Fumigation spraying substance used for soil sterilization injected into the soil before a crop is planted and after harvest in storing grains. Fumigation spraying substance is a vaporizing broad spectrum pesticide that usually used in sterilization.	0.6	5
Hydrochlorofluorocarbons HCFC›s	Transitional alternatives to CFC›s, used in refrigerators, solvents and foam blowing agents & fire fighting equipments. HCFC›s depleted stratospheric ozone but to a lesser degree than CFC›s, but they are among the global warming gases.	0.1 – 0.5	76 - 2270

Ozone Depleting Potential (ODP):

Is the ratio between the environmental effect of a substance on ozone compared to the effect of the same amount fromCFC-11. Ozone Depleting Potential equal 1.0.

Global warming potential (GWP):

Is the ratio between warming caused by a substance and warming caused by a similar mass of carbon dioxide. The global warming potential of carbon dioxide reaches 1.0.

4-3 Harmful impacts on health and environment caused by ozone depletion

The Ultra Violet UV-B ray which comes from the sun reaching earth's surface has harmful effects such as; human skin cancer and eye cataract, immunodeficiency, effect on photosynthesis in green plants, reducing plant growth and affecting agricultural crops; in addition to its adverse impact on aquatic environment, all of which leads to an unbalanced general system of nature and life on earth, which in turn, affects the global climate change; hence, threatening human health and environment safety.

4-4 Environmental Indicators

Environmental indicators of ozone unit adheres to provisions and decisions of Montreal Protocol concerning the gradual reduction of the consumption of ozone-depleting substances leading to total phase - out, according to schedules of the Protocol and various amendments made to it.

a) Halons Sector:

Preparation of a National Strategy for Halon Sector, aimed at phasing-out these ozone-depleting substances in fire fighting and the use of halon alternatives; Multilateral Ozone Fund has established the Halon Bank in Egypt, aimed to recover and recycle halons for necessary use in various vital sectors in the state. In 16th September, 2006, a cooperation protocol had been signed between Ministry of State for Environmental Affairs and Ministry of Military Production. Helwan Company for Engineering Industries (formerly Military 99 Factory) is selected to be responsible about management of the Halons Bank Project under UNDP and MSEA supervision. Full installation ,operation and training employees on how to recover and recycle Halons has been completed. The Halon bank was inaugurated during the celebration of International Ozone Day in 2008, as clarified in figure (4-1).

Fig (4-1) Egyptian Halon Bank

The EEAA compiled all Halons, from all parties that possess stagnant stockpile to transform into alternatives for fire-fighting systems; all quantities are collected and delivered to the Halon bank. Allowing use of halons in some fire fighting systems only to secure critical expensive equipments , maintain the functional viability of aircrafts, ships , tanks ,communications systems, computers , other sophisticated and critical electronic equipments from a strategic point until their replacing with non-depleting Ozone Layer alternatives during the coming years.

b) Medical Aerosol Sector (MDI):

The Egyptian Strategy for Pharmaceutical Sector has been completed which aims to transform the manufacturer's production lines of medical aerosols using ozone-depleting substances CFC's in Metered Dose Inhalers (MDI's) for the treatment of asthma and allergic respiratory diseases as clarified in figure (4-2).

Multilateral Ozone Fund has approved funding such strategy in collaboration with Ministry of Health and Population to phase out use of such substances, as this sector consumes 163 tons of ozone-depleting CFC's. Full transformation of pharmaceutical production lines is expected by the end of year 2010.

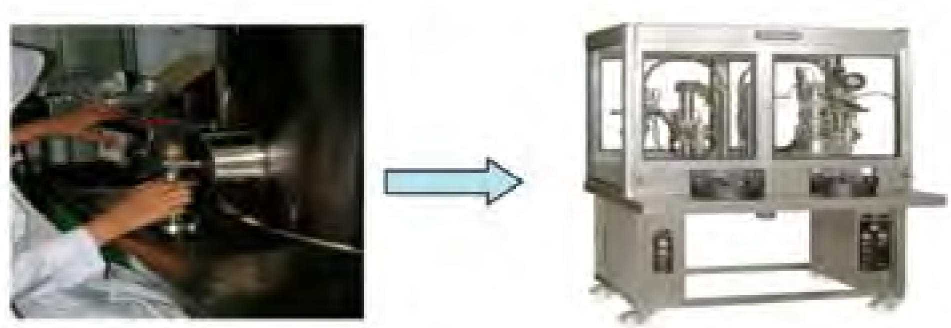


Fig (4-2): Transform the manufacturer's production lines of medical aerosols using ozone-depleting substances

c) Refrigeration and Air Conditioning Maintenance sector:

The Egyptian Strategy aims to final phase–out use of 822 tons of CFC's used in refrigeration and air-conditioning in accordance with Table (4-2). Accomplishment of first & second phases of this strategy had been completed. All planned objectives have been achieved without affecting the national economy.

1- The most important achievements during the first phase from 2005 – 2006:

- Selecting and distributing best recovery and recycling devices for refrigeration and mobile air conditioning (MAC) to auto service centers in order to freeze and reduce consumption of CFC's, figure (4-3).

- Organizing a national training program for training and rehabilitating 1240 trainees to be trained on modern technologies for maintenance and repair services in refrigeration and air-conditioning sector.

- Increasing awareness & information among refrigeration maintenance sector about using modern technology for maintenance and repair of refrigeration and air conditioning devices (use of alternatives, recovery and recycling, retrofit old refrigeration equipment to use environmental-friendly alternatives).

2- The most important achievements during the second phase from 2007 – 2008:

- An experimental project has been implemented for (15) air-conditioned railway cars, by retrofitting the mechanical systems for cooling (compressor - condenser - evaporator – expansion valve), and will be completed to retrofit (100) railway cars during the third phase.

- An experimental project has been implemented for (3) air-conditioned Public transport buses, by replacing full air-conditioning systems inside the cabin with the same cooling efficiency, and will be completed to amend (22) buses during the third phase.

- It is expected to fully complete the remaining stages of the strategy to phase – out (CFC's) depleting the ozone layer used in refrigeration and air conditioning systems by the end of 2009.

Fig (4-3): Recovery & Recycling equipment for vehicles air conditioning

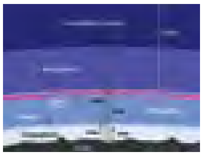


Table (4-2): Gradual reduction for using of chlorofluorocarbons (CFC's) that deplete Ozone Layer

No	Year	Allowable consumption Value (Ton)	Reduction target (Ton)
1	2005	822	227
2	2006	595	355
3	2007	240	127
4	2008	113	64
5	2009	49	49
6	2010	--	--

d) Methyl Bromide Sector:

- During 2005, the Egyptian strategy has been implemented, in cooperation with the Ministry of Agriculture; this strategy aims at the implementation of the gradual reduction of methyl bromide usages in soil treatment, grain fumigation and storage of agricultural crops and commodities.

- This strategy has been implemented in two phases; the first phase started in 2006 till June 2009, followed by the second phase and it is expected to achieve its optimum target which is the final phase-out of methyl bromide consumption that deplete the Ozone Layer (317 tons / annually) ,using the appropriate environment- friendly alternatives by 2013.

- During the first phase of the project, using of bio-chemical alternatives have been applied to the users of methyl bromide and exported companies of agricultural commodities , and it was all recorded in Egypt (at strawberry crops, cucumber, peppers, tomatoes, Sherry, tomato, herbs, cantaloupe, lettuce), at 442 acres including 154 acres in 2008.

- During 2008 three modern greenhouses have been established for vegetables grafting on agricultural pests resistance basis, as an alternative to methyl bromide, The capacity of each greenhouse estimated by 5 million seedlings annually (tomatoes Sherry, peppers, cucumbers and watermelons, cantaloupe), it is worthy to mention that this experiment has been implemented by Spanish technology, in Cooperation with the University of Almeria, one of the leading countries in this field.

- The project has also developed a local alternative to methyl bromide, which is cultivation on the rice straw to produce Strawberry crops, to be exported, and the results were excellent that confirmed the necessity to expand in this project at the second phase to solve the environmental problems resulting from rice straw burning (Fig. 4-4)

Fig (4-4) Strawberry cultivation on bales of rice straw

e) Egyptian Strategy to phase- out the use of Hydrochlorofluorocarbons HCFC's:

Egyptian Strategy aims at phasing - out the use of HCFC's that deplete the Ozone Layer in various sectors and replace with environment-friendly alternatives to reduce damages that affect Egyptian economy & industry by phasing - out the use of HCFC's. The first phase of this strategy includes; review of ministerial decrees and regulations, update data for each sector concerning consumed quantities.

The HCFC's are important substances used in many sectors; such as foam, thermal insulation, refrigeration, air conditioning & solvent sector. Although HCFC's have low level of Ozone Depleting Potential (ODP), but they have high level of Global warming Potential (GWP) which contribute to the global warming phenomena.

Table (4-3) illustrates the Schedule program to phase - out the use of HCFC's that deplete Ozone Layer for Article 5 countries (including Egypt) according to Montreal Protocol on Ozone Layer Protection.

Table (4-3): Phase-out schedule of HCFC's Depleting Ozone Layer:

Substance	Base level	Regulatory standards
Annex (c) , group I HCFC›s substances	average consumption of 2009 - 2010	Freezing production and consumption levels (1 Jan 2013)
		Reduction by 10% (1 Jan 2015)
		Reduction by 35% (1 Jan 2020)
		Reduction by 67.5% (1 Jan 2025)
		Reduction by 100% (1 Jan 2030) with possibility of exemptions for essential uses.

4-5 Future Vision

- Egyptian environmental policy seeks facilitating compliance with Montreal Protocol on Ozone Protection without prejudice to development programs or impacting priorities set by the State for sustainable development.

- Egypt has succeeded in fulfilling its obligations towards reducing consumption of ozone-depleting substances under the Protocol through phasing out use of great deal from ozone-depleting substances and replacing them with environment-friendly alternatives in many industrial sectors. However these achievements do not mean that a course of action was complete or all commitments to the Montreal Protocol had been implemented, efforts are being made to completely phase-out use of ozone-depleting substances in all sectors and the Ministry is relying on the following along next phase:

- Gradual progress in the use of alternatives to ozone-depleting substances and providing competitive prices to guarantee stability of the product in the Egyptian markets.

- Continuing the implementation of ozone-depleting substance recovery and recycling, and providing equipment for maintenance workshops and service centers for free, as well as training technicians on such equipment.

- Intensifying awareness campaigns on environment-friendly alternatives and orienting them to all community segments.
- Cooperating with all monitoring entities in the State and provide them with needed equipments

for analyzing refrigerants. Organize training courses on the use of these equipments in order to prevent illegal trade of refrigerants and tightly controlling markets.

- Preparing a national strategy aimed at phasing out the use of HCFC's depleting Ozone Layer in various sectors according to Egyptian obligations with Montreal Protocol provisions for the Protection of Ozone Layer.

Part2

Water

Chapter 5
Fresh water

5-1 Introduction

Egypt lies at the northeast corner of Africa and extends partly into Asia, bounded from the north by the Mediterranean Sea with about 995 km and from the east by the Red Sea with about 1941 km.
Egypt covers an area of about one million km^2 with unevenly distributed population; about 99% of Egyptians occupy 4 % only of the total area along the narrow Nile valley and Delta regions.
Egypt is dominated by desert and draught, except for the northern parts in which warm and moderate weather prevail with a semi Mediterranean climate; Egypt characterized by hot dry summer and moderate winter with little rainfall, that become heavier along the north coast in winter.
Due to the rapid population growth and constant water resources (55.5 billion m^3) each person's quota decrease to less than 1000 m^3 /year, which is the world water scarcity border. In addition to the limited water resources required for development projects, deterioration of water quality is currently the greatest concern and main issue for Egyptian government.
Water is a substantial element for socioeconomic development and one of the natural resources that must be protected and rationalized; as well as consumed according to sustainable development principals. There is no doubt that development projects are facing many challenges as a result of the limited water resources and population growth that necessitates cooperation and coordination among concerned authorities to develop strategies for implementing the integrated water management programs.

❖ Egypt's Water policy:

The Egyptian government has set the "National Plan for Water Resources " based on the integrated water management and the sustainable development principals. In order to achieve fair distribution of water without negative impact on the environment, all concerned agencies and authorities should be involved in decision making at the central government level through the "Higher Water Ministerial Committee" and the "Units of Water Resources" in concerned ministries; and on the decentralized level through involving governorates and "Unions of Water Users ".
Government takes the following important principles in consideration to achieve an integrated water management harmonized with socioeconomic development policy and insuring the protection of health and environment:

- Fresh water (surface and ground) is an exhaustible limited resource, so we should consider its quantity and /or quality in an integrated manner.
- Insuring participation principle among stakeholders, planners and decision makers at all levels.
- Water is a valuable economic important resource for all uses.
- Activating women's role because of their importance in achieving water management.

The main objective of "National Water Resources Plan" is to set guidelines and general policies for all concerned ministers and agencies in Egypt to reach the maximum benefits from water resources, realize cooperation and coordination between them for the successful integrated management of water resources.
Water policy in "National Water Resources Plan" is based on a strategy called "Facing Challenges", including many activities that can be divided into the following three pivots:

1) Developing water resources.
2) Improving efficient use of the present water resources.
3) Protecting people's health and environment.

The proposed strategy "Facing Challenges" shall be implemented till 2017 through the five-year plans of concerned ministries and authorities after defining the role of each partner and the required financial resources.

Investment cost to implement the "National Water Resources Plan" is about 145 billion Egyptian pounds (according to 2001 prices), 63% will be executed by Ministry of Housing, Utilities and New Urban Communities, 32% by Ministry of Water Resources and Irrigation, while private sector is expected to execute 4.7%, and the remaining o.3% by other concerned bodies.

The following results are expected to be achieved by implementing the "National Water Resources Plan":

- Improving efficiency of water regime in Egypt.
- Increasing agricultural land with 35% through horizontal expands and increasing desert urbanization to include more than 20% of population.
- Supporting socioeconomic development.
- Providing all citizens with clean drinking water.
- Increasing access to healthy sanitation systems to 60% of the population by 2017.
- Securing water resources for different development programs until 2017.

Water management Policies set by Ministry of Water Resources and Irrigation concentrate on developing and improving water resources to satisfy water needs for different sectors; prepare and develop infrastructure of irrigation and drainage networks systems to secure water provision to all users with less amount of loss.

The following are the most important visions of water strategy to insure the optimum use of available water resources:

1) Decrease water loss in water distribution networks.
2) Expand application of irrigation improvement systems in old lands.
3) Apply policies of costs recovery.

٤) Improve agricultural crops.
5) Increase dependence on ground water in Sinai and western desert.
6) Expand reuse of agricultural drainage water.
7) Increase reuse of treated waste water.

In addition to the strategies of developing available water resources, Ministry of Water Resources and Irrigation is exerting great efforts to develop additional new water resources to solve the expected water deficiency as follows:

1) Increase Egypt›s quota of Nile Water.
2) Desalinate brackish water.
3) Harvest Rains and floods water.

In this regard, Ministry of State for Environmental Affairs has set its water policy in participation and cooperation with Ministry of Water Resources and Irrigation and other concerned authorities; this policy concentrates on strategies and plans that support water management, protect water resources from pollution, implement plans of agriculture expansion and satisfy the increase in water needs. This policy depends on the following main pivots:

First: Protect water resources from pollution.
Second: Rationalize water consumption.

MSEA executes its water policy strategy depending upon setting and implementing plans that considers the integration of available water resources in governmental programs for economic development while implementing different projects, without neglecting the environmental and social dimensions.

First pivot: Protecting water resources from pollution:

To achieve this target the following programs have been implemented:

1. Domestic wastewater program:

A. Stop discharge of domestic wastewater into water streams (canals and drains) and expand the establishment of treatment stations to serve villages and cities all over Egyptian governorates ; treatment quality will de specified according to the usage of treated water in agriculture as follows:

- Desert-fenced areas will have primary treatment only, using the final effluent to irrigate timber forests with modern systems of irrigation that do not pollute ground water, or in areas with high salinity ground water that can not be used as a source for drinking water.

- Areas without desert-fence (some of Delta's governorates), will require secondary treatment and treated water will be discharged into agricultural drains in accordance with standards of Executive Regulation of Law No. 48 /1982 regarding the Protection of Nile and Water streams from Pollution.

B. Applying Egyptian code for "Reusing Treated Wastewater in Agriculture" according to the quality of water produced after treatment.

2. Industrial wastewater program:

A. Obligate industrial enterprises to separate industrial wastewater from domestic wastewater especially the final effluent of chemical, mineral and tanner industries; in addition to construct treatment stations to achieve compatibility of water quality with the standards of Executive Regulation of Law No. 48 /1982 to discharge into water streams. In case of discharging liquid industrial wastes into public sanitation networks it should be compatible with the standards of the Executive Regulation of the Ministerial Decree No. 44/2000 to protect sanitation networks and its workers, maintain the efficiency of treatment process in treatment stations to produce water quality that can be used in agriculture without affecting people's health and environment according to the "Egyptian code for Reusing Treated Waste Water".

B. Reduce industrial wastewater by establishing closed circles for cooling water, reuse of treated water in industrial processes or to use it in irrigating green areas inside and outside the factory.

C. Applying clean technologies in industries.

3. Drinking water program:

A. Stop discharging wastes of drinking water purification into water streams which lead to increase sedimentation in front of discharging units and increase Aluminum concentration in water streams. The trend is to collect and dry this waste to be used in brick manufacturing and roads pavement or disposed in safe landfill.

B. Expand in using pipes manufactured from materials do not interact with water or soil (e.g. Polyethylene HDPE) for the following reasons:

- It has a long age exceeding 50 years
- Resistant to earthquake
- It doesn't require a continuous maintenance especially Cathodic and Anodic protection in addition to insulation.

Second pivot: Policies of rationalizing water consumption:

A. Raise environmental awareness among users (industry - agriculture – citizens) through audiovisual awareness campaigns, in addition to encourage application of constructive proposals in different fields in cooperation with all concerned ministries.

B. Study the possibility of connecting and operating turbid water networks to irrigate green spaces in all cities, new urban cities and tourist villages; as well as the possibility of extending this system to old gardens to save purified water.

C. Generalize use of meters system to calculate the actual water consumption, and set segments that start with minimum limit that gradually scale up to maximum limit; support can be provided to consumers of minimum segment.

D. Study the possibility of setting Egyptian standards and specifications (Egyptian Code) for sanitary equipments' manufactory (e.g. valve tapes, combination faucets, pipes and connection pipes…..) to ensure the minimum limit of quality and safe operation without leakage of drinking or waste water.

E. Develop workers' capacities in the field of plumbing, extending water and sanitation pipes; in order to be qualified through education and training programs. They will not be allowed to work in that field without passing these programs and getting permission through certificates to work in this vocation (e.g. ordinary plumber - pipes plumber).

F. Develop water systems used in industrial field to rationalize water consumption in addition to recycle and reuse wastewater.

❖ The institutional framework for Integrated Water Management:

The following concerned ministries and agencies participate in different fields of the Integrated Water Management:

- Ministry of Water Resources and Irrigation, the main responsible about developing and implementing water policies and water distribution according to different national requirements; setting regulating legislations that govern water resources and their protection from pollution in cooperation with all relevant authorities.
- Ministry of Planning, responsible about the annual and five-year plans, identifies investment priorities and funding allocation for various ministries and authorities.
- Ministry of Agriculture, Irrigation and Land Reclamation, contribute in rationalizing water consumption by using modern irrigation techniques (drip - sprinkler …..); protect water from pollution by rationalizing use of fertilizers and pesticides and prevents unauthorized pesticides.

- Ministry of Industry, contribute in protecting water from pollution by treating liquid industrial wastewater before discharging into water courses or sanitation plants; as well as applying clean technologies in various industries.
- Ministry of State for Environmental Affairs, concerned with environment conservation from pollution in general and aquatic environment protection in particular, set and implement regulating laws (Environment Law No. 4 / 1994 amended by Law No. 9 /2009) and implement pilot projects to conserve and rationalize water consumption in coordination with various ministries.
- Ministry of Housing, Utilities and New Urban Communities, responsible about supplying population with clean and adequate quantities of drinking water, establishing sanitation networks and facilities in cities and villages.
- Ministry of Local Development, responsible about realizing development sustainability in villages and small towns.
- Ministry of Health, responsible about setting standards of drinking water, conditions of drinking water stations intakes and the implementation of related water legislations according to its defined items.
- Ministry of Transportation, responsible about river transportation and following up its governing legislations.
- Ministry of the Interior, responsible about implementing laws and taking legal procedures against violating establishments.

In addition to other ministries and authorities directly or indirectly participate in the implementation of water policies (Ministries of Tourism and Electricity …..).

❖ Legislative and legal framework:

The Following are some of the legislations, ministerial decrees and regulations governing water protection from pollution and implementation of Integrated Water Management:

1. Law No. 48 / 1984 regarding Protection of Watercourses from pollution.
2. Law No. 4 / 1994 amended by Law No. 9 / 2009 regarding Protection of Environment.
3. Law No. 12 / 1998 for Irrigation and Drainage.

5-2 Water resources in Egypt

5-2-1 Nile River

Nile River is the second longest river in the world with about 6,825 km^2, its basin with about 3.1 million m^2, extends by 1,530 km^2 length inside Egyptian lands; it is the main source of fresh water in Egypt and more than 95% of Egyptian people depend on it. According to 1959 Convention “Convention of the Full Exploitation of Nile Water” between Egypt and Sudan, Egypt fixed share of Nile’s water represents 55.5 billion cubic meters, while Sudan’s share represents 18.5 billion cubic meters annually. Ten countries participate in the Nile Basin; they are “Egypt, Sudan, Ethiopia , Kenya, Uganda, Tanzania, Eritrea, Rwanda, Burundi and Democratic Republic of Congo “.

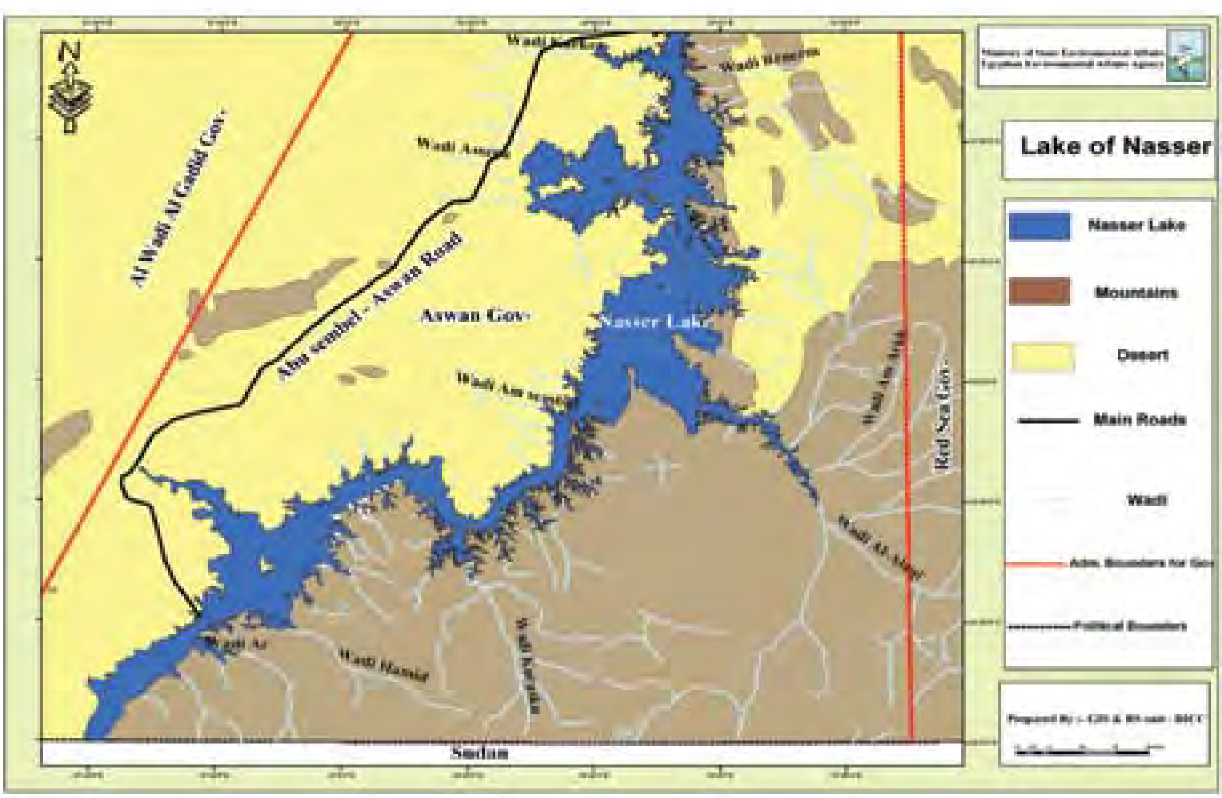
Map (5-1) Nile Basin countries.

5-2-2The High Dam (Lake Nasser)

It is considered the second largest artificial lake in the world with a total area of 5237 km^2 and extends to a distance of 350 kilometers inside Egyptian territories and 150 km^2 in Sudan territories. Lake Nasser is the strategic reservoir of water in Egypt, which regulates water in front of the High Dam with a storage capacity of 162 billion cubic meters. Its water level is ranging between 183 m to 182 m; the lake and its optimum management is the fundamental and essential element to ensure the security, safety and efficiency of this vital facility especially preserving environmental balance of its water and stability of its banks, insure the availability of requirements and standards for its management according to its rules of operation, storage and drainage; so that lakes' water quality should be protected from pollution.

All developmental projects should consider these standards when establishing any facility near the lake that may have harm effect on its water. The General Authority of the High Dam identified the expected pollution hot spots around the lake as follows:

1. High Dam Port, a port for fishing and tourist activities, adjoining Misr Aswan factory for fishing and fish processing.
2. Tourist projects in Khor Ramlet area.
3. Agricultural activities in Khor Jalal.



Map(5-2) Lake Nasser

5-2-3 Groundwater

Groundwater is one of the most important water resources in Egypt, in spite of scarcity of rain fall it is one of the main sources for feeding ground water; estimated quantity of groundwater in Egypt is about 6.1 billion cubic meters annually in Valley and Delta. In general, the available amount of water that could be used from aquifers is estimated by 11,565 billion cubic meters annually.

Aquifers in Egypt can be divided as follows:

1. Aquifers of Nile River Basin and Delta:

It is considered one of the renewable aquifers as it draws its water from leakages of Nile River, canals network and irrigation water; this resource is used to provide cities and villages with clean drinking water after purification, because of its low treatment costs.

2. Aquifers of Western Desert (Nubian Sandstone Aquifers):

One of the non-renewable aquifers, its ground water is estimated by 200000 billion cubic meters, but due to its existence at far depth of earth layers with high cost of extraction, little amount of this water can be utilized. The Nubian Sandstone Aquifer is considered the largest groundwater reservoirs in the world, and both of Sudan, Libya and part of Chad participating Egypt in this huge aquifer.

3. Aquifers of the Eastern Desert and Red Sea coast:

Is considered a non-renewable aquifers because it is fed by winter's rainfall, the possibilities of water extraction is very low due to its existence at far depth of earth layers with high cost of extraction.

4. Aquifers of the Sinai Peninsula:

There are three ground aquifers in Sinai Peninsula:

- Shallow aquifer located in North Sinai
- Average depth aquifer located in valley's area at central of Sinai
- Far deep aquifer.

They are non-renewable aquifers, total amount of water that can be exploited by them are about 150 million m^3 / year. Aquifers located in valleys areas can be considered from the renewable aquifers as they are fed by rains gathered in valley's area.

Water of aquifers in coastal areas of Sinai face the risk of seawater intrusion that would lead to increase salts concentration because of withdrawing high rates from the existent wells. Some areas of shallow groundwater wells exposed to the risks of contamination as a result of their proximity to the Earth's surface and their affected by various activities. While deeper aquifers are not exposed to any effect as a result of their existence under a layer of non-penetrating silt, which is working to protect them from sources of surface pollution. Therefore, attention must be given to study the environmental effects of activities implemented upon shallow aquifers.

Table (5-1) Quantity of groundwater in Egypt (2006-2007)

Sources of groundwater in Egypt (2006-2007)	Quantity (billion m^3 / year)
Renewable groundwater	5.69
Non-renewable groundwater	3,785
Groundwater in Nile valley and Delta (renewable & non-renewable)	2.09

5-2-4 Desalination of seawater

Egypt characterized with its distinguished geographical position between nations of the world, bounded by the Mediterranean Sea from the north and Red Sea from the east; because of Egypt's limited share from water and its growing development .It is necessary to find alternative means to develop water resources such as desalination of seawater. But, this technology did not receive enough attention, unless in recent years, because of the high costs of desalinating cubic meter of sea water, which ranged between three and seven pounds.

Seawater desalination concentrated in coastal areas that do not have any other source of water where about 21 desalination plants is working with production capacity of about 60,380 m^3/ day, contributing with 0.06% from the total water resources in Egypt.

5-2-5 Rains

Egypt's climate fluctuates between severe arid, semi-arid and scarcity of rainfall with average 158 mm / year. Quantities of rains are very small on most areas with exception of the north-west coast where the average of rainfall is about 200 mm / year in the east of Alexandria, 75 mm / year in Port Said city that decreased to 25 mm / year, as we move towards south from the coast to Cairo.

The Red Sea and South Sinai region exposed to heavy rainy spells resulting in severe flooding in some cases, which may lead to some economic and social losses. Many efforts have been exerted to benefit from water flooding through their accumulation in artificial or natural reservoirs after being rehabilitated for direct use or recharge underground aquifers with them.

Flood water (which can be used) is estimated with about one billion cubic meters annually. Despite the fact that amounts of rain waters falls over Egypt are considered small amounts but it contributes in the total water resources of Egypt with about 1.3 billion m^3 / year.

5-2-6 Use of domestic and agricultural waste water

First: Agricultural waste water:

Large amounts of water return to drainages as a result of irrigating agricultural lands representing about 30% from the total irrigation water, so they are one of the important sources that can be used to provide part of water requirements.

About 4.07 billion m^3 of water re-discharged into the Nile from Upper Egypt annually; agricultural drainages in Delta flowed in North Lakes then to the Sea. Amounts of agricultural wastewater that had been pumped into the sea during 2006/2007 were about 15.651 billion m^3. This mount had been decreased over the past two years due to the expansion in reuse of agricultural waste water.

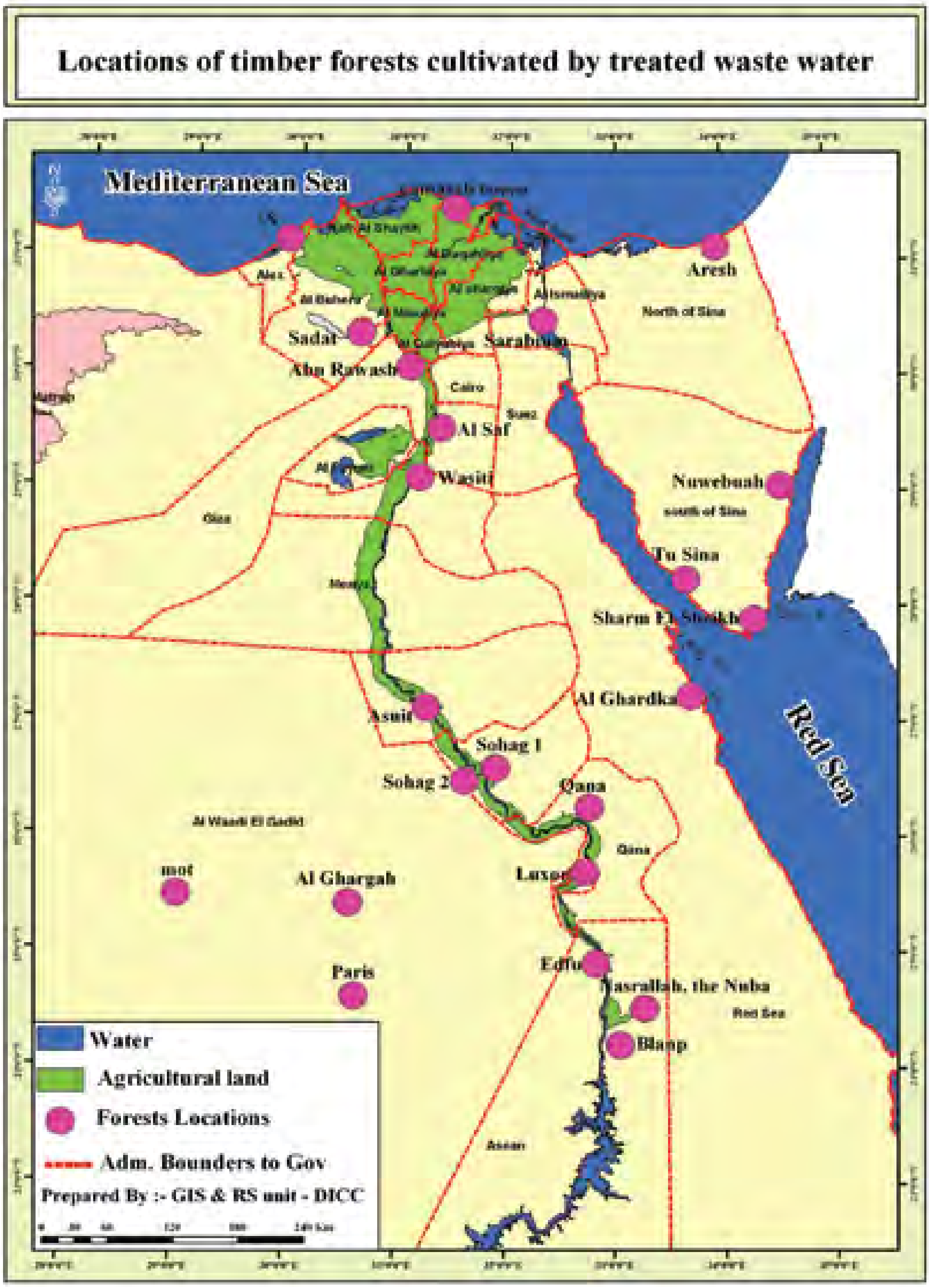
Second: Domestic wastes:

Domestic wastes that currently treated are about 8,123 million cubic meters / day.

Due to the steady increase of population and rapid development in industry, it is expected to increase volume of treated domestic and industrial wastewater in the coming few years. Therefore, this resource was taken into consideration while planning water policies to be used in providing part of water needs, particularly in agricultural sector. However, usage of this resource must be accompanied with great careful through setting and developing legislation to ensure safety of its use and reduce environmental hazards that may result from its abuse.

Desert-fenced governorates are currently using treated domestic wastewater in cultivating timber forests and bio-fuel crops, about 155.5 thousand Feddan all over Egypt are the estimated area that currently available for cultivation with treated domestic wastewater.

11195 Feddan of timber forests are currently irrigated with about 485,800 m 3 / day of treated domestic wastewater distributed along most governorates of Egypt. Establishment of a water network has been conducted to irrigate an area of 500 Feddan of timber forests in Marsa Matrouh , a drip irrigation network to irrigate an area of about 120 Feddan in the timber forest at Alaqi in Aswan Governorate to benefit from the treated domestic waste water produced by Al-Alaqi station and work is going on to finalize the network to cultivate the remaining area estimated with 1000 Feddan; as well as establishing an irrigation water system to irrigate an area of 300 Feddan in the timber forest located in Bblana area in Aswan governorate.



Map (5-3) distribution of timber forests in Egypt

Table (5-2) and Fig (5-1) distribution of water resources in Egypt from (2002 – 2007).

(Water Resources of Egypt from (2002- 2003) till (2006 -2007					
Billion m 3 / year					
Year	2002 / 2003	2003 / 2004	2004 / 2005	2005 / 2006	2006 / 2007
Source					
Nile Water	55.5	55.5	55.5	55.5	55.5
Groundwater in Delta and Valley	6.1	6.1	6.1	6.1	6.1
Reuse of Agricultural Waste Water	4.4	4.8	5.1	5.4	5.7
Reuse of Sewage water	0.9	1.0	1.1	1.2	1.3
Rains & Floods	1.3	1.3	1.3	1.3	1.3
Desalination of Sea water	0.06	0.06	0.06	0.06	0.06
Total	68.26	68.76	69.16	69.56	69.96

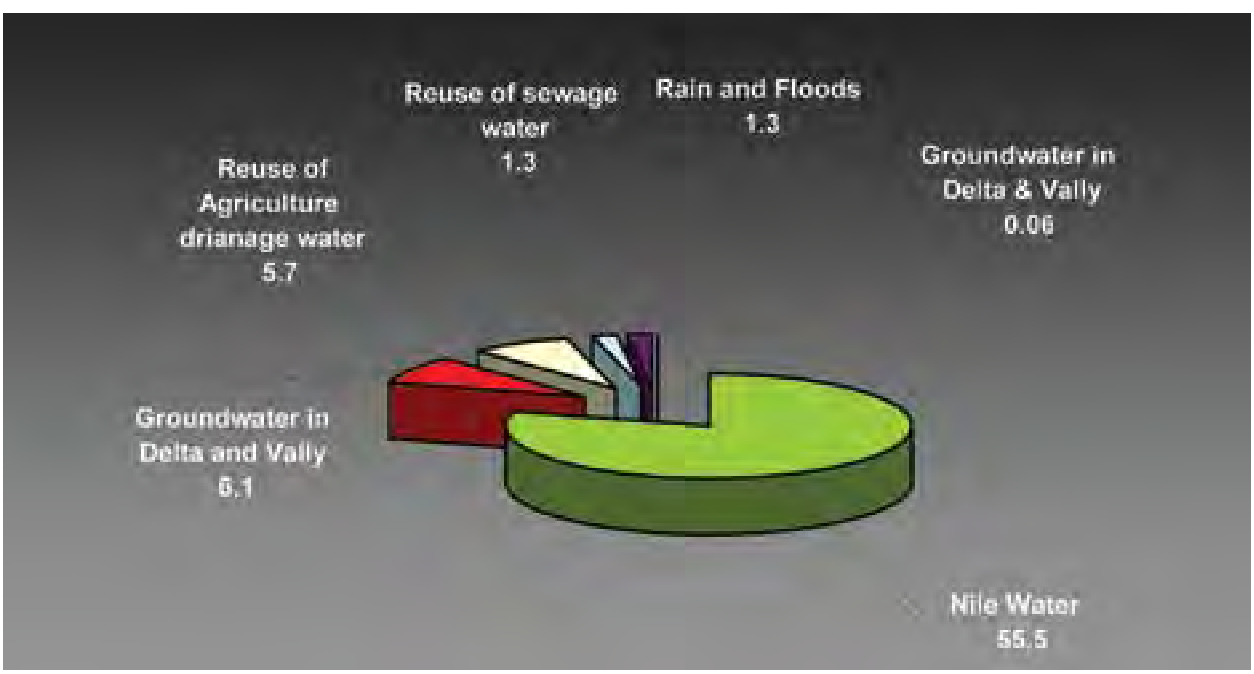
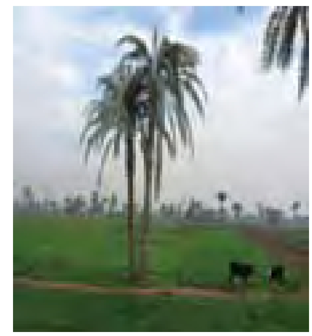


Fig (5-1): Distribution of various water resources in Egypt during 2006/2007

5-3 Fields of water usage in Egypt

5-3-1 Agriculture:

Egypt is one of the agricultural countries that relies on agriculture as its most important economic activity, Egypt's agricultural land estimated with 8,384,768 Feddan (old lands 6.648.330 Feddan, new land 1.736.438 Feddan); agricultural water usage represent the greatest portion of water needs in Egypt estimated with 86.1% from the total water usage. This rate decreased during this year to 85.6%, due to the exerted efforts from relevant ministries to raise farmers' awareness with the importance of using alternative methods of irrigation such as drip and sprinkle irrigation.



Pic. (5-1) Agricultural Lands in Egypt

5-3-2 Industry

At the beginning of the industrial revolution in Egypt in early sixties and after many years industrial activities increased and multiplied in different sectors; industrial water needs constitutes an essential portion that can not be neglected. Actual consumption of water resources in manufacturing processes estimated with 1.15 billion cubic meters.

Pic. (5-2) Use of Water in Industry

5-3-3 Drinking Water

Continuous population growth and rising of living standard led to increase amounts of water consumed in drinking, domestic and health purposes to about 6.5 billion cubic meters/ year with 9.4% from the total water usage serving about 75 million people.
Drinking-water plants in Egypt reach to 914, in addition to groundwater and desalination plants; with an estimated production capacity of about 25.073.212 m3/day, covering 100% of all cities and towns and 98% of villages during 2008.

Pic. (5-3) Pure Drinking Water

5-3-4 Tourism and Transport

River navigation is one of the revitalizing and prosperity factors for tourism in Egypt, so that Ministry of Water Resources and Irrigation discharge an additional amount of Nile Water estimated with about 1.16 billion cubic meters during the period of less requirements to

Pic. (5-4) Tourism and Nile Transport

reach the necessary water level for navigation and river transportation "passengers and goods".

5-3-5 Electric power generation

Water used to generate electric power from the High Dam and Aswan Reservoir. Due to the importance of generated energy and the total reliance on them, Ministry of Water Resources and Irrigation discharge amount of water estimated with 80 million cubic meter / day from Aswan Reservoir during the period of less requirements in winter to ensure the operation of High Dam turbines that used to generate electricity.

Pic. (5-5) Use of Water in Electricity Generation

Table (5-3) and fig (5-2) distribution of water usage (billion cubic meters) of Egypt from 2002 / 2003 until 2006 / 2007.

Table (5-3) :Distribution of water usage in Egypt

Data Years	2002 / 2003		2003 / 2004		2004 / 2005		2005 / 2006		2006 / 2007	
	٪	Billion m^3/year	٪	Billion m^3/year	٪	Billion m^3/ year	٪	Billion m^3/year	٪	Billion m^3/year
Agriculture	86.8	57.8	86.6	58.1	86.3	58.5	86.1	59	85.6	59.3
Evaporation From Nile and Canals	3.1	2.1	3.1	2.1	3.1	2.1	3.0	2.1	3.0	2.1
Drinking And sanitary Usage	8.1	5.4	8.4	5.6	8.6	5.8	8.9	6.1	9.4	6.5
Industry	1.7	1.1	1.6	1.1	1.7	1.15	1.7	1.15	1.7	1.15
River Navigation	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2
Total	100	66.6	100	67.1	100	67.75	100	68.55	100	69.25

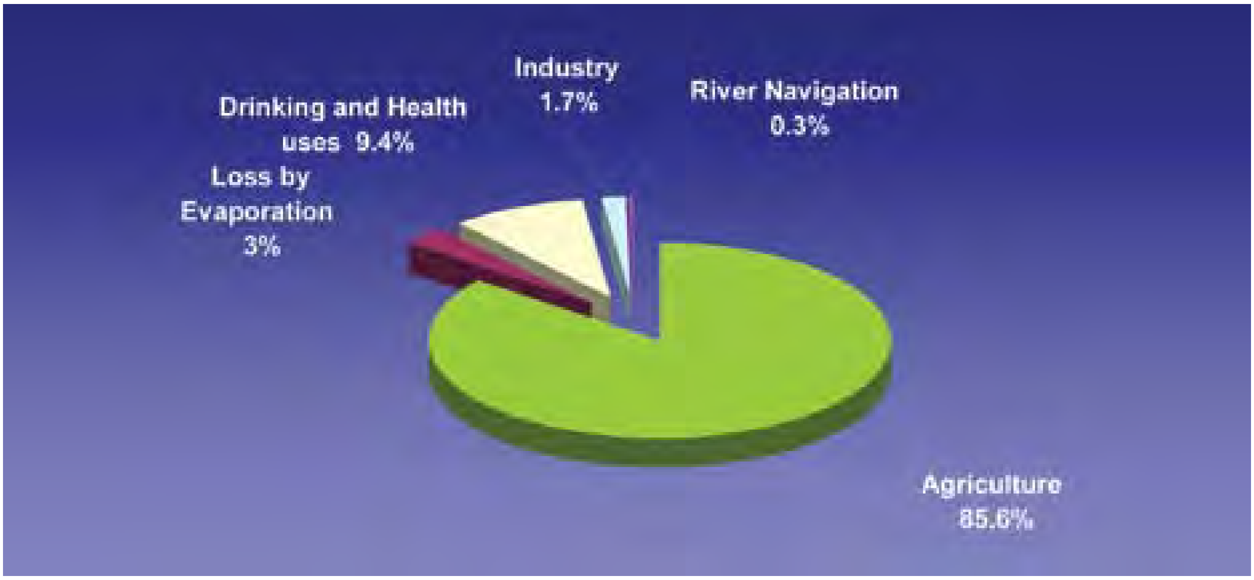


Fig (5-2) :Total water usage in Egypt

5-4 Sources of freshwater pollution

Pollution sources affecting quality of fresh water represented in the following:

5-4-1 Domestic wastewater

Domestic wastewater is estimated with 12 millions m^3/ day, large portion of this amount discharges into sanitation networks and the remaining into agricultural drainages then into the Nile, canals, lakes or into the sea. 239 is the number of domestic wastewater treatment plants allover Egypt , producing about 8,123 million cubic meters per day of different kinds of treated water (primary - secondary - biological – activated sludge - plant – aerobic and anaerobic oxidation ponds). 23 is the number of companies affiliated to the Holding Company for Drinking Water and Sanitation, responsible about operating treatment plants in 23 governorates serving about 75 millions, in addition to Luxor and Shubra al-Khaimah.

Pic. (5-6) Sewage Wastewater

Domestic wastewater is one of the most important pollution sources of watercourses due to its contents of biological and chemical pollutants; domestic wastewater collected from approximately 5000 basin in small remote villages are directly discharged into agricultural drains without treatment in addition to the untreated or secondary treated sewage from sanitation networks of major cities. Due to the continuous increase in population and the consequent increase in quantities

of domestic wastewater, a plan has been developed to increase sanitation network system coverage by implementing new domestic wastewater treatment projects in different governorates.

Table (5-4): Domestic wastewater treatment plants in Egypt

No.	Governorate	Plants Number	Design capacity (thousand m3/day)	Actual capacity (thousand m3/day)	Population Number (thousand)
1	Cairo	7	4680	4630	15920
2	Alexandria	8	1191	947	3888.3
3	Kafr El-Sheikh	4	73.5	31	275.6
4	Sharkeya	12	210.8	143.9	1120
5	Domiatt	23	167.2	154	
6	Dakahleya	25	288.5	231.5	995.1
8	Behera	25	361	246.2	1648.3
9	Gharbeya	18	441	289.3	2183.5
10	Monoufia	18	351	218	
11	Qalyobia	9	218.5	215.3	
Total Northern Egypt Governorates		**149**	**8149.7**	**7106.2**	**26030.8**
11	Minia	5	94	74.6	583.4
12	Bani Suef	4	70.1	46.7	298.8
13	Aswan	7	97.4	93.6	382.8
14	Fayyoum	22	301.7	138.8	320
15	Luxor	5	51.5	44.5	
16	Qena	8	369	40	
17	Sohag	12	335	66	946
18	Assiut	5	185	43	1166.7
Total Upper Egypt Governorates		**68**	**1503.7**	**547.2**	**3697.7**
19	Ismailia	7	165	165	
20	Port Said	5	234	167.5	475
21	Suez	3	144	144	
22	New cities	10	309.6	140	
23	The Red sea	1	18	10	950
Total Governorates			**10524**	**8279.9**	**31153.5**

31 plants from the above mentioned are still under construction in Monoufia, Behera, Sohag, Assiut and Qena governorates and two plants will be delivered sooner in Fayyoum.

Table (5-5) shows size of the overall and per capita rate from domestic wastewater discharge in Egypt and investments carried out since 1982 till 2008, figure (5-3) shows the overall discharge in cubic meters from 1991 till 2008.

Table (5-5) : Size of the overall and per capita rate of domestic wastewater discharge in Egypt and investments carried out since 1982 till 2008

Per capita discharge rate	160 liters / day
Total discharges	12 million m 3 / day
Production of treated sewage	8,123 million m 3 / day
Implemented Investments since 1982 till now	48 billion pounds

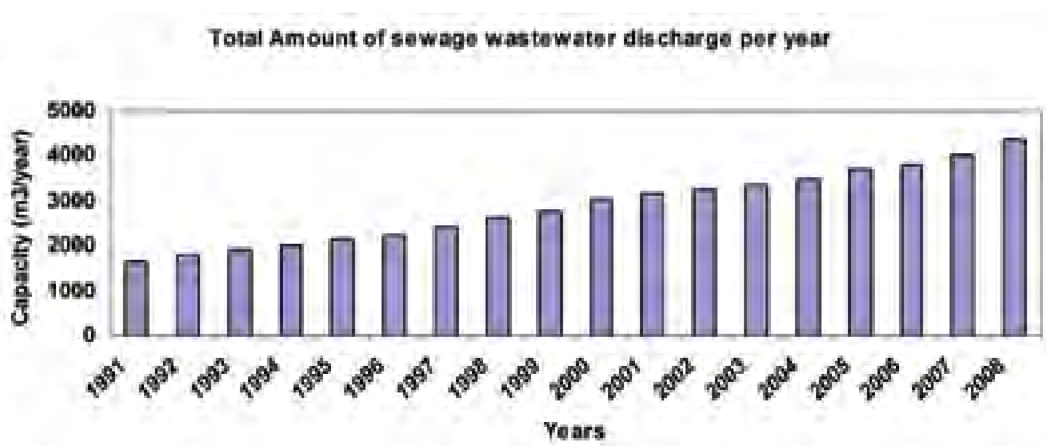


Fig (5-3)

- **Sanitary drainages coverage at the Republic level:**

Egypt is suffering from a gap in the distribution of sewage networks between cities and villages, the proportion of sanitation service coverage at the city level after finalizing ongoing projects will be 100%, at the village level will be 11% by the end of 2010. This is expected to reach 40% by 2012.

The following figure shows sanitation coverage rates in cities and villages from 2004 - 2012.

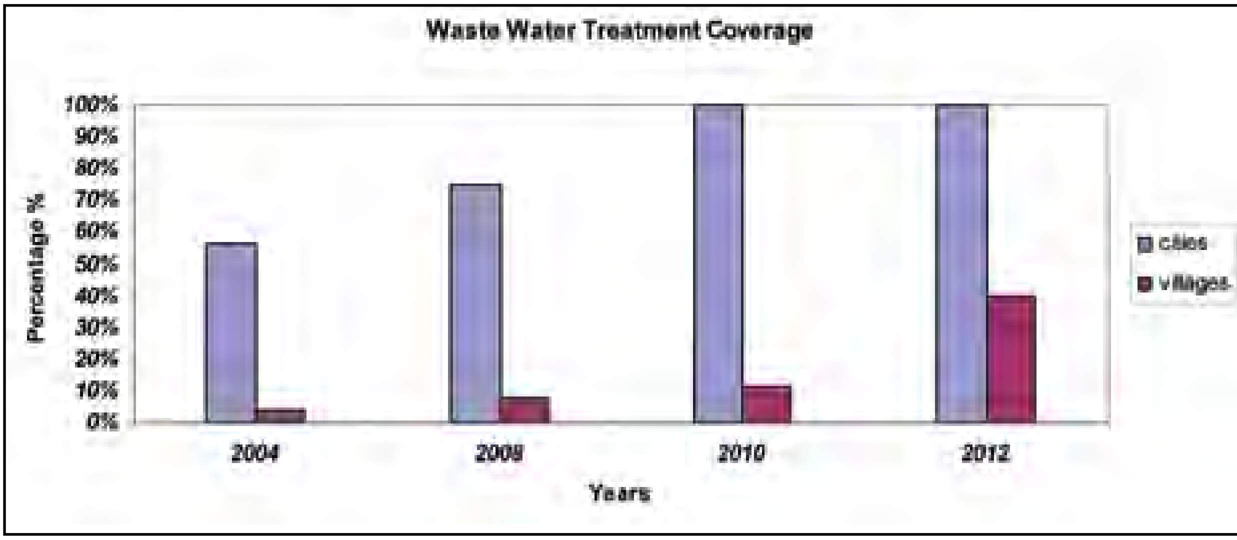


Fig (5-4)

- **National Strategy for Sanitary Drainage in rural areas:**

In the frame of government interest to provide sanitation services to most of the villages deprived from this service, and according to the Election Program of President Mubarak which included an ambitious program focused on allocating 20 billion pounds for the national project of providing sanitation services for Egyptian villages to be implemented along the current five-year plan (2007 - 2012). So that, the government interested with setting up a national strategy aiming at providing safe disposal of domestic wastewater to reach 100% sanitation coverage allover Egypt.

A unified list including 1165 villages deprived from sanitation services that identified implementation priorities depending on pollution degree and agreed upon by concerned ministries; Ministry of Housing, Utilities and Urbanization; Ministry of Water Resources and Irrigation; Ministry of State for Environmental Affairs and Ministry of Health. This strategy based upon the following objectives:

- Prevent discharge of untreated wastewater into water courses.
- Improve public health of all citizens and reduce financial burden needed to resist diseases related to water pollution.
- Providing sanitation networks in villages.
- Improve environmental performance of sanitation systems

5-4-2 Industrial Wastewater

Industrial wastewater is one of the main sources of polluting River Nile, canals and drainages that may penetrate into

groundwater in case of being illegally discharged or injected into the soil. Industrial wastewater contains many heavy metals, organic and inorganic components that harmful to public health and prevents the optimal usage of some water sources. Wastewater resulting from food industries is one of the most important sources leading to increase organic matter contents that consume dissolved oxygen as a result of its decomposition. While chemical industries contribute in pollution with heavy metals, organic and inorganic chemicals.

Pic. (5-7) Industrial Wastewater

- About 129 industrial facilities are located along Nile River or the water courses among which 102 industrial facilities discharge directly or indirectly about (4.047 BCM /year) into the River Nile; some of these facilities stopped their discharge completely, while others discharge in compliance with law No. 48/1982 regarding protection of Nile and water streams from pollution and law No. 4/1994 for Environment Protection. Violating facilities are committed to implement an environmental compliance plan to adjust their conditions and legal procedures are taken against other violating facilities. These indicated as follows:

    1. 65 factories stopped their discharge with total 447.44 MCM/ year representing 93 .7%.
    2. 7 factories discharge 1.8 MCM/year; comply with permissible standards stipulated in laws representing 0 .4%.
    3. 20 facilities are currently implementing environmental compliance plans to stop their discharge with total 21.81 million m3/year representing 4.5%.
    4. 10 violating facilities not committed with an environmental compliance plan, discharge 6.34 million m3/year representing 1.4% into the Nile. These factories have been alerted to submit their environmental compliance within 60 days from alerting date before taking legal procedures against them in accordance with Article 22 of law No. 4/1994 amended by law no. 9/2009 for Environment Protection.

- In addition to 14 factories and 13 electric power stations discharging about 6.8 billion m3/year of cooling water complied with permissible standards of law No. 48 /1982 and law No. 4/1994 for Environment Protection. Table (5-6) shows number of factories under control of EEAA’s Regional Branches and their current status during 2008 in different governorates subordinate to each Branch and table (5-7) shows the total amount of industrial wastewater discharged into River Nile during 2008.

Table (5-6): Number of factories under control of EEAA›s Regional Branches

Branch	Complianced Facilities	Non - Complianced Facilities	Stopping Discharge	Total
Alexandria	---	---	15	15
East Delta	---	---	2	2
Central Delta	4	13	9	26
Greater Cairo	1	7	27	35
Central Upper Egypt	2	3	8	13
South Upper Egypt	---	7	4	11
Total	7	30	65	102

Table (5-7): Total amount of industrial wastewater discharged into River Nile from factories under control of EEAA›s Regional Branches during 2008.

Branch	Amount of Compliance Discharge	Amount of compliance Discharge (cooling) for power plants	Amount of Non Compliance Discharge	Amount of Discharge That has been stopped	Total
Alexandria	1.440 million	2.164 Billion	--	0.261 million	2.165 Billion
East Delta	---	1.59 Billion	--	3.33 million	1.60 Billion
Central Delta	1.647 million	---	4.347 million	6.616 million	12.61 million
Greater Cairo	0.231 million	13.14 million	9.865 million	7.534 million	1.48 Billion
Central Upper Egypt	1.24 million	36.8 million	1.080 million	0.024 million	0.381 Billion
South Upper Egypt	6.84 million	---	19.989 million	0.06 million	26.89 million
Total	22.524 million	4.257 Billion	35.281 million	17.825 million	4.321 billion

5-4-3 Nile Cruisers

Pic. (5-8) Nile Cruisers

Nile Cruisers coexist along Nile River from Aswan down to Cairo, with a limited number of them working in Cairo either at fixed locations or moving between Helwan and Giza; where food is presented in lunch and dinner trips daily. These Cruisers equipped with storage tank to collect wastewater enough for at least 6 hours (time of the trip from Giza – Helwan – Giza), they have their own fixed anchorage through which wastewater is discharged into the sanitation network. There are about 300 Nile Cruisers working between Luxor and Aswan, all of them have treatment units for liquid waste in accordance with law No. 481982/ and its Executive Regulation. The efficiency of most of these units is not good as a result of the inappropriate technology to wastewater quality as well as the inadequate storage tanks capacity, which lead to inconformity of treated wastewater with standards of law no. 481982/. In addition anchorages are insufficient to receive wastewater from the existent Cruisers. So that short-term plans were adopted in coordination with both owners and Chamber of Nile Cruisers to improve efficiency of treatment units, in addition to long-term plans to expand in establishing equipped anchorages to receive effluents from Nile Cruisers, where 4 anchorages have already been constructed and operated at Athar EL-Naby in Cairo, Menya, Assiut, and Sohag. And lately, anchorage of 900 m3/day capacity with an estimated cost of about 5 million L.E, inaugurated at Aqab area east of Aswan to receive and collect liquid waste and treat it to be used in cultivating 69 Feddan of timber forest through an expulsion pipe line of 4.5 km long instead of being discharged into the River without treatment. Currently, a study is conducted to establish a new anchorage at the north of Aswan city under the auspices of Ministry of Tourism and Aswan governorate to reduce the accumulation intensity of Nile Cruisers and to provide needed services. In addition to another study to establish a new anchorage with 3.5 km length at Luxor city, 33 anchorages along Aswan old cornish equipped with sanitation services and connected with the network system, beside the ongoing construction of a new anchorage at Edfu with 1292 meters length.

EEAA follows up construction of the 60 anchorages (4.8 km along Aswan new cornish) in coordination with Ministry of Tourism and Aswan governorate. In addition to the periodic inspection plans of fixed and mobile Cruisers and legal procedures taken against violators, which resulted in 1451 violations along the Nile during 2008, 39 among them are violation of tourist Cruisers.

5-4-4 Agricultural Drainage

Pic. (5-9) Agricultural Drainage

Agricultural drainages are exposed to pollution as a result of receiving direct discharge of incompatible industrial wastewater or receiving primary treated and/or untreated domestic wastewater leading to deteriorate water quality; in addition to the irrationalized usage of drainages water in irrigation that lead to increase salinity in agricultural drainages with more than 2750 mg/liter in some of them.

The irrationalize usage of pesticides and fertilizers in agriculture is one of the most important reasons of water pollution in agricultural drainages, in addition to salts resulting from soil washing. Some drainage is affected by the spread of aquatic weeds that hinders water flow and looses water through transpiration.

Egypt is exerting great efforts to reduce use of pesticides through using licensed pesticides only, rationalize use of fertilizers, encourage vital resistance of insects and use modern techniques in irrigation e.g. drip and sprinkler irrigation. There are 66 agricultural drainages lie between Aswan and Delta Barrages discharge their waters into the main Nile stream, in addition to 9 drainages discharge into the two branches of the Nile in Damietta and Rosetta. According to State of Water Quality Report issued in 2007 by Ministry of Water Resources and Irrigation, the major polluted agricultural drainages from Aswan to Delta are khour El-Seil drainages in Aswan, Al-Barba, Al-Rimon and Kom Ombo drainages.

5-5 Monitoring of water quality

Due to the increase of development activities carried out in Egypt to cope with population growth to provide real employment opportunities through the expansion in different industrial enterprises that lead to increase different sources of pollution, it was necessary to follow-up the biological and chemical changes in water quality in surface and ground waters to trace sources of pollution and take necessary actions to protect water resources.
Monitoring of surface and ground water is carried out through monitoring networks systems allover Egypt affiliated to the following ministries:

- Network of Ministry of Water Resources and Irrigation, consisting of 232 monitoring sites for surface water located on (Nile, main canals and drainages) in addition to 203 sites for monitoring quality of groundwater.

- Network of Ministry of Health (Environmental Monitoring and Occupational Health Studies Center), consisting of 154 sites for periodical monthly monitoring of water quality along the Nile, its two branches, and some of its major canals such as Mahmoudia, Ismailia, Ibrahimia; as well as other large canals (Bahr Moess, Bagouria, Qassed, Bahr Shebin) that directly branched from the Nile at Al-Qanater Al- Khayria and fed from El Rayah El-Tawfiqi and El-Rayah El Monoufi. In addition to 20 sites located in El-Fayoum governorate along Bahr Youssef Canal.

- Network of Egyptian Environmental Affairs Agency, consisting of 69 monitoring sites on the Nile carried by laboratories affiliated to EEAA's Regional Branches located at different governorates, map (5-4) shows these locations.

Map (5-4): Monitoring locations of Nile water quality

5-6 Deficiencies in existing monitoring programs

Although many agencies under different ministries are involved in water quality monitoring, there are many gaps which can be summarized as follows:

1. All monitoring programs are focused only on the traditional parameters and very limited data is available about the micro-pollutants (pesticides, heavy metals and hydrocarbons).
2. Monitoring programs focus on water analysis, and no information is available on sediments, fish and biota which reflect the presence of micro pollutants and their concentrations.
3. There is no unified system for monitoring and analyzing methods in all agencies upon which a comparison can be conducted among results of different agencies for the same site to ascertain their accuracy and quality.
4. There is no consistency between different institutions regarding methods of sampling and analysis to insure reliability and validity of data, to appropriately assessed and presented for decision makers.
5. There is lack of inter-ministerial cooperation and data sharing to maximize benefits.

5-7 Indicators of water quality in Lake Nasser, Nile River and its two branches

5-7-1 Water Quality in Lake Nasser

According to monitoring results of the Environmental Monitoring Center affiliated to Lake Nasser Development Authority, which is conducted upon sites affected by development around the lake; as well as monitoring results of the Environmental Monitoring Center and Environmental Work Studies affiliated to Ministry of Health, which is carried out periodically every month, water quality of the lake can be identified as follows:

Water quality of the lake is good and results issued by Ministry of Health have indicated that the lake is not adversely affected by existing development, where the results indicated that average values of organic materials in forms of biological oxygen demand (BOD_5) and chemical oxygen consumed (COD) were 6 mg /L and 8.63 mg /L, respectively, these values didn't exceed the permissible limits for Nile water quality. The less (BOD_5) value was 5.8 mg/L during March and April, while the highest one was 6.2 mg/L during August. Also, data indicate that average COD values are within the permissible limits for Nile River's water quality (10 mg/L) as it ranged between 8 mg / L and 9.5 mg / L. A comparison between average COD and BOD values during the period from 2004 to 2008 are represented in Figures (5-5) and (5-6).

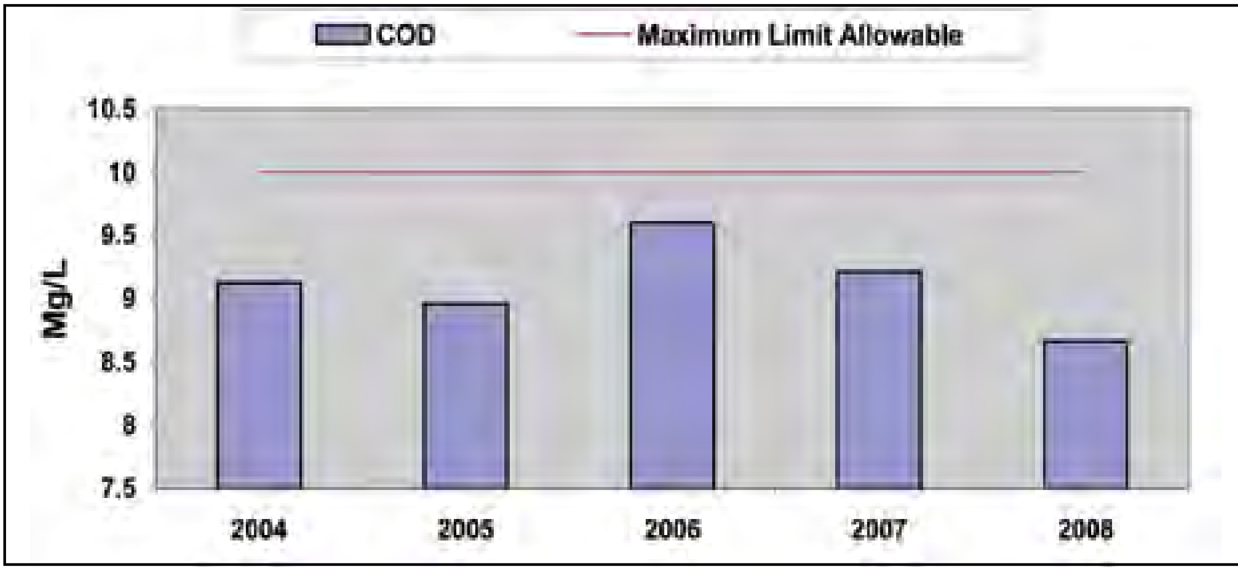


Fig (5-5): comparison between average concentration of COD over the past five years

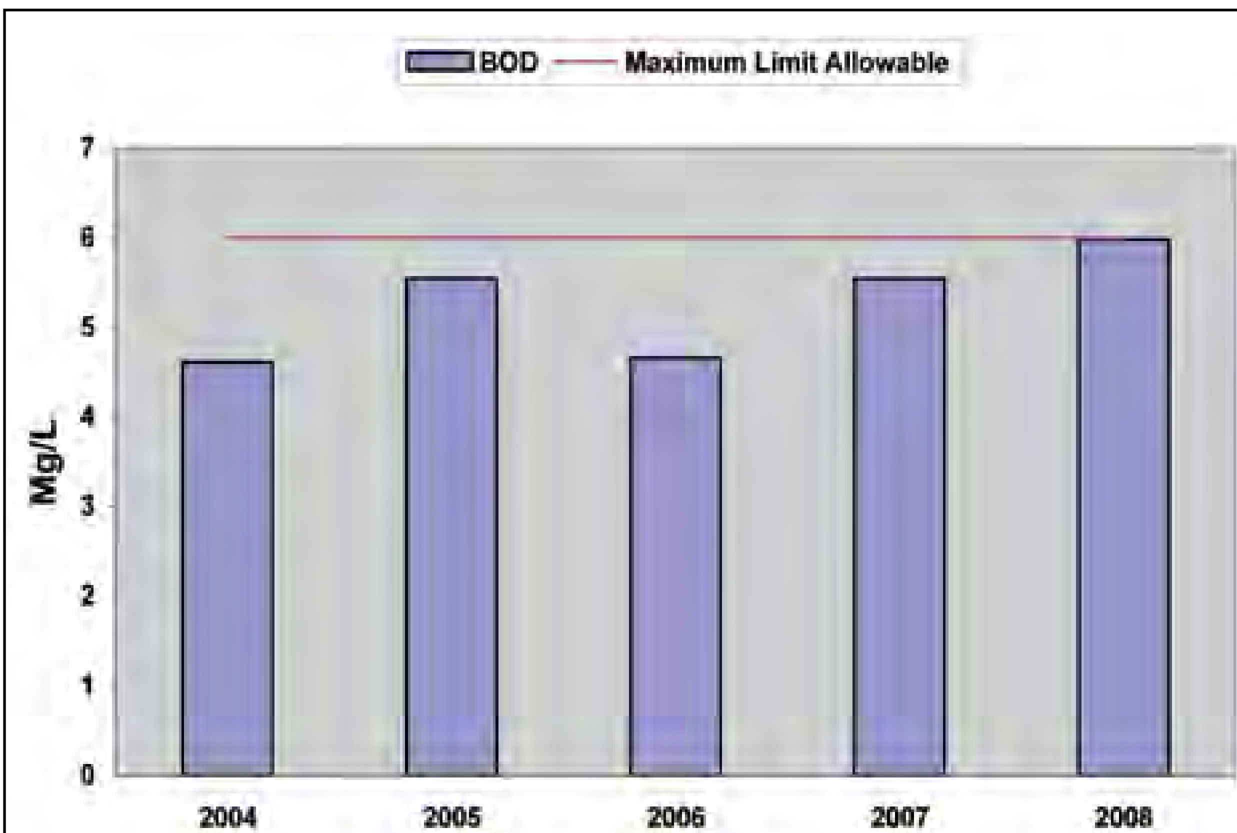


Fig (5-6): comparison between average concentration of BOD over the past five years

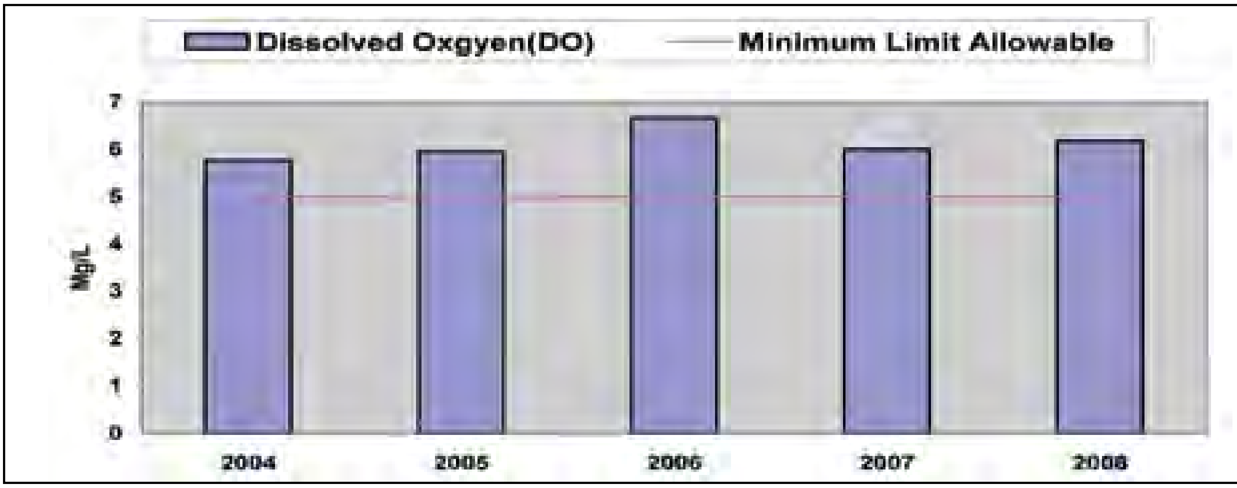


Fig (5-7): comparison between average concentration of DO over the past five years

Comparison between the average concentrations of dissolved oxygen (DO) during the period from 2004 to 2008 is shown in Figure (5-7)

The relationship between average concentrations of COD, BOD and DO during the period from 2004 to 2008 is illustrated in Figure (5-8). Available data show that the increase in DO concentrations confirms the good quality of water.

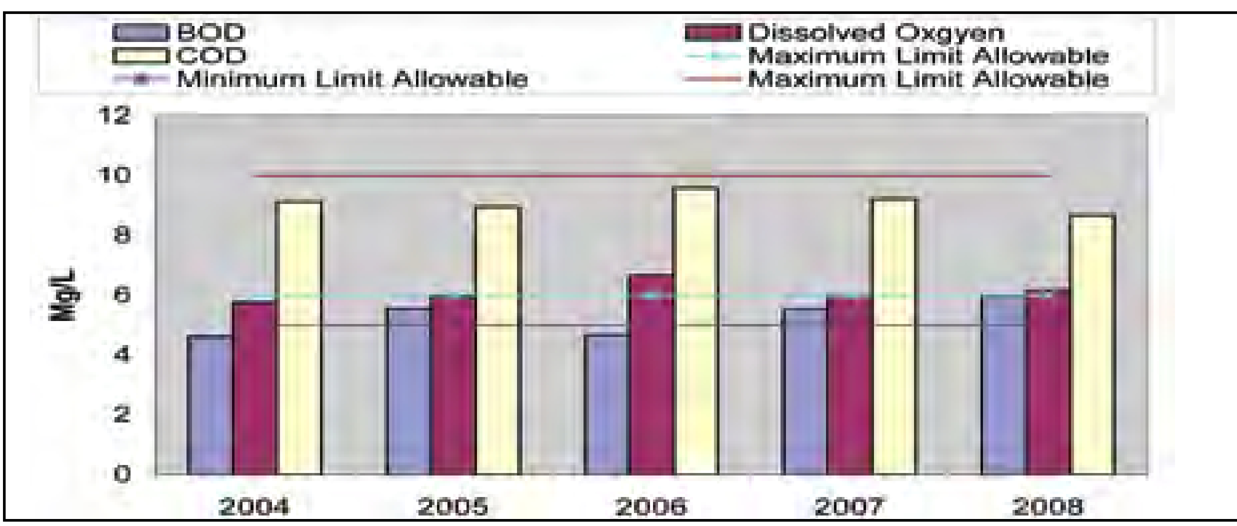


Fig (5-8): comparison between average concentration of COD, BOD, DO during the years 2004 - 2008

Total dissolved solids ranged from 162 mg/L in August as the minimum value to 177 mg/L in January as the maximum value with an average value of 166.3 mg/L.

Analyzing results of nitrogen, phosphates, iron and manganese values were less than reading of the devices used in the analyses process.

5-7-2 Water Quality of Nile River

Results of monitoring campaigns carried out during 2008 by the Environmental Monitoring Center of the Ministry of Health and EEAA laboratories in different governorates can be summarized as follows:

1. Average concentrations of organic matter, as represented by the biological oxygen demand (BOD5) were lower than the permissible limit (6 mg / L) in all governorates as shown in (Figure 5-9). This is attributed to the integrated exerted efforts by concerned ministries to reduce discharge of municipal wastewater into the river and use of treated municipal wastewater for timber forests irrigation.

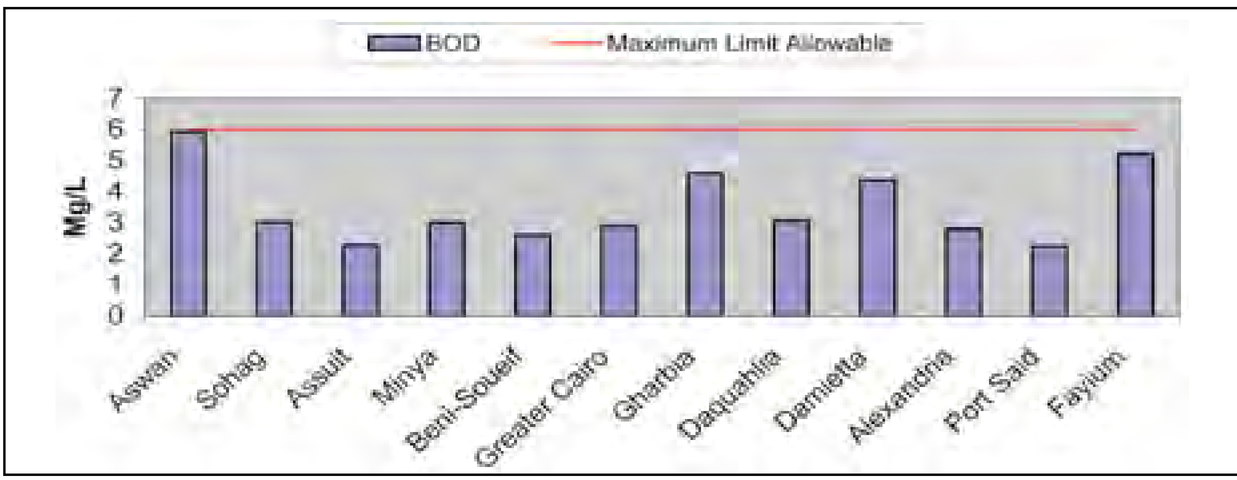


Fig (5 - 9):Comparison of BOD averages among Governorates in 2008

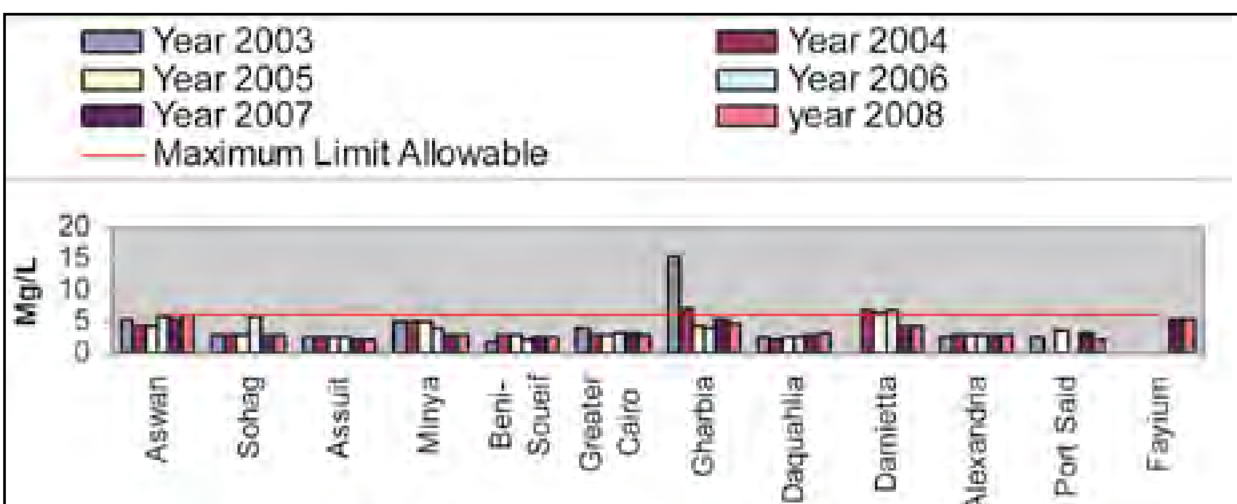
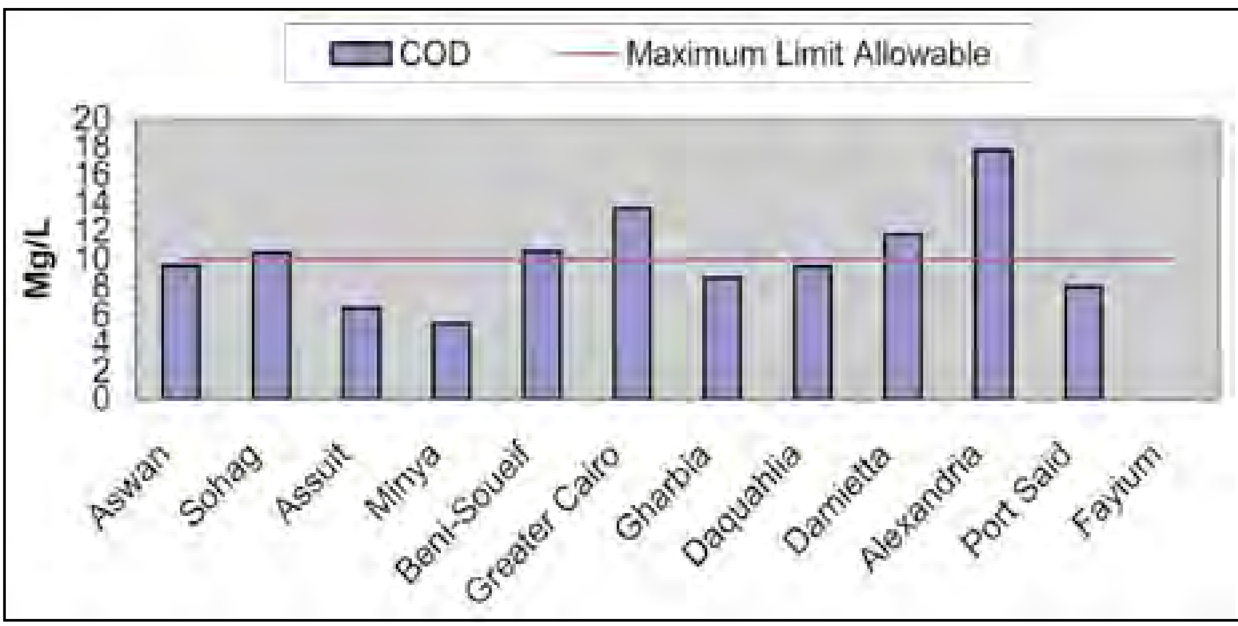


Fig (5-10):Comparison of average results of organic load expressed in BOD among Egypt governorates in 2003-2008

A comparison of average BOD values obtained during 2008 with those recorded along the previous five years shows a noticeable improvement in water quality in the majority of these governorates e.g. Port Said, Gharbia, Fayium and Greater Cairo, as it is shown in (Figure 5-10).

In spite of the slight increase in the average values of BOD in Aswan and Daquhlia governorates during 2008 as compared with last year, BOD is still within the permissible limit of law No. 48 / 1982.

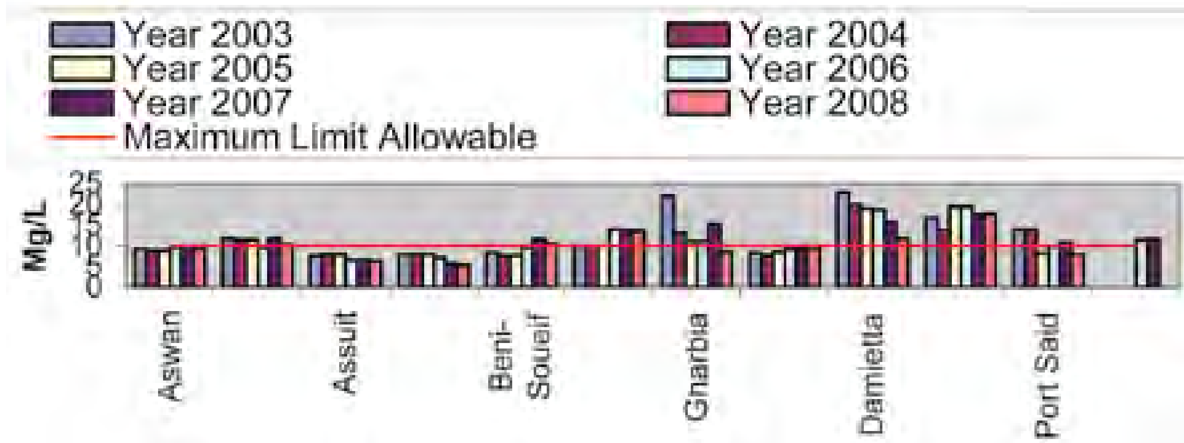
2. A comparison of the changes in the COD average concentrations in different governorates during 2008 is illustrated in Figure (5-11).



Fig(5-11): comparison of average chemically consumed Oxygen among Governorates for the year 2008.

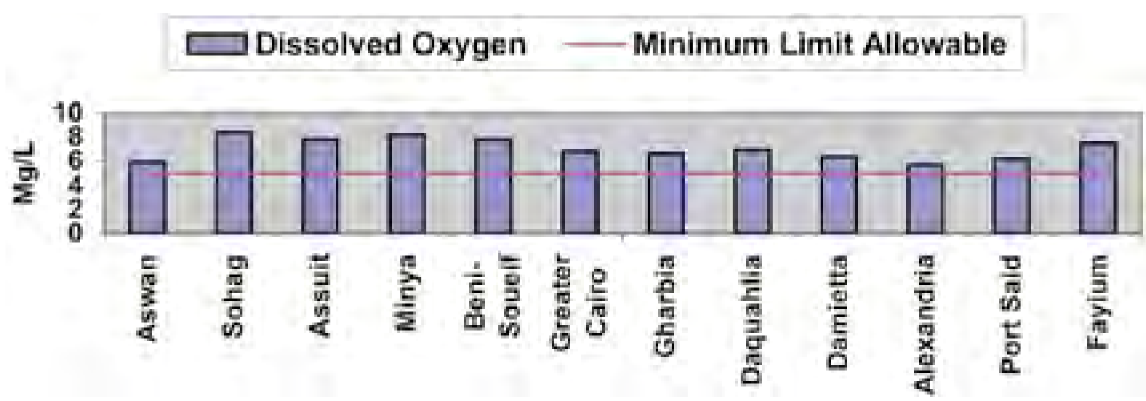
In spite of the slight increase in the average values of COD in Greater Cairo, Beni-Soueif, Damietta and Sohag governorates during 2008 as compared with permissible limit , they are still less than last year concentration. Also there was a slight increase in COD concentration in Aswan but still less than the permissible limit of law 48 / 1982 ,in addition, results indicate a remarkable increase in COD average values in Alexandria Governorate.

A comparison of changes in COD average concentrations in different governorates during the period from 2003 to 2008 is illustrated in Figure (5-12).



Fig(5-12): Comparison of the results of average organic load expressed in COD among Egypt governorates in 2003-2008

3. Dissolved oxygen concentrations in all governorates were higher than the lower permissible limit (5 mg / L) as shown in figure (5-13). This is an indication of good water quality.



Fig(5-13): Comparison of average DO concentrations among Egypt governorates in 2008

4. Concentrations of nutrients (ammonia, nitrate and phosphate) were within the permissible limits in the majority of monitoring sites. Ammonia concentrations were less than permissible limit (0.5 mg / L), but it exceeded this limit at two points in Alexandria where its concentration was 0.76 mg/L which is less than the reported value of last year (0.84 mg / L).Nitrate concentrations varied between 0,249 and 1.98 mg / L , while the permissible limit is 45 mg / L. Also, results indicated that phosphate concentrations ranged between 0.015 to 0.3 mg / L. A comparison between average concentrations of the nutrients in different governorates during 2008 is illustrated in figure (5-14).

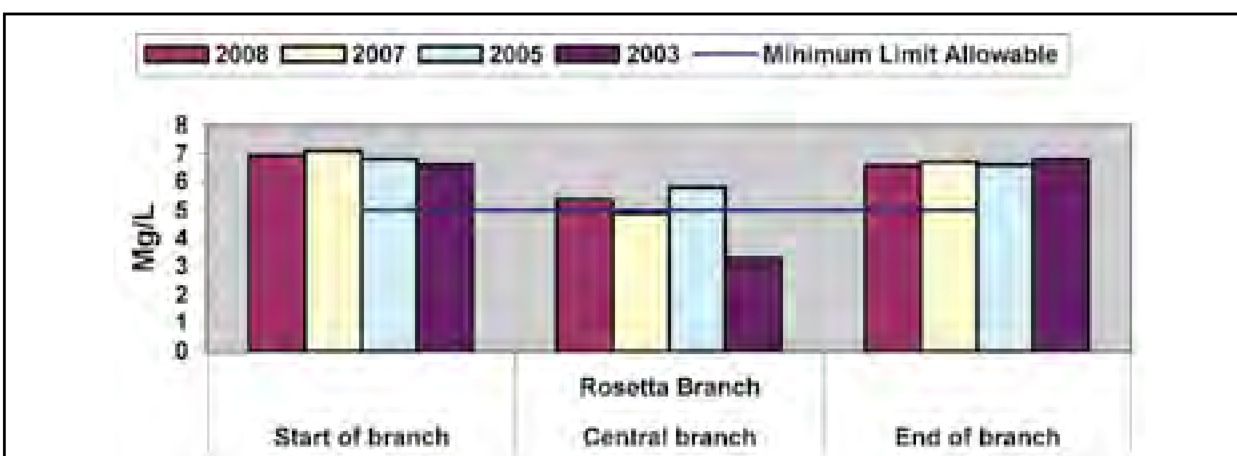
5. Available data showed that average concentrations of fluorides and sulfates were within the permissible limits at all the monitoring sites. The average concentrations for fluoride ranged from 0.11 to 0.47 mg / L and for sulfates from 10 to 80 mg / L, while the permissible limits for fluoride and sulfate are (0.5, 200 mg / L) respectively.
6. Average concentrations of total dissolved solids (TDS) ranged between 116 mg / L to 378 mg / L which is less than that of last year, while the permissible limits are 500 mg / L.
7. Lead, chromium and cadmium were not detected in all monitoring sites. Average concentrations of iron ranged from 0.01 to 0.71 mg / L. These values are less than the permissible limit (1 mg / L). As for manganese, it was not detected in most of the monitoring sites in all governorates, and its maximum concentration was 0.1 mg / L, which is less than the permissible limit (0.5 mg / L).

In general, it could be concluded that the quality of water from Aswan to Cairo is good, except in some areas. This is attributed to the high dilution rate which improves the self purification capacity of the river to get red of pollutants.

5-7-3 Water quality of Rosetta branch

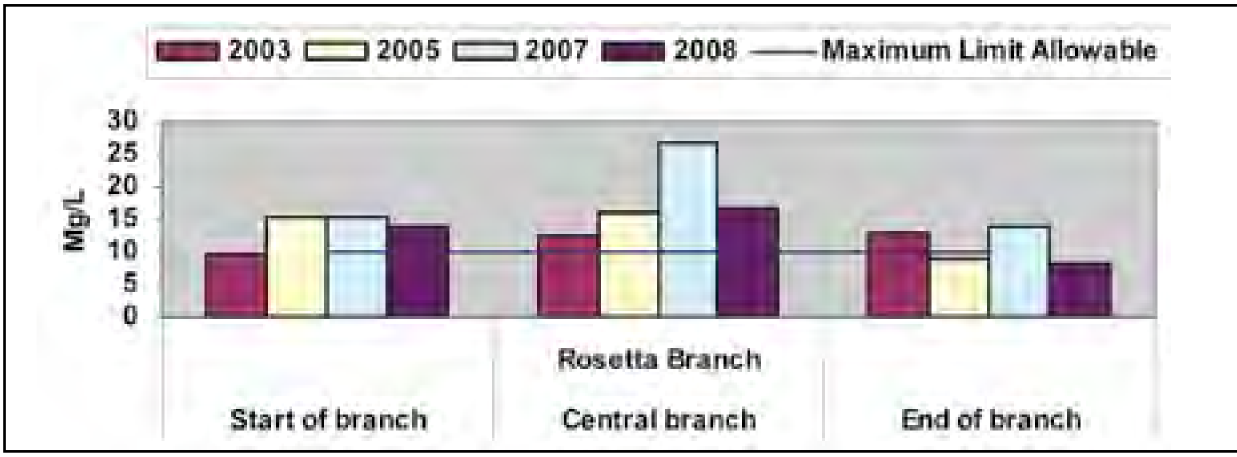
Monitoring results carried out during 2008 by the Environmental Monitoring Center of the Ministry of Health and EEAA laboratories in different governorates indicate the following:

1. Dissolved oxygen concentrations along the branch were higher than the lower permissible limit (5mg/L) in all sampling sites which indicate a good water quality. There was an improvement in the DO concentration in the middle of the branch, during 2008 than last year, in addition to a remarkable increase than 2003 compared with the lower permissible limit as indicated in (Figure 5-15).



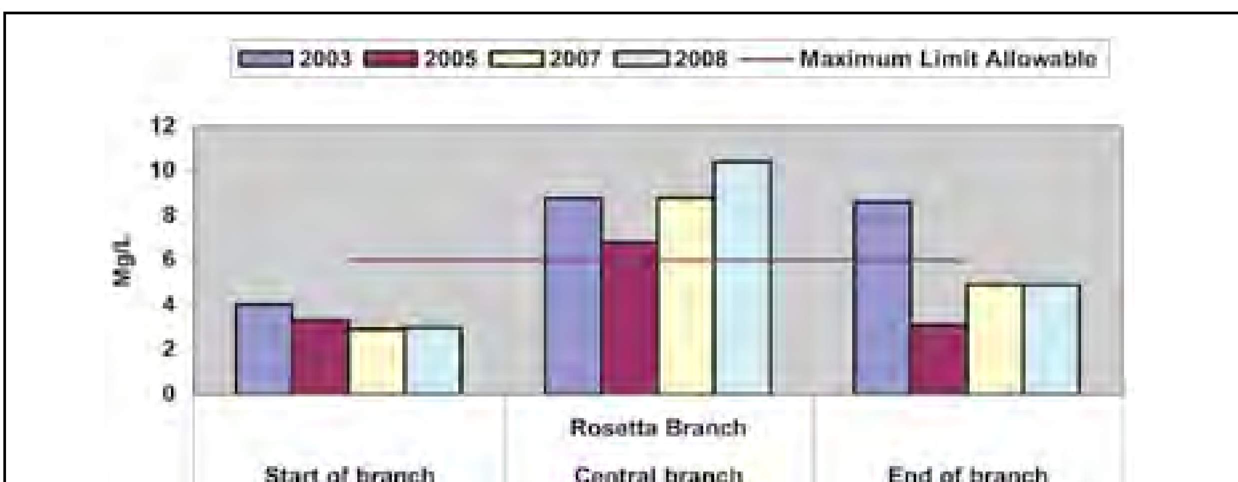
Fig(5-15): comparison of results of average Dissolved Oxygen in rosetta branch from 2003 - 2008

2. COD average concentration was less than the permissible limit (10 mg/L) at end of the branch only, while it exceeded the limit in the beginning and middle of the branch. In general most of the values during 2008 were much lower than previous years as indicated in (Figure 5-16).



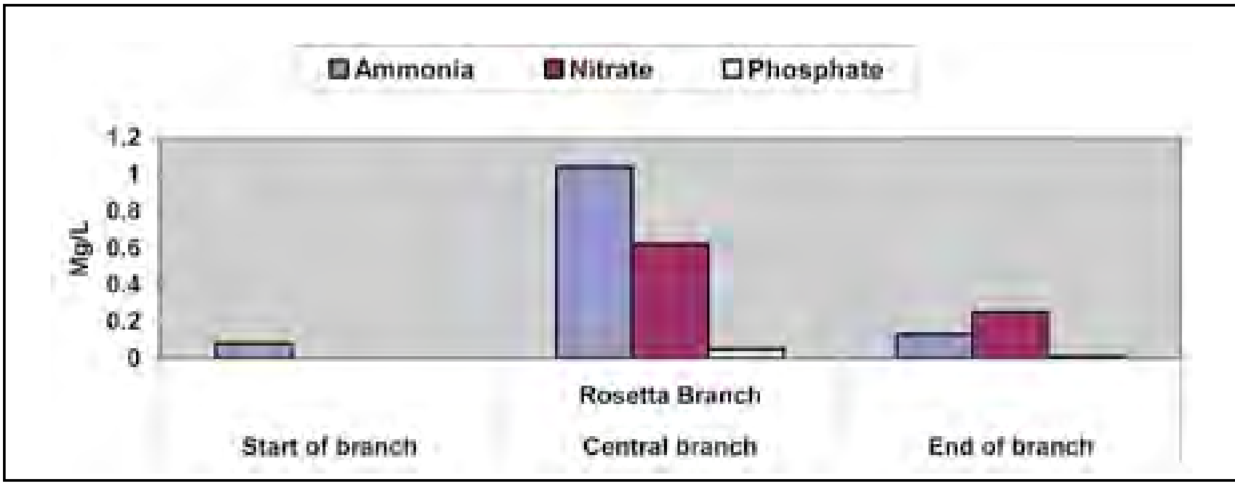
Fig(5-16): comparison of the results of average organic load expressed in COD for rosetta branch from 2003 - 2008

3. Average concentration values of organic matter (BOD_5) were less than the permissible limit (6 mg / L) at the beginning and end of the branch, while they exceed the limit at the middle of the branch which may attributed to the discharge of agricultural and industrial wastewaters in the middle of the branch (Factories in Kafar El-Zayate) as indicated in (Figure 5-17). MSEA exerted efforts to help these factories to achieve environmental compliance, in addition to coordination with Ministry of Housing and Urban Communities to provide sanitary services to villages located around Rosetta branch.



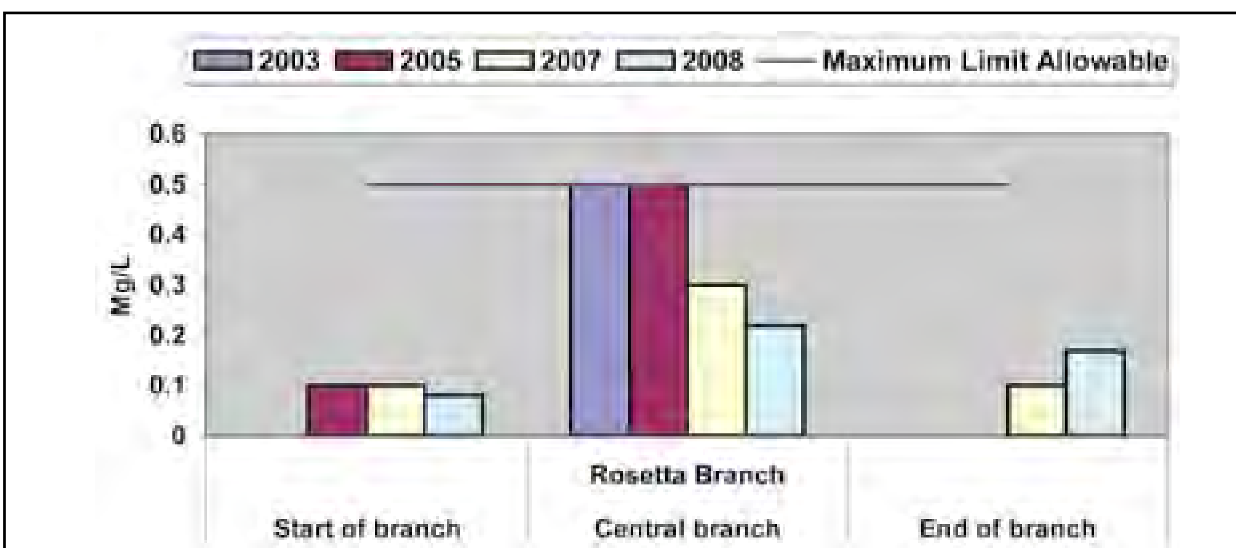
Fig(5-17): comparison of the results of average organic load expressed in BOD for rosetta branch from 2003 - 2008

4. Nutrients concentrations (ammonia, nitrate and phosphate) were within the permissible limits in almost all monitoring sites during 2008 as shown in figure (5-18).



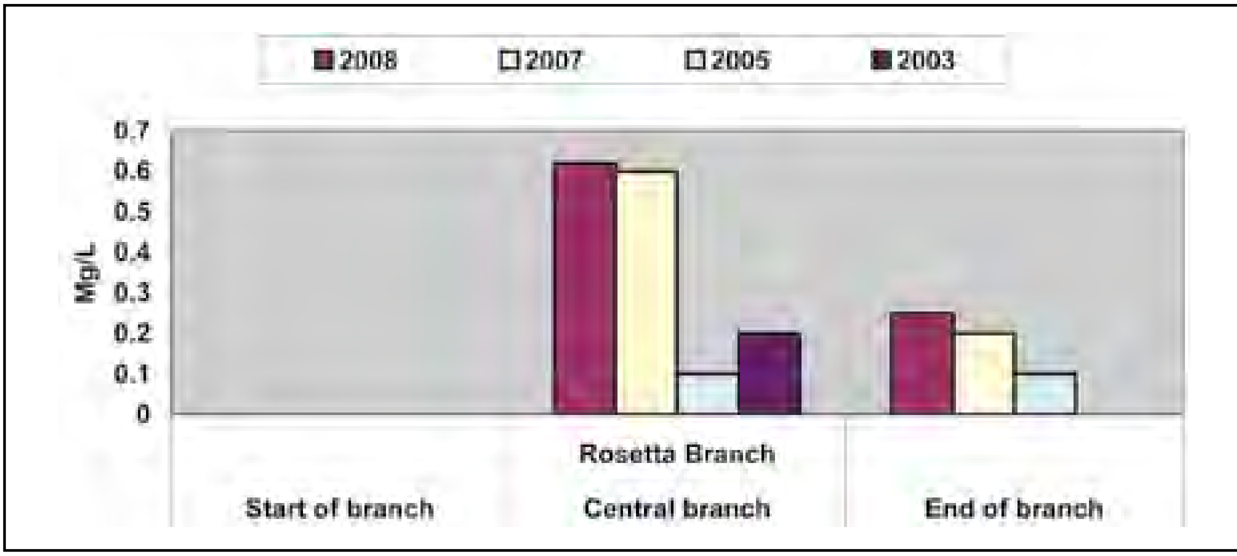
Fig(5-18): results of average concentraton of Ammonia, Nitrate and Phosphate in rosetta brance during 2008

5. Ammonia average concentrations were less than the permissible limit (0.5 mg/L) at all monitoring sites except at only one site with concentrations ranged from 0,488 mg / L to 2.44 mg / L during 2008. In general, ammonia average concentrations were less than its concentration in previous year where its average concentrations exceeded the limit at three sites and ranged from 0.56 to 0.82 mg / L. Figure (5-19) shows the comparison of ammonia average concentration during the period from 2003- 2008.



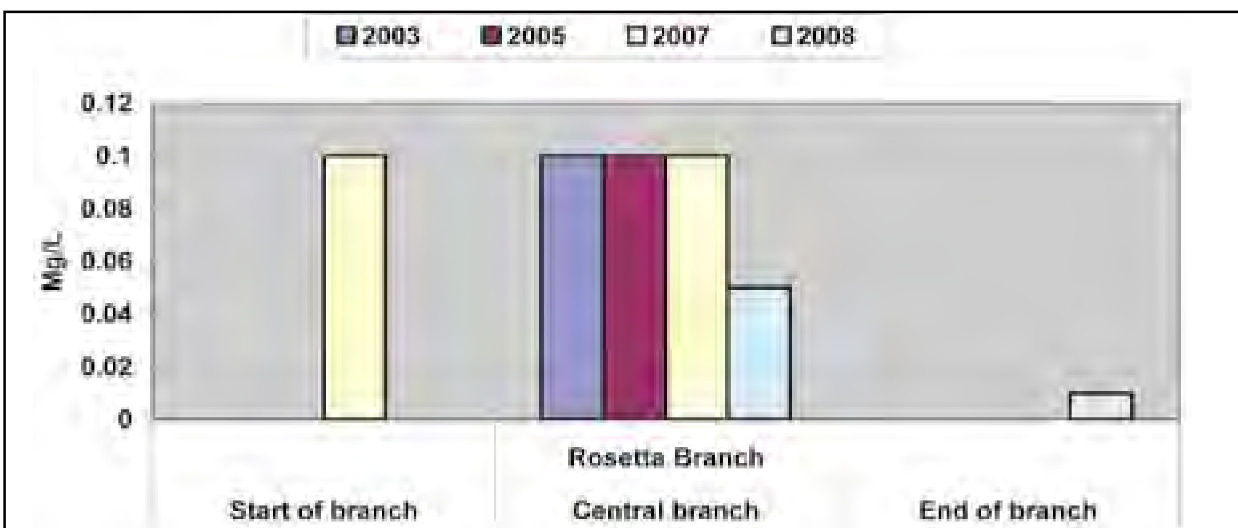
Fig(5-19): comparison of average concentration of Ammonia in rosetta branch from 2003 - 2008

6. Average concentration of nitrate ranged between (0.15, 0.9 mg / L), while the permissible limit is 45 mg / L as shown in figure (5-20).



Fig(5-20): comparison of average concentration of Nitrate in rosetta branche from 2003-2008

7. Results also indicated that average concentrations of phosphate ranged from 0,031 to 0,071 mg / L while the permissible limit is 1 mg / L, as shown in figure (5-21).

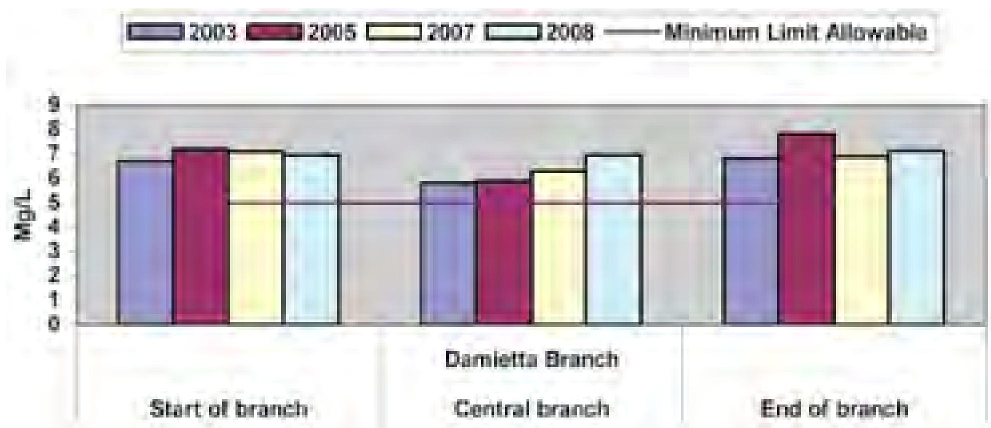


Fig(5-21): comparison of average concentration of phosphate in rosetta branche from 2003-2008

8. Average concentration of total dissolved solids ranged from 314 mg / L to 502 mg / L, while the permissible limit is (500 mg / L).

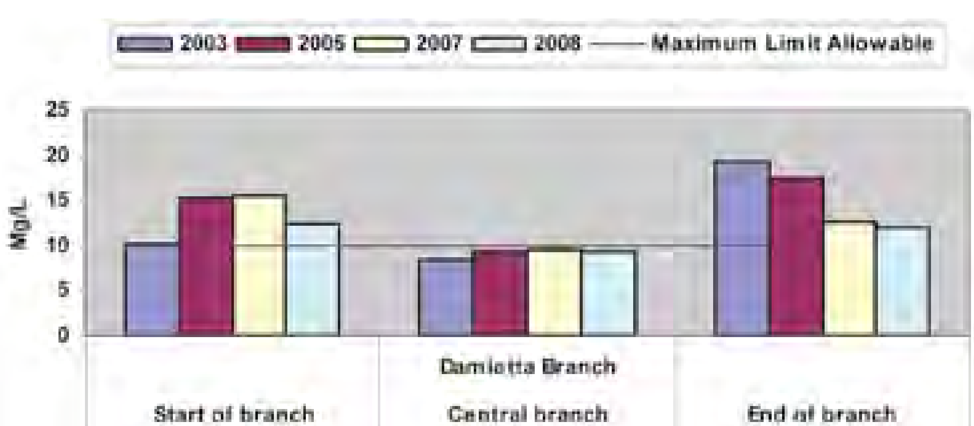
5-7-4 Water quality of Damietta branch

1. Monitoring results along Damietta branch over past years indicate that concentration of dissolved oxygen (DO) was higher than the minimum permissible limit (5 mg / L) as shown in figure (5-22) which is a sign of good water quality and lightly organic pollutants.



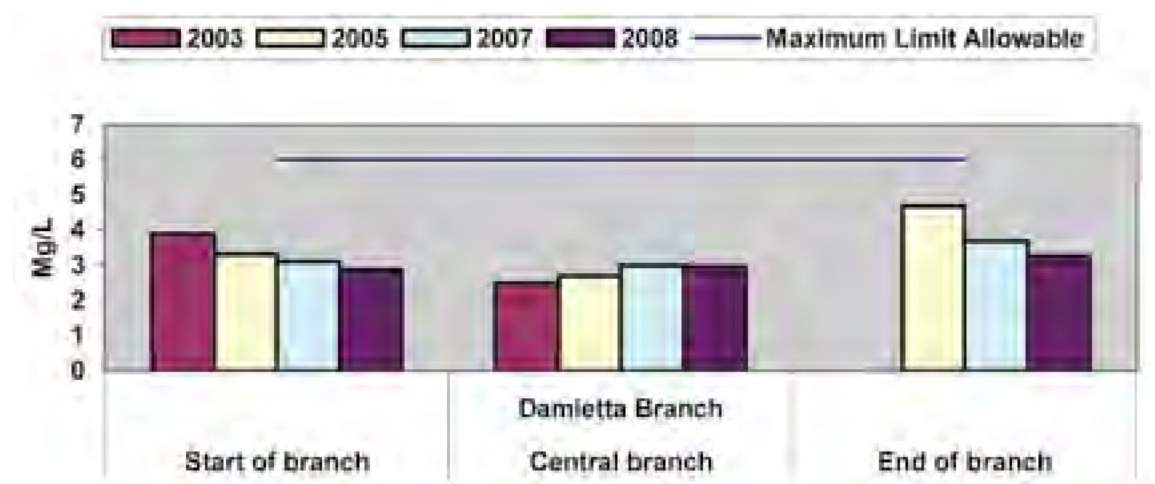
Fig(5-22): comparison of average concentration of Dissolved Oxygen in damietta branch from 2003 - 2008

2. Average concentrations of chemical oxygen demand (COD) were less than that recorded over previous years as shown in(figure 5-23), however they slightly exceeded the standard value at the beginning and the end parts of the branch, while they were less than the permissible limit in the middle.



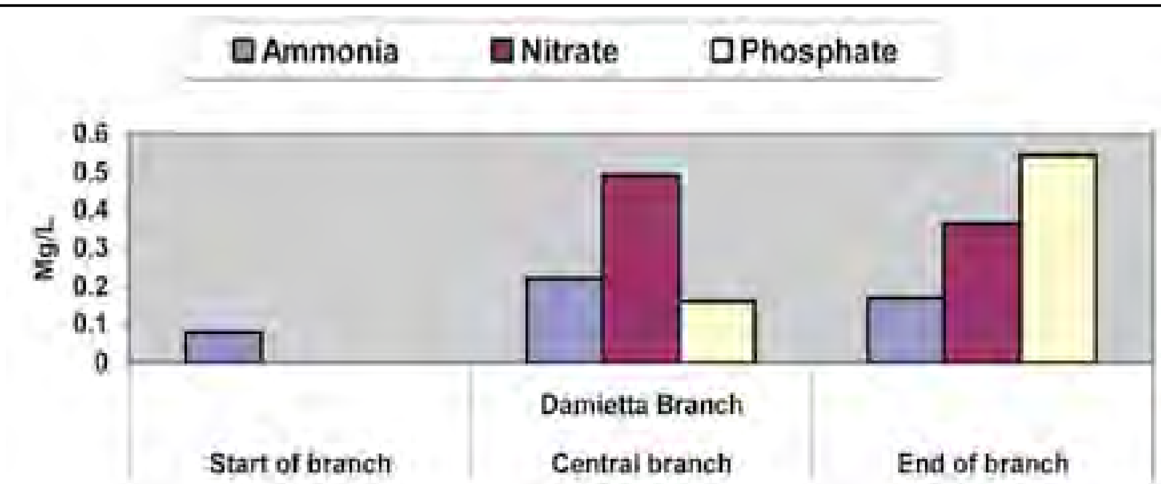
Fig(5-23): comparison of average concentration of organic load expressed in COD for damietta branch from 2003 - 2008

3. Average concentrations of organic matter (BOD_5) along the branch during 2008 were less than the permissible limit (6 mg/L); these averages were less than that of previous years which indicate an improvement in water quality in Damietta branch, as shown in figure (5-24).



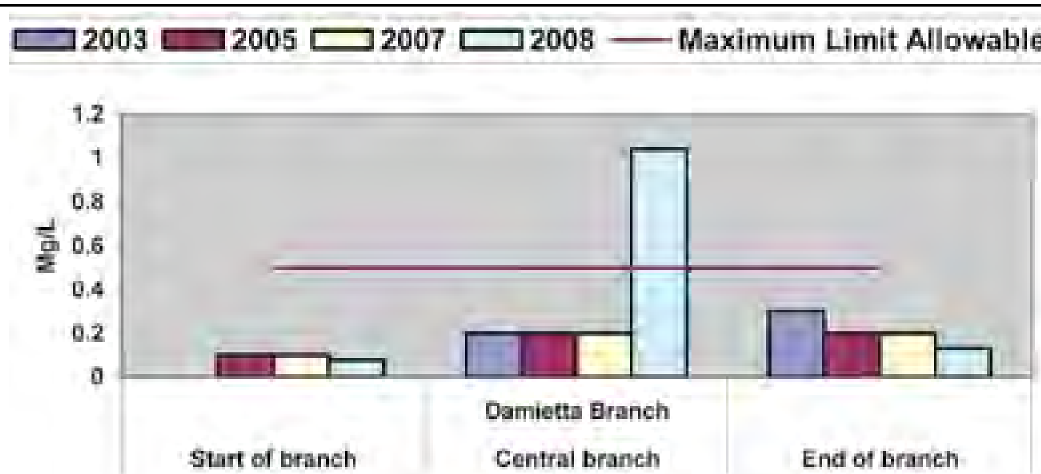
Fig(5-24): comparison of average concentration of organic load expressed in BOD for damietta from 2003 - 2008

4. Nutrients concentrations (ammonia, nitrate & phosphorus) during 2008 were less than the permissible limits in most monitoring sites as shown in figure (5-25).



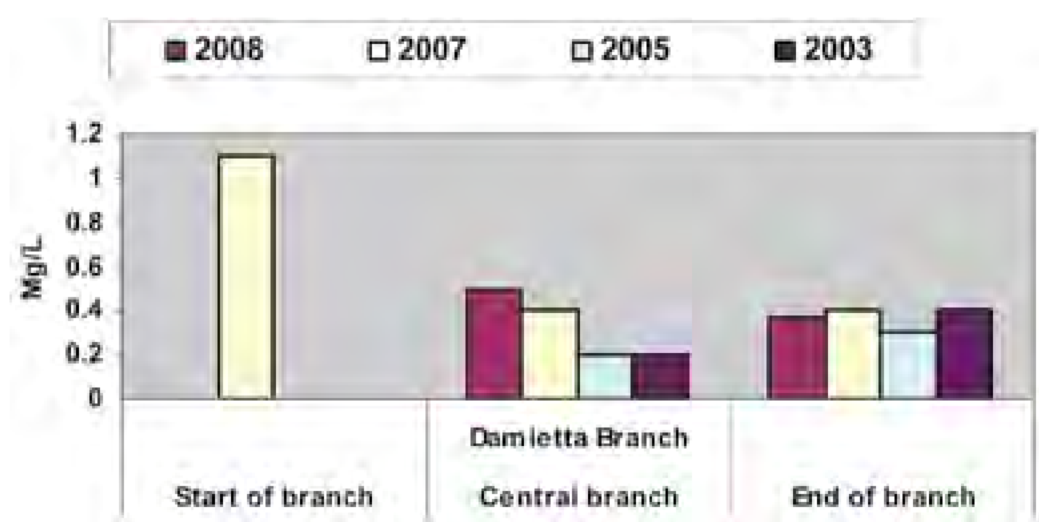
fig(5-25): results of average concentration of Amonia, Nitrate and Phosphate in damietta branch during 2008

5. Average concentrations of ammonia were less than the permissible limit (0.5 mg /L) along Damietta branch and ranged from 0.1 to 0.5 mg / L during this year as shown in figure (5-26), also results indicated five sites with concentrations exceeded the permissible limit ranged from 0.9, 1.0, 1.54 mg/L.



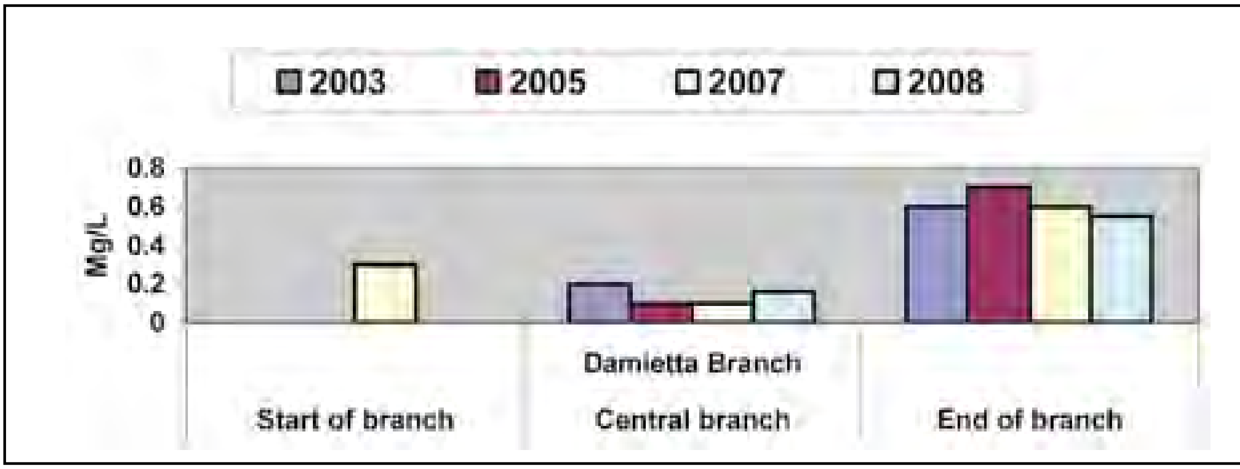
Fig(5-26): comparison of amonia average in damietta branch from 2003 - 2008

6. Average concentration of nitrate ranged between (0.2, 0.73 mg / L), while the permissible limit is (45 mg / L), as shown in figure (5-27).



Fig(5-27): comparison of average concentration of nitrate in damietta branche from 2003-2008

7. Average concentration of phosphate ranged between (0.04, 0.8 mg / L), which is less than the permissible limit of water quality in River Nile (1 mg / L) as shown in figure (5-28).



Fig(5-28): comparison of average concentration of phosphate in damietta branch from 2003 - 2008

8. Average concentration of total dissolved solid (TDS) ranged from 222 to 282 mg /L which is less than the permissible limit 500 mg /L for water quality in River Nile .

5-7-5 Water quality in canals and drainages

National Water Research Center affiliated to Ministry of Water Resources and Irrigation through Nile Research Institute (69 monitoring sampling sites) and Agricultural Drainages Research Institute (163 sampling sites) conduct monitoring of water quality twice per year during February and August; except in Fayoum area monitoring is carried periodically every month, due to the intensity of canals and drainages network there.

Latest report issued by the National Water Research Center in December 2008 included monitoring results of surface & and groundwater during 2007 allover Egypt for some of the water quality indicators in these canals and compare their results with standards of Law 48/1982.

❖ Monitoring results of canals and rayahs in Upper Egypt:

Monitoring results clarify the following:

1. Biological oxygen demand (BOD_5) of all irrigation canals and rayahs in Upper Egypt did not exceed the permissible standard limit (6 mg/L) set by law 48/1982.
2. Organic matter concentrations represent by chemical oxygen demand (COD) did not exceed the permissible standard limit (10 mg/L) in most of canals and rayahs during February and August.

But there was a slight increase during August and a significant increase during February of COD concentrations in each of Kalabiah, West Naga Hammadi and Asfon Canals. Also, there was a noticeable increase in concentration of Rayah El-Taofeky during February.

3. Dissolved oxygen (DO) concentrations were higher than the minimum permissible limit (5 mg / L), which is an indication of the vitality of water, while they were less than the standard value by 18%, 30% and 60% In Bahr Yousef, Asfahon Canal and Kalabiya canal respectively, this may be attributed to oxidation of organic matter which consume the dissolved oxygen.

4. Total dissolved solids concentrations, at all monitoring sites were within the permissible limit (500 mg/L) during February and August. The recorded concentrations varied between 191 and 330 mg/L during February and ranged from 178 to 262 mg/L during August.

5. Fecal coliform counts were less than the agreed limit in some international standards of the drinking water intakes (2000 Cells in 100 milliliters) in most of the sampling sites during February and August. However, they exceeded this limit in Rayah El Monofy, Bahr Youssef and Ibrahimia Canal at Menia during August as well as in Ibrahimia canal at Beni Soueif which may be attributed to domestic wastewater pollution.

6. Ammonia concentration exceeded the standard limit (0.5 mg/L) in many locations, where it ranged from 0.3 to 1.2 mg/L. The analysis results of samples taken by Ministry of Health (from the outlet of drinking water stations , located on canals and rayahs of Delta and Upper Egypt regions), proved the efficiency of these stations in purifying water according to standards of drinking water.

7. Concentrations of heavy metals were less than the permissible limits of water quality at all canals and rayahs; but there was an increase in lead and cadmium concentrations in Asfahon canal ;increase in lead, manganese and chromium in Naga Hamady canal and an increase in manganese concentration in kalabia canal.

❖ Monitoring results of canals and rayahs in Delta:

Monitoring results clarify the following:

1. A gradual increase in concentrations of dissolved salts is detected as we move from south to north in Delta region with average concentrations of 435 mg /L, 354 mg / L and 351 mg / L in the northern, central and western parts of the Delta, respectively. The standard limit (500 mg/L) was exceeded in two canals in eastern, one canal in central and one canal in western area of the Delta. This may be attributed to reuse of agricultural drainage water after being mixtured with irrigation water.

2. Organic matter concentrations, represented by the BOD_5 and COD values, exceeded their permissible standard limits (6 mg / L and 10 mg / L) respectively. Their average concentrations

were 10.2 mg /L and 13.5 mg /L respectively, which is an indication of water quality deterioration in irrigation canals in Delta region. This necessitates being careful while mixing it with agricultural drainages water, which may be loaded with industrial and domestic wastewater.

3. Dissolved oxygen (DO) concentrations were higher than the minimum permissible limit (5mg/L) in most canals and rayahs with the exception of 6, 4, 5 canals in the eastern, middle and western part of Delta respectively which were less than this limit . This confirms the vulnerability of water quality with Organic matter.

4. Fecal coliform counts were relatively high in all sampling sites. The counts varied from 10^3 , 1.25 x 10^6 , where the count was obviously high in a limited number of monitoring sites which is an indicator of contamination with domestic wastewater.

5. An increase in ammonia concentrations has been recorded. Average concentration was 0.86 mg/L in the central part of the Delta. Corresponding values for both east and west parts was 0.91 mg/l. However, an obvious improvement than those obtained last years was indicated. This may be due to the exerted efforts to expand in sanitation services and reuse of treated wastewater in the irrigation of timber forests.

6. Average concentrations of nitrate were 2.89, 3.14 and 3.19 mg /L in middle, eastern and western parts of the Delta respectively, which is less than the permissible limit (45 mg/L) demonstrating the ability of water for self-purification.

7. The highest heavy metals concentrations were 0,012 mg / L for lead and 0.99 mg / L for iron in western Delta; 0,043 mg / L for zinc in the western delta and 0,022 mg /L for copper in eastern and middle Delta. all of them were less than the permissible limit (05.0 mg / L for lead, 1 mg / for iron, zinc and copper)

❖ Monitoring results of irrigation canals in Fayoum governorate:

Monitoring results clarify the following:

1. Average value of pH was 7.57 which are compatible with the permissible limit of water quality for irrigation canals (7 - 8.5).
2. Average concentration of total dissolved solids was 850 mg / L, which is higher than the permissible limit (500 mg /L). The highest value has been recorded at the outlet of Bahr Wahbi (890 mg /L), and the lowest one at the outlet of the Bahr kasr El-Banat canal (450 mg /L).
3. Average concentration of ammonia was 1.18 mg / L, the highest and lowest value were about 4.5 mg / L and 0.65 mg / L respectively at various monitoring sites in Bahr Wahbi, which means the presence of domestic wastewater contamination.

4. Average concentration of nitrate was 4.06 mg / L, while the highest and lowest value were about 22 mg /L and 0.65 mg / L respectively in Bahr Wahbi and Bahr Kasr El-Banat . But it still much lower than the permissible limit (45 mg / L). Table (5-8) shows averages concentrations of nutrients in irrigation canals in Fayoum.

Table (5-8): Average concentrations of nutrients in the irrigation canals in Fayoum.

parameter	General average (mg/L)
Ammonia	1.18
Nitrate	4.0
Total Phosphate	0.18

5. Average concentration of organic matter as represented by biological oxygen demand (BOD_5) was 13.6 mg / L, while concentration in various monitoring points ranged from 21 mg / L as the highest value in Bahr Wahbi to 7 mg / L as the lowest value in Bahr Kasr El-Banat, and they are all higher than the permissible limit (6 mg / L).
6. Average concentration of dissolved oxygen (DO) was 6.4 mg / L and ranged in general between 5.1, 8.2 mg / L.
7. Average concentration of heavy metals (copper - iron - zinc - lead) in the irrigation canals of Fayoum irrigation basin were variable during 2007, but all were within the permissible limits, as shown in table (5-9).

Table (5-9): Average concentrations of heavy metals in irrigation canals of Fayoum irrigation basin

Metal (mg / L)	Irrigation canals of Fayoum Basin	Limits of law (48/1982)
Copper	0,016	1.0
iron	0,861	1.0
Zinc	0,015	1.0
Lead	-	0.05

The increase in concentration of organic matters and ammonia indicates the presence of domestic wastewater contamination which necessitates coordination among concerned stakeholders.

❖ Monitoring results of agricultural drainages in Upper Egypt:

Monitoring of 29 agricultural drainages distributed from Aswan to Cairo is carried out by analyzing water samples to obtain major indicators for water quality, where the following results have been indicated:

1. The pH registered its highest value in El-Berba drain (8.35), and its lowest value (6.94) in El-Masanda drain. In general all pH measurements were within the permissible limits (from 7 to 8.5) during measurement period in February and August.

2. Total dissolved solids concentration exceeded the permissible limit (500 mg /L) in 59% of the drains during February (the period of less requirements) and August.

3. Dissolved oxygen (DO) concentrations registered during February were in its highest values, and about 24% of the drains exceeded the permissible standard limit (5 mg/L) during February while 28% of the drains exceeded this limit during August. In general it was noticeable that concentration of DO decreased in some drains connected with discharging of domestic wastewater that contain organic matters.

4. Nitrate concentration complied with the permissible standard limit (45 mg/L) in almost all monitoring sites, with exceptions of Al-Radisa and Khor Sale Aswan where the nitrate concentrations exceeded the permissible limit by 48 mg /L, 205 mg/L during February and 52 mg/L& 370 mg/L during August.

5. Phosphate concentration ranged from 0.045 to 0.931 mg /L during February and from 0.015 to 0.861 mg / L during August, which are all within the permissible limit (1 mg/L) of law 481982/.

6. With regard to COD, 52% of the drains from the total investigated drains failed to comply with the permissible standard limits (15 mg/L) during February campaign. Corresponding value for August was 38%; this indicates the increase of organic pollutants concentration during period of less requirements.

7. Organic matter concentration represented by biological oxygen demand (BOD_5) is compatible with the permissible limit (10 mg / L) in 86% and 90% of the drainages during February and August respectively; but they exceeded this limit with 51 mg/L in Khor Sale Aswan, 88 mg/L in Albarba, 70 in Atsa and 26 mg/L in Almasanda drains during February. During August it exceeded the limit with (65, 15 ,70 mg/L) in khor Sale Aswan, Rirramon and Atsa drains respectively, this may be due to the fact that these drains receive domestic wastewater discharge which contain high concentrations of organic pollutants.

8. Coliform bacterial counts exceeded the permissible limits (5000 in 100 mille) in 28% and 52% of the drains during February and August respectively, this is due to the sewages discharge into these drains.

9. Heavy metals concentration (iron, copper, manganese, lead, zinc, cobalt, nickel, cadmium and chromium) were within the permissible limits at all monitored drains during February; with the exception of cadmium concentration, which exceeded the permissible limit (0.01 mg / L) with minor concentration in 38% of the drains, where its concentrations ranged from 0.0109 mg /L in Abu Wansa drain to 0.0128 mg / L in Al-Radesia drain. During August, iron exceeded the limit (1mg/L) in 28 % of the drains where its concentration ranged from 1.18 mg / L in Kom Ombo drain to 5.91 mg / L in El Ghap drain. Manganese exceeded the permissible limit (1.5 mg / L) at only one site (1.83 mg / l) in Khor El Sale drain in Aswan. Cadmium limit exceeded in 10% of the drains with 0,015 mg / L in Al-Tonsa drain and 0,035 mg/L in Hammad drain.

❖ Agricultural drains in (central - east - west) Delta:

Assessment of February's results (the period of less requirements) and August (the period of high water flow in Nile River, canals and drains) can be summarized as follows:

1. Average pH values were in line with the permissible standard limits (7- 8.5), it was 7.56 in west, 7.67 in central and 7.59 in east Delta

2. Dissolved salts exceeded the limit (1000 mg/L) which were 1392, 1195, 1633 mg/L in central, western and eastern parts of Delta, respectively. This may be attributed to discharge of irrigation water saturated with soil salts, as well as leakage of saline underground water at North Delta. Also, there was high concentration of salts in northern part of Central Delta near Baltem area and down stream in Bahr El-Bakar (west Delta) and El-Omoum drain (east Delta) as a result of agricultural activities. There is a difference in salinity from south to north, for example, in the east and north parts of central Delta salinity were 2000 mg/L this is attributed to the intrusion of sea water, whereas salinity in western part of Delta ranged from 502 to 4090 parts per million (p.p.m) except at the point on Al-Salam Canal.

3. Average BOD_5 values exceeded the permissible limit (10 mg/l). It ranged from 18.4 mg/L in western, 22.5 mg/L in central and 21.L mg/l in Eastern Delta, which is an evidence of pollution with domestic wastewater.

4. Average COD values did not comply with the permissible limit (15 mg/L). It ranged from 23.31 mg/L in western , 28.3 mg/L in central and 26.7 mg/L in eastern Delta; this is due to discharge of industrial and domestic wastewater, whether after being treated or directly discharged from residential areas that do not have sanitation services.

5. Dissolved oxygen DO concentration was below the minimum permissible limit (5 mg/l) in almost all drains. They were 2.5 mg/L, 2.88 mg/L and 3.67 mg/L in western, central and eastern parts of Delta respectively. This is a sign of water quality deterioration and disability to carryout self-purification.

6. Concentration of nutrients (nitrate, ammonia, phosphate) in Delta were varied in the three regions of Delta , as indicated in table (5-10) :

Table (5-10): Average concentrations of nutrients in the three regions of Delta

Indicator	Overall average	Average of each area		
		West Delta	Central Delta	East Delta
Nitrate (mg/L)	4.71	4.54	4.66	5.01
Ammonia (mg/L)	1.41	1.39	1.38	1.47
Phosphate (mg/L)	0.51	0.66	0.56	0.39

A. Ammonia concentration was higher than the permissible limit (0.5 mg/L) in 98% of drainages' samples, highest concentration was (1.47 mg/L) in eastern Delta while the lowest was (1.38 mg/L) in central Delta.
B. All phosphate concentration was within the permissible limit (1 mg/L), with the highest value in West Delta (0.66 mg/L).
C. Nitrate concentration in all common areas of Delta was within the permissible limit (45 mg/L), the highest value was in center of Delta (4.66 mg/L).

7. Overall average fecal coliform count was 1.776.331/ 100 ml. **Average counts in the three regions of Delta were as follows:**

- West Delta 1.202.318/100 ml
- Middle Delta 2.660.369/100 ml
- West Delta 1.531.614/100 ml

8. All values of average concentration of heavy metals were within the permissible limit in all three areas of Delta, as shown in table (5-11).

Table (5-11): Average concentration of heavy metals in three regions of the Delta

Heavy Metals	West	Central	East	Law Limits
Cupper (mg/l)	0.023	0.036	0.022	1
Iron (mg/l)	0.9	0.828	0.805	1
Zinc (mg/l)	0.07	0.025	0.034	1
Lead (mg/l)	0.011	0.011	0.010	0.05

❖ Agricultural drains in Fayoum Basin:

Water Samples were taken from seven sites of drainage water and analyzed monthly from January - December 2007, through which the following data were reported:

1. Average pH value was (7.65) in all drains that is within the permissible limits (7 – 8.5). The lowest value was recorded in the south-western part of Fayoum Basin (7.5), while the highest value (7.9) was measured at Wadi Al-Rayan Drain.

2. Total dissolved solids concentration exceeded the permissible limit (500 mg/L) at the seven monitoring sites; most of the high concentrations were measured in northern part of Fayoum Basin and in Wadi Al Rayyan drain; the highest value (2300 mg/L) was at Wadi Al-Rayan compared to the lowest value (720 mg/L) at the southern-western part of Fayoum Basin.

3. Average concentration of organic matter (BOD_5) was 15.08 mg/L, which exceeded the permissible limit (10 mg/L); the lowest average value was 9.6 mg/L at Wadi Al-Rayan while the highest was 29 mg/ L at Al Bats Drain.

4. Average concentration of chemical oxygen demand (COD) was 18.67 mg/L which exceeded the permissible limit (15 mg/L).

5. Average concentration of Dissolved oxygen was 5.06 mg/L, which is within the permissible limit (5 mg/L). The highest value was (7.2 mg/L) in El-Gharik drain while the lowest value (3.5 mg/L) were monitored in two monitoring sites in Wadi El-Rayan.

The uncontrolled discharge of industrial and domestic wastewater is the major source of pollution by organic compounds. This is reflected by the high values of COD, BOD and the low DO concentrations.

6. Average concentrations of nutrients in the agricultural drains of the Fayoum basin, during 2007 were as follows:

- Average concentration of ammonia was 1.14 mg/L which exceeded the permissible standard limit (0.5 mg/L) in about 98% of Fayoum drains. The lowest ammonia concentration was (0.9 mg/L) in Al-Bats drain while the highest value was (14.5 mg/l) in Wadi Al-Rayan drain.
- Average concentration of nitrate was (3.97 mg/L), which is less than the permissible limits (45 mg/L). Its lowest limit 3.3 mg/L was recorded at Al-Bats drain while its higher limit was 5.1 mg/L in Wadi El-Rayan drain.
- Average total phosphates was around 0.34 mg/L which exceeded the permissible limit (1 mg/L) by only 1% of the examined samples and the concentrations ranged from 0.1 mg/L to 0.82 mg/L at Al Bats Drain.

It has been observed that nutrient concentrations increased in 51% of the fishing areas samples.

7. Average fecal coliform counts during 2007 were 2.361.649 cell per 100 ml. The lowest count was in Al-Bats drain (10×10^3 /100ml) and the highest count was detected in Wadi El-Rayan drain (4.5×10^5 /100ml).

8. Heavy metals concentrations in Fayoum drains were as follows:

- Copper concentrations in all samples were within the permissible limit (1 mg/L) with average concentration of 0.023 mg/L; the lowest and highest values in Al-Bats drain were 0,007 mg/l and 0.41 mg/L, respectively.
- Iron average concentration was 0.7 mg/l which is less than the permissible limit (1 mg/L).
- Zinc average concentrations was 0.25 mg/l which is less than the permissible limit (1 mg/l) ; the lowest and highest values in Al-Bats drain were ranged from 0,008 mg/L to 0,042 mg/L respectively.
- Lead average concentrations was 0.01 mg/l which is less than the permissible limit (0.05 mg/L) the lowest and highest values in Al-Bats drain were 0,007 mg/L in Wadi Al-Rayyan drain to 0,016 mg/l in Al Bats drain respectively.

5-7-5 Water quality of groundwater in Egypt

Groundwater is an important source of water in Egypt, which is a reliable source for drinking water in some regions that lack the presence of fresh water, it also used to irrigate some areas for different crops .And because of its importance and their uses, Ministry of Water Resources and Irrigation has established a National Network to monitor groundwater at 203 sites distributed all over Egypt as follows:

1. Nile Delta Aquifer (51 sampling sites)
2. Nile Valley Aquifer (55 sampling sites)
3. Greater Cairo (12 sampling sites)
4. Western Desert Aquifer (43 sampling sites)
5. Eastern Desert and Sinai Aquifers (42 sampling sites)

Groundwater Research Institute and the Central Laboratory carried out monitoring and analysis of groundwater. 2007 monitoring result indicated the following:

❖ Aquifer of Delta and Greater Cairo region:

1. Concentration values of the total dissolved salts in Greater Cairo was less than the permissible limit for drinking water (1000 mg / L) and agriculture purposes; while concentrations exceeded the permissible limit in about 33% of the sample in Delta wells, where it was greater than 1200 mg/L; and it was more than 2000 mg/L in about 24% of the samples. The largest value found in northern part of Delta. This is may be due to sea water intrusion which is an indication of the unsuitability of this water to be used in irrigation of some sensitive crops.

2. In Greater Cairo and Delta region, chlorides concentration were within the permissible limit of drinking water (250 mg / L), but it exceeded this concentration at about 22% of water samples from Delta wells whether for drinking or agricultural purposes. High value of chlorides concentrated in the northern part of the Delta may be due to the intrusion of sea water.

3. In general, sulfate concentration in Greater Cairo and most of Delta region were low with the exception of some wells in the northern part of Delta, which may be attributed to dissolved chemicals used in agriculture and fertilizing.

4. Nitrate concentrations were within the permissible limits for drinking and agriculture purposes. Only about 4% of the monitored wells had nitrate concentrations higher than the permissible limits for drinking. This could be due to the recently used nitrate fertilizers in Delta region. In general, the existence of nitrate in deep groundwater leads to raise value of pH due to nitrogen and ammonia gases formation from decomposition of nitrate in the presence of bacteria.

5. Average value of calcium ion concentrations was low and ranged from 109 to 195 mg / L in Greater Cairo and Delta.

6. Values of sodium ion concentration were less than the permissible limit for drinking water in Greater Cairo and Delta. In the northern Delta area, sodium concentrations exceeded the limit in 36% of the wells. This is attributed to the intrusion of sea water into the groundwater aquifer and exchange of potassium ion with sodium.

❖ Nile Valley Aquifer:

1. otal dissolved solids (TDS) concentrations were higher than 1200 mg / L which is higher than drinking water standards (1000 mg / L) in about 52% of the monitored wells. While in 41% of the wells TDS concentrations were higher than 2000 mg / L, making it unsuitable for irrigating some types of crops. These wells were found mainly in east of Atfeh, Al-Qubabat, West Al-Fashn, Samalut, Minya, Tahtah, Luxor and Esna.

2. Manganese concentrations were within the permissible limit for drinking water (0.5 mg / L) in about 97% of the monitored wells. Only 3% of the wells in Qena exceeded this limit.

3. Iron concentrations were within the standard for drinking water (0.3 mg / L) in about 49% of the monitored wells. The permissible limit was exceeded in 51% of the wells in Eastern Atfaih, Al-Qababat, Al-Fashn, West Menya, Naga Hammadi and west Luxor. This is often due to the natural presence of iron and discharge of industrial wastewater.

4. Values of Nitrate concentrations were within the permissible limit set for drinking water (10 mg / L) in about 33% of the wells while in the rest (67%) the limit were exceeded. Exceeded values were found mainly in central and southern parts of the Nile (Assiut, Sohag, Qena, Luxor and Esna).

5. Concentrations of sodium in about 49% of the wells were within the permissible standard limit (200 mg / L). The rest (51%) exceeded the limit, most of which were found in east of Atfaih, Al-Qababat, west Al-Fashn, west Samalut, Minya, west Tahtah, west of Luxor and Esna .

❖ Western desert Aquifer:

The following results have been detected from analyzing water samples taken from 41 wells, among which 13 wells located in Siwa oasis and 28 wells distributed in western desert:

1. Total dissolved solids concentrations were within the permissible limits for both drinking and irrigation purposes in about 82% of the monitored wells. The TDS concentrations were higher than 2000 mg / L in about 18% of the wells located mainly in Siwa oasis. The presence of salts is due to nature of the rock in this area.
2. Chlorides concentrations were within drinking water standards (500 mg / L) and also within guidelines for irrigation water in about 82% of the wells. The rest (18% of the wells) exceeded limits set for drinking and irrigation of sensitive crops, most of which were found in Siwa Oasis due to the nature of rocks in this region.

3.Concentrations of sulfates in most of the monitored wells were within the standard of drinking water (400 mg / L) and the guidelines of irrigation water, with the exception of some wells in Siwa oasis. This is attributed to the dissolution of salts from natural rocks in this region (Perret and Gypsum).

4.Nitrate concentrations were within the permissible limits (45 mg / L) for both drinking and irrigation purposes.

5.Calcium concentrations were acceptable in water of most wells and it complied with both standards of drinking water (200 mg / L) and guidelines for irrigation. The limits were exceeded in some wells of Siwa oasis. This is due to the dissolution of limestone, Dolomite and Gypsum rocks occurring naturally in this region.

6.Sodium concentrations complied with standards for both drinking (200 mg / L) and irrigation purposes in most of deep wells. Only 15% of the wells exceeded the limits due to dissolution of salts from Halite and Feldspar rocks which exist naturally in the area, as well as due to the presence of sodium cationic exchanges in water.

7.Concentrations of manganese exceeded drinking water limit (o.4 mg/L) in about 75% of the wells.

8.Concentrations of iron exceeded standard for drinking water (0.3 mg / L) in up to 100% of the wells. This is due to the anaerobic conditions fit for the reduction and dissolving of oxides and hydroxide of both iron and manganese.

9.Heavy metals in most water samples were not detected. The low concentrations are due to dissolution of these minerals during the water flow through rocks and soil.

10.Boron concentrations (which are one of the important and necessary elements for plants) were within the permissible limits for agriculture in about 97% of the monitored wells. Only 3% of the wells exceeded the limit. The presence of boron is attributed to the infiltration from rocks (Tourmaline) or may be attributed to the agricultural wastewater carrying fertilizers and pesticides containing boron.

❖ Aquifer of Eastern Desert and Sinai area:

Groundwater in this aquifer is used primarily as drinking water source and also for agricultural and industrial purposes. So, different measurements of water quality were carried out and compared to both “Egyptian drinking water standards and guidelines for irrigation purposes” in addition to

standards of "World Health Organization and Food and Agriculture Organization ". Results of the 42 monitored wells during 2007 were as follows:

1. Total dissolved solids (TDS) concentrations in more than 57% of the monitored wells were within the allowable standards for drinking water (1000 mg/L), while it exceeded this limit in about 42% of the wells. TDS were higher than 2000 mg/L in about 28% of the wells. High concentration is due to the dissolution of sodium and potassium chlorides from the carbonate rock.

2. Chlorides concentrations in most of the monitored wells were within the permissible limit for drinking water and agriculture purposes, while it exceeded this limits in about 42% of the wells, especially those in the northern part of Eastern Desert.

3. Sulfate concentrations in most of the monitored wells were within the permissible limit for drinking water and agriculture purposes, but exceeded the standards for drinking water (400 mg / l) in about 35% of the wells.

4. Nitrate concentrations in most of the Eastern Desert and Sinai wells were within the permissible limits for both drinking water (45 mg/L) and irrigation purposes. Only 7% of the wells exceeded the limits.

5. Calcium concentrations in about 45% of the wells were within the limit for drinking water (200 mg / L). However, it exceeded this limit in remaining wells. The presence of calcium salts is due to its solubility from water-bearing rocks and leakage from existing rocks such as limestone, Dolomite and Gypsum.

6. Sodium concentrations were complying with the standards for drinking purpose (200 mg / l) in about 54% of the monitored wells, where 46% of the wells exceeded the limit making water unsuitable for drinking. The presence of sodium is attributed to its dissolution from rocks such as Halite and Feldspar which naturally exist in the area; also the presence of sodium can be attributed to sodium cationic exchanges in water.

7. Manganese was detected in 86% of the monitored wells with very low concentrations. Its high concentrations were detected in only 14% of the wells as a result of oxides and hydroxides of manganese dissolution from sedimentations located in bottom of the aquifer.

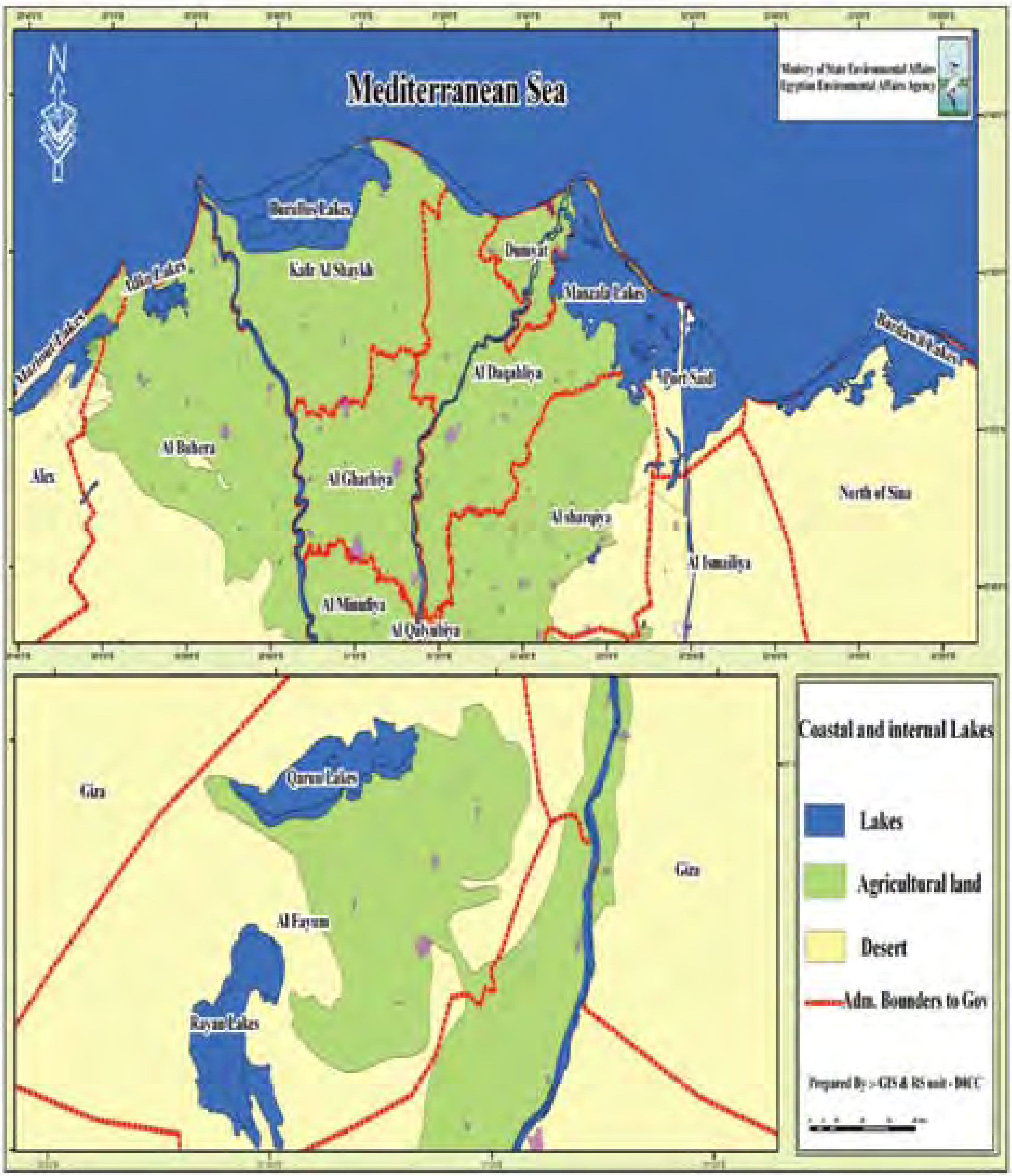
8. Iron concentrations were within the permissible limit for drinking water in most of the monitored wells, and exceeded the limit in only 14% of the wells.

9. Aluminum concentrations were within the permissible limit for drinking water standard (0.2 mg / L) and agriculture guideline in almost all wells. Its maximum concentrations were 2.5 mg /L

detected in 3.6% of the wells. The presence of aluminum in the water is due to its dissolution from natural existing rock.

5-8 Egyptian lakes

Lakes represent a vital economic resource for Egypt as they are an important source for fishing resources. Consecutive governments exerted great efforts to secure provision of food for the steady increase of population through fisheries' development because fish is considered an important source of protein. Egyptian lakes are of great economic importance with their fishing resources ,they are varied between fresh and salty water and can be divided according to their location into three internal lakes (Qarun – Al-Rayan - Nasser) and six coastal lakes located along Mediterranean Sea among which four are locating in Delta region (Manzala, Burullus, Edco , Mariout) ; in addition to two lakes locating in the east of Suez Canal (Malahet Port Fouad and Bardawil). Map (5-5) shows distribution of coastal and internal lakes in Egypt.



Map (5-5): Distribution of coastal and internal lakes in Egypt.

5-8-1 Burullus Lake

Burullus Lake is the second largest natural lake in Egypt located in Kafr El-Sheikh governorate at the northern part of Nile Delta. It lies between the two branches of the Nile (Rosetta and Damietta), with an estimated area of about 410 km^2, 56 km long and width ranged between 6-16 km with an average of 11 km. The lake is a shallow basin with variable depth ranging between 20 and 200meters. Currently, it covers 70000 Feddan with fish productivity of about 55 thousand tons per year. The lake is connected to Mediterranean Sea via Bogaz Burullus which is located in the far north-east part of the lake and linked to the Nile (Rosetta branch) through Brenbal channel, which had been established in 1926. The lake has been declared a Natural Protectorate by the Prim Ministers' decree No. 1444/ 1998. It receives agricultural wastewater from 8 drains namely; drain No. 3, Ketchener drain, Tera drain, El -Batara drain, and drain N0. 7, Nashart drain, drain No.9 and El-Moheet drain; which make its water quality a mixture of fresh and saline waters.

5-8-2 Manzala Lake

Manzala Lake is one of the most important and largest northern lakes of Egypt; its great importance comes from being a barrier separating between the Mediterranean Sea, underground aquifer and east Delta lands as well as it is one of the most important fish resources. It is connected to the Mediterranean and Suez Canal through the three Boaquezes (El-Gamel, El-Baghdadi, and El-Kabouti) and to the River Nile (Damietta branch) through two channels (El-Rtamh and El-Sfarh). So, marine and Nile fish spread in the lake with an average productivity about 60 thousand tons annually. The lake is located within boundaries of four governorates (Port Said , Dakahliya , El-Sharkia and Damietta) with approximate area of 100 thousand Feddan, its average depth 1.15 meters, length 60 km (from east to west) and width 25 kilometers; however, its width decrease in the medium sector to 17 km.

There are more than thousand islands scattered along most parts of the lake, with an environmental importance as it consider a shelter for various immigrant birds migrate temporarily to Egypt during winter; in addition to its economic importance to the surrounding population estimated with about 2 million people. Mediterranean Sea is the principal water feeding source of Mazala Lake from north side through the three Boaquezes (old Ostom El-Gamel, new Ostom El-Gamel and Baghdadi); in addition to El-Rtamh channel which derived its water from the Nile River at the section lies between Damietta City and Esebet Al-Borg.

5-8-3 Mariut Lake

Mariut is the smallest lake of the Northern Lakes; it is an isolated water body located 20 meters away from the Mediterranean north of Alexandria city. It extends for about 25 kilometers, with

maximum width of 10 km and varies in depth between 0.6 and 2.7 meters. Its area estimated by 17,000 Feddan with an average fish production about 4700 tons annually. The lake is unconnected directly to the sea, so its water is discharged into the sea via El-Mex Bay through pumping station to control level of water in the lake, as it receives water mainly from agricultural drains.
The lake Consists of four basins separated from each other by bridges (the main basin with 6000 Feddan, fishery basin with 1000 Feddan, the north-western basin with 3000 Feddan and the south-western basin with 7000 Feddan).

5-8-4 Edku Lake

Edku Lake is located about 35 km Northeast of Alexandria. The lake covers an area of approximately 4000 Feddan. Its depth is approximately 1.5 meters. The total length of its shore line is about 40 kilometers; it connected to the Mediterranean Sea with Abu Qir Bay through Bogaz El-Maadia. Its average fish production is about 9500 tons annually, including about 10 major islands with a total area of about 3 km^2 (about 4.8% of the total area of the lake) as well as an unspecified number of small islands. Its main sources of water are the two agricultural drains; Bersik drain, which discharge into the southern edge, and Edku drain which discharge into the eastern north side of the lake.

5-8-5 Bardawil Lake

Located in northern Sinai along the Mediterranean coast and extends for about 85 km length with an area of 650 km^2 approximately. Its depth ranges from 0.3 to 3 meters and separated from the Mediterranean with sandy coastal strip ranging from 100 meters to 1 km width. Compared to other lakes it is the least polluted one with an average fish production of 23000 ton annually.

5-8-6 Nasser Lake

Lake Nasser is the second largest artificial lake in the world lies at the southern part of Aswan city, its formation was a result of water accumulation after the High Dam establishment during sixties. It manages Nile water in front of the High Dam with a storage capacity of 162 billion m^3 with water level varying between 182 and 183 meters. Its total area is of 5237 km^2 and average width of 12 kilometers, extends 350 km inside Egyptian territory and 150 km inside Sudanese territory where it is known as Lake Nubia.

5-8-7 Qarun Lake

Qarun Lake is one of the oldest natural lakes in the world. It is an inland closed basin located at the north-western part of Fayoum governorate, about 100 kilometers southwest of Cairo. It covers an

area of 225 km^2, among which about 53 thousand Feddan (with length of 40 meters and average width of 5.7 km) lie in Fayoum's depression. It is surrounded by farmlands from both southern and southern-east and bordered with desert from the north.

Its water level varies between 44.3 and 44.8 meters below sea level, with an average water depth of about 4.2 meters, drainages are the main source of its water (Bats, Wadi El-Rayan and 12 sub-drainages).

5-8-8 Wadi El-Rayan Lake

Artificial Lakes were formed at Wadi El-Rayan since 1973, as a result of flooding Fayoum depression with drainage water through a constructed tunnel (7.5 km) to spill excess drainage water to Wadi El-Rayan. In 1989 Rayan Lake had been declared a Natural protectorate with decree No.943/1989 to protect the unique biological, geological and cultural resources in the region. It covers an area of 1759 km^2 in south-western part of Fayoum governorate, and contains diversity of environments distinguished with its unique features in addition to its special wildlife species. Wadi El-Rayaan protected area is of the sixth type according to the divisions of World Federation for Nature Conservation due to its multi-purposes.

5-9 Future vision of water policies

- **Preparing a National Contingency Plan to protect water resources from accidents and environmental disasters:**

  To deal with disasters and accidents that affect water quality of Nile River and its branches, especially those of oil pollution or transportation accidents. This has to be through cooperation between all concerned ministries and agencies after identifying each one role.

- **Establishing a National Database to gather results of Monitoring Networks :**

  Establishing a national database in cooperation with Ministries of "Water Resources and Irrigation; Housing, Utilities and Urban Development; Agriculture; Environmental Affairs; Health; Local Development" to collect data of monitored results to be analyzed in the appropriate form for decision makers so that best solutions and necessary actions can be taken in a timely manner. Also, assess data and put them in form of information packages for different stakeholders.

- Stop any violations on Egyptian lakes, wither by filling up, fallow or built upon; which led to shrinking areas of about 90% of some of the registered lakes before half century ago. This will be through strict enforcement of related laws to criminalize such violations.

- Protect agricultural drainages from pollution in order to protect Lakes' water quality.
- Conduct periodic monitoring programs for Lakes' water quality, prepare databases and create a website to provide information and data for students and public. Rehabilitate polluted lakes through usage of appropriate methods which do not affect the environment.
- Establish a National Authority responsible about management of Egyptian lakes to identify, diagnose problems and specify special needs of each lake through forming a Fund to finance necessary projects for lakes' development. The proposed authority must be entitled with powers to enable it coordinate with all ministries and agencies concerned with wetlands in Egypt.
- Clean up bogazes of Lakes to insure renovation of their water.
- Set a periodic monitoring program to monitor pesticides, heavy metals, hydrocarbons, pathogens, sediment, fish, fauna and flora in most monitoring sites.
- Necessity to apply a unified system for monitoring and analyzing systems of water samples in all relevant stakeholders; so that to be able to hold comparisons between results of various stakeholders in the same site and to ensure their accuracy. This system must be adjusted to carry statistical analysis of monitored data to be presented in the appropriate forms for decision makers.

❖ Consider joining companies specialized in the production of networks supplies:

Consider joining companies specialized in producing requirements of sanitation network systems (such as pipes - locks - bluffs) to the Holding Company for Drinking Water and Sanitation, this is to ensure the good quality of products in accordance with the Egyptian code and reduce time of bids and tenders. In this regard it is expected for these companies to achieve regional referential reputation to insure the good quality of their products and increase export potential.

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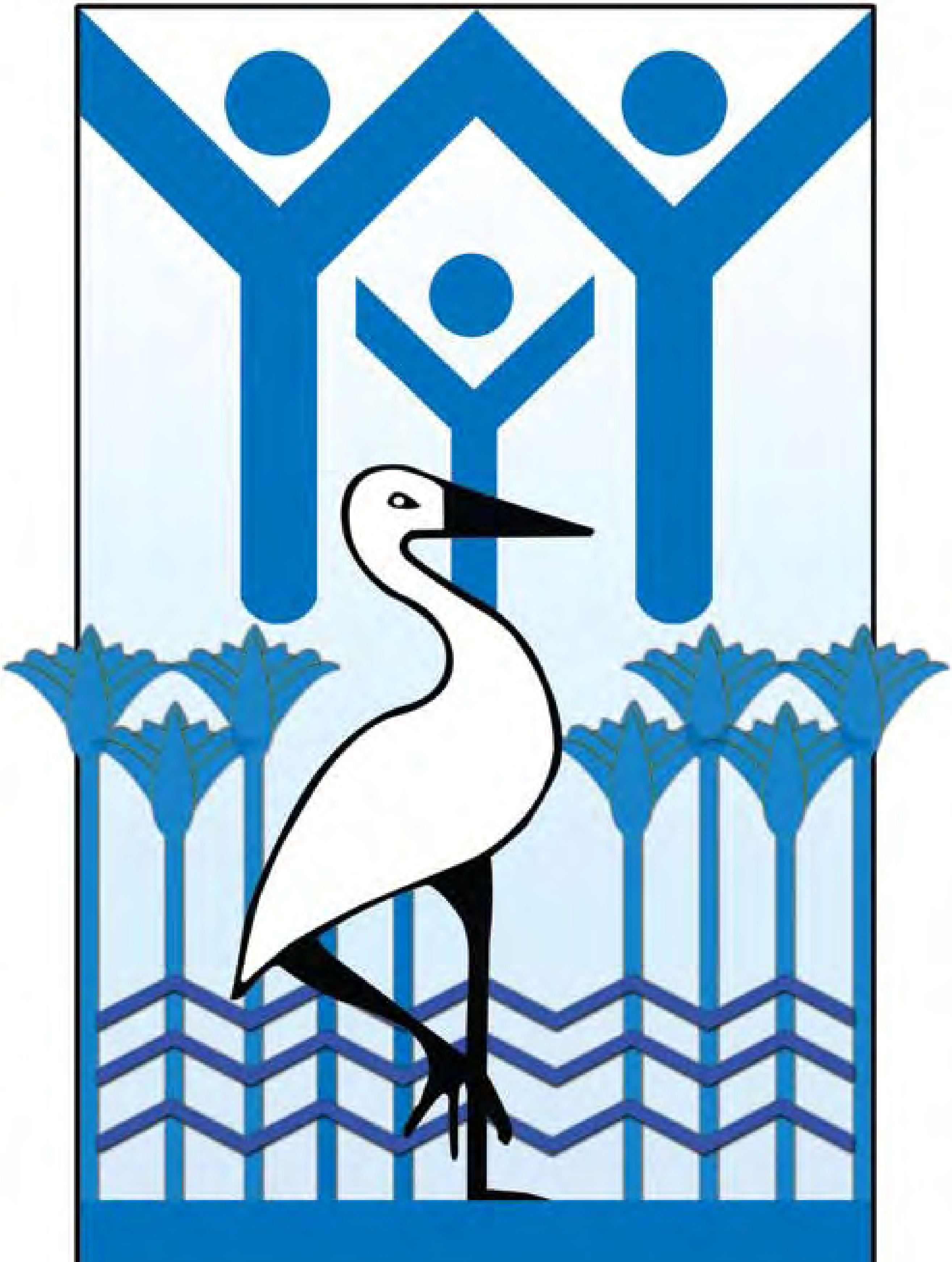


Chapter 6
Coastal and Marine Zones

6-1 Introduction

Egyptian coasts are approximately 3000 km in length extending for about 1150 km along the Mediterranean Sea from Sallum in the west to Rafah in the east , as for the Red Sea length about 1850 km covering the main Red Sea basin (about 1200 km) and both Gulf of Suez and Gulf of Aqaba (about 650 km).

Egypt marine and coastal areas contains a lot of natural resources with high economical and environmental value as Coral reefs, Mangroves and Sand dunes (act as natural barriers for storms, floods and erosion processes) and coastal systems as wetlands which absorb (excess nitrogen element, pollution from land base sources and decrease effects of pollution resulting from land to marine environment) , so that coastal areas are considered fragile systems that must be sustainably managed and conserved for present and future generations .

Coastal zones in Egypt had been among the most heavily exploited areas because of their rich natural resources. The conflict between the need for consumption or usage of coastal resources and the need to ensure their sustainability on long terms ; lead to a critical status represented in coastline erosion, deterioration of fishing resources, destruction of coastal habitats, increasing demand of growing population and deterioration of water quality. These were the essential factors that raised the need for application of Integrated Coastal Zone Management procedures “ICZM”.

6-2 Problems and Challenges threatening Coastal and Marine Environment

Coastal zones in Egypt are known by the presence of many natural habitats and vulnerable environmental ecosystem whether in marine environment or coastal areas and with respect to this unique nature and the availability of economical and environmental resources, coastal areas are facing a lot of environmental pressures due to the different development activities. These pressures can be classified into the following main issues:-

- Coastal erosion
- Deterioration of coastal water quality
- Irrational land use
- Deterioration of natural resources and destruction of living organisms ‘habitats
- Climate Change and sea level rising

6-3 EEAA exerted efforts & achievements in ICZM field

Egypt started to adopt Integrated Coastal Zone Management “ICZM” on coastal area since 1980s, after the issuance of Environment Law No 4/1994, Egyptian Environmental Affairs Agency (EEAA) was charged with the responsibility to initiate and coordinate national ICZM activities in

Egypt. EEAA achieved progress success in this field by adoption of three main strategies:

1. Strengthening policy and decision making process.
2. Integration of planning and sustainable development.
3. Environmental monitoring of coastal water quality

6-3-1 Strengthening policy and decision making process

To integrate coastal polices, enhance performance level and achieve implementation of ICZM, EEAA conducted a reconstruction of institutional capacities on the following three levels: national, regional, and local.

6-3-1-1 National level

Several actions have been taken to integrate institutional and environmental needs at the national level through enhancing institutional capacities by setting appropriate and applicable regulations and legal framework for the protection of natural resources. Achievements on that level can be briefed as follows:

Reformation and activation of the National Committee for Integrated Coastal Zone Management

To ensure integration among all stakeholders at the national level, representatives from all governmental stakeholders concerned with coastal management are represented in this committee to concern the following issues:

- Coordination and integration between ministries and specialized authorities to achieve an effective coastal zone management through implementation of guidelines for each activity as well as Environmental Impact Assessment studies.
- Publishing series of guidelines for coastal zones' activities and projects to promote sustainable development ensure optimum utilization of coastal resources, pollution reduction, protection and conservation of natural habitat and eco-systems.
- Ensure that the land-use plans are included in the development programs of coastal areas.
- Adopting optimum utilization of coastal resources to compromise between development and sustainable use of coastal resources.
- Sharing visions while preparing National Strategy of ICZM in Egypt.

- Assurance of Egypt's commitment with its duties and responsibilities in regional and international conventions.
- Following global environmental issues as Climate Change and studying its effect on sea level.

Amendments of Environment Law No. 4/1994 with Law No. 9/2009:

The Amended Law includes:

- Article (1): adding item number (39) defining coastal zones and item number (40) defining Integrated Coastal Zone Management.
- Article (5): adding item number (22) stated that EEAA should prepare a National strategy for ICZM.
- Amending article (48 Para H), concerning Integrated Coastal Zone Management, as competent Minster of Environmental Affairs in coordination with relevant authorities shall fulfill objectives of this article as well as objectives of the ICZM which considered a legal enhancement for ICZM.

Preparing National Strategy for ICZM in Egypt:

Executive operational steps had been taken to develop a National Strategy for ICZM in Egypt, through preparing its primary draft with the technical and financial support provided by Priority Actions Program / Regional Activities Center (PAP/RAC) to comply with national and international parameters of Integrated Coastal Zone Management protocol.

Upgrading institutional structure of ICZM department, EEAA:

Upgrading institutional structure of ICZM department affiliated to EEAA to be a Central Directorate including two General Departments. The first, General Department for Coasts and Lakes; the second, General Department for Ports Affairs and Marine Pollution Control to ensure integration in management system and controlling decision making.

6-3-1-2 Regional Level

New departments for ICZM affiliated to Regional Branches Offices of EEAA "RBO's" have been established in coastal governorates to support integrated approach, enhance work profile and decision decentralization.

6-3-1-3 Local Level

ICZM units and departments have been introduced to the institutional structure of environmental departments at coastal governorates which realize the integration process between EEAA, ICZM committee and RBO's at national level. Promote awareness among local communities at coastal governorates about the importance of coastal zone resources, concepts of sustainable development and the significance of environmental protection.

6-3-2 Integration of planning and sustainable development

Series of projects have been implemented since the beginning of 1990's to protect natural resources, ensure sustainable development and prepare integrated coastal zone management plans in cooperation with donors and line ministers; the following are some of the ongoing projects:

1. Shoreline Management Project for the coastal area located between Ras El Hekma and Matrouh.
2. Integrated Coastal Zone Management Project for the coastal area located between Matrouh and Sallum.
3. Integrated Management project for Maryut Lake - Alexandria Alamin.

6-4 Environmental Monitoring Program for Egyptian Coastal Water

The Coastal Water Moitoring program is one of the most comprehensive monitoring programs in Egypt. The main objective of monitoring coastal water of Egyptian territories is to establish baseline data on the dynamics of water quality.Results of monitoring program are used to establish trend analysis of water quality, identify sources of pollution and recommend mitigation measures. Within the framework of this program, four monitoring campaigns are organized each year in March, May, July and September to represent temporal changes during the four seasons of the year. The program executed in cooperation with the scientific institutions in Egypt. The measurements cover hydrographical conditions (water temperature, salinity, dissolved oxygen & PH) ,eutrophication parameters (chlorophyll-a, total suspended matter, transperancy, ammonia, nitrite, nitrate, total phosphorous, total nitrogen & silicate) and bacteriological indicators of pollution (total coliform, e-coli & faecal streptococci), in addition to visual observations. This year report will focus on the main results of monitoring campaigns carried out during 2008 then compare them with those of previous years to indentify improvemnt, stability or detoriation in water quality and assess efficiency of mitigation measures.

Table (6-1) Parameters used to classify quality of water based on concentrations of nutrients and Chlorophyll-a content

	Chlorophyll-a Concentrations	Ammonia Concetrations	Nitrate Concetrations
Low	at concentration less than 1 microgram/ l	at concentration less than 0.5 micromole/ l	at concentration less than 0.5 micromole/ l
Medium	At concentration between 1-2 microgram/ l	at concentration between 0.5 – 2 micromole/ l	At concentration between 0.5 - 4 micromole/ l
High	At concentration between 2-5 microgram/ l	at concentration more than 2 micromole/ l	at concentration more than 4 micromole/ l
Very High		at concentration more than 5 microgram/ l	

Parameters used as indicator for water quality as related to public health :

Microbiological indicators for water quality have been recommended internationally by various agencies/countries. The Egyptian Standards (Eg. S), and the European Community Standards (E.C.S) for coastal water adopted the same bacterial counts for the presence of coliforms bacteria and the thermotolerant coliform bacteria (*E.coli*). According to the Eg. S as well as E.C.S, values of coliforms bacteria should not exceed 500 CFU/100 ml, whereas *E. coli* count should not be more than 100 CFU/100 ml in sea water. Counts of faecal streptococci in Eg.S were comparable to those of E.C. standards which adopted a faecal streptococci count not more than 100 CFU/100 ml of sea water.

6-4-1 Coastal water Quality in Mediterranean Sea in 2008

Four sampling campaigns were conducted during 2008 (March, May, July and September). Thirty seven seawater samples along the Mediterranean coast of Egypt from Salloum (Me 1) to Rafah (Me 47a) have been collected and analyzed. Map (6-1) shows the sampling locations. The sampling sites were selected to cover all ongoing activities that could affect the quality of coastal water such as: over populated areas, harbors, industrial and tourist facilities. Furthermore, sites away from any external pollution sources were selected as control sites. The measured parameters comprised: depth, temperature, pH, dissolved oxygen, salinity and conductivity, total coliforms, *E.coli* and feacal streptococci, nitrate, nitrite, total nitrogen, total phosphorous, ammonia, phosphate, silicate, chlorophyll-a and suspended matter. Transparency was measured using Secci disk at all stations where the eutrophication parameters have been investigated. The exact coordinates for the different sampling sites were determined by using ground Positioning System (GPS Garmin II**).**

Map (6-1) Monitoring stations along Egyptian coasts in 2008

6-4-1-1- Visual observations

In general, no abnormal visual observations have been recorded along the coast during 2008, except on the beach of Romana (Me 42) where huge amounts of shells and shell debris (*Mainly Cardium*) were detected. Measurement of hydrogen ion concentrations (pH) along the Mediterranean coast

of Egypt showed that all recorded values were slightly alkaline and fall within the normal range of seawater. The lowest average temperature was recorded during the first campaign (March, 2008), while the highest average value was recorded during the third campaign (July, 2008). Weather temperature played an important role in this aspect. During 2008, hypoxia (DO less than 3 mg/l) was observed during the second, third and fourth campaigns (May, July and September respectively) at El Dekhaila (Me 10a) and Eastern Harbor (Me15 & Me 16). This is attributed to the discharge of wastewater loaded with organic compounds. The highest transparency was observed at the western sector which extends from Salloum (Me 1) to El Bitash (Me 10) and the eastern sector which extends from Arish (Me 44) to Rafah (Me 47a), plus Alexandria sector. The most turbid water was found in front of the outfalls, and Delta regions.

6-4-1-2 Bacteriological Examination in 2008

Counts of total coliform bacteria, presumptive thermotolerant *E.coli* and faecal streptococci were investigated at 37 stations from El Salum in the west to Rafah in the east during the period from March to September, 2008. Sampling of seawater, as well as methods and types of media used for isolation and identification of the faecal bacteria were carried out according to ISO 1984, ISO 1990 and ISO 1992.

The quality of Mediterranean coastal water with respect to counts and levels of the three faecal indicators of pollution, are shown in figures (6-1 & 6-2). The results show a great variability in the bacterial counts ranging from very clean areas such as: Salloum (Me 1), Matrouh (Me 2), Baghoush (Me 4a), Sidi Abd El-Rahman (Me 5), Marina (Me 6) and Sidi Kerir (Me 7a), El-Agamy in Hanoville and El-Bitash (Me 9 and Me 10), El-Mamoura (Me 18), Damietta New (Me 35),, Romana (Me 42), El Arish (Me 44), Sheikh Zowaied (Me 46) and Rafah (Me 47a)) to acceptable water quality where the counts did not exceed the permissible numbers during at least three of the four campaigns, such as Romel (Me 3a), Nobareya (Me 8), NIOF (Me 14), Eastern Harbour of Alexandria city (Me 15 and 16), El Shatby (Me 17a), Sidi Gaber (Me 17b), Gleem (Me 17c), Sidi Bisher (Me 17d), Montaza (Me 19), West Abu Qir (Me 20), Edku (Me 26), Ras El-Bar (Me 36), Dammita (Me 37), El-Gamil (Me 40) and Port Said (Me 41). However, some sites showed very high degree of faecal contamination such as El-Dekhaila (Me 10a), El-Mex (Me 11), Western Harbour of Alexandria (Me 12), East Abu-Qir (Me 21), Rashid (Me 29), El-Burg (Me 33) and Gamasa (Me 34). This faecal contamination is due to the discharge of raw or partially treated domestic wastewater into the sea.

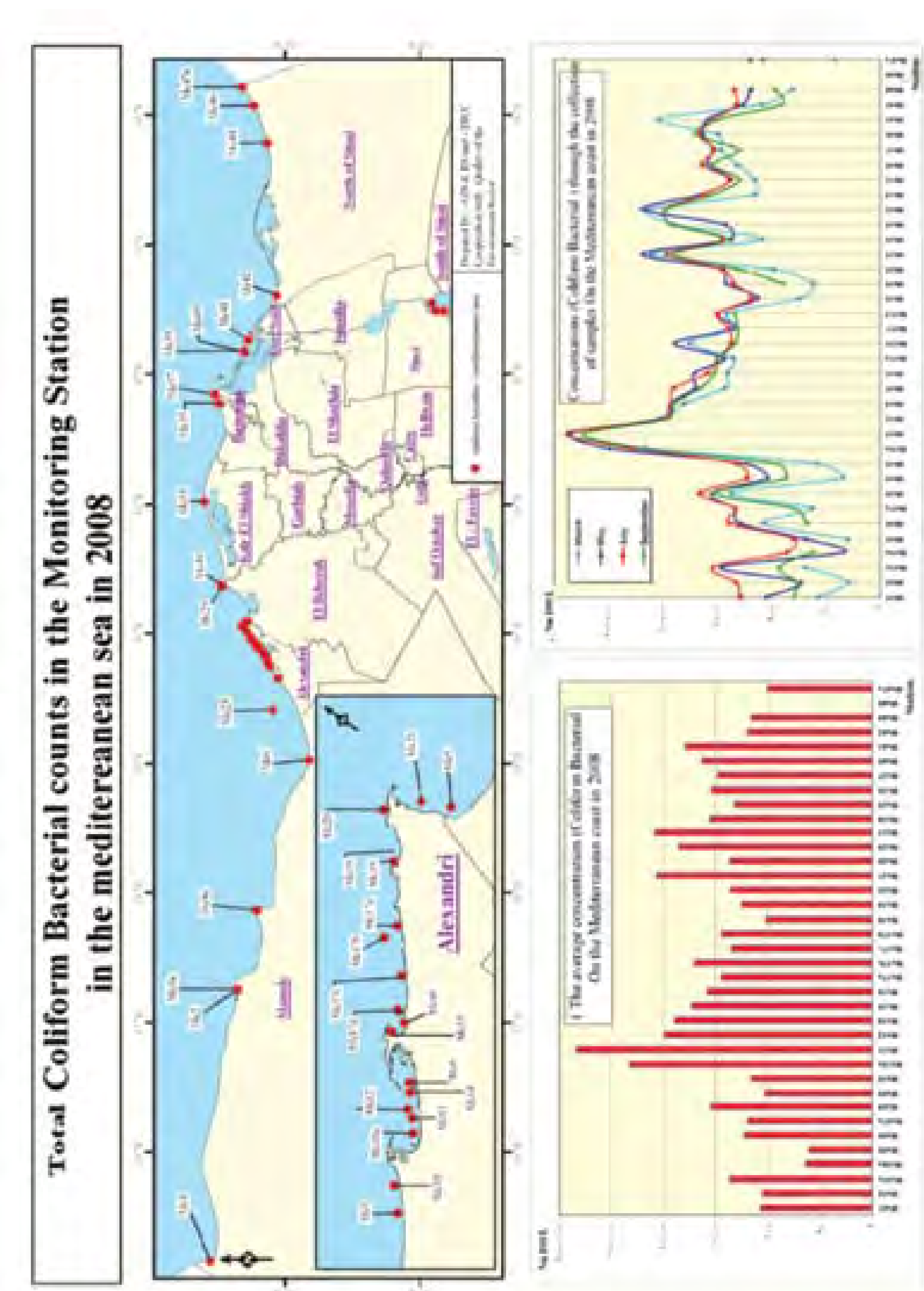


Fig (6-1) Total Coliform Bacterial counts in monitoring stations along the Mediterranean Sea in 2008

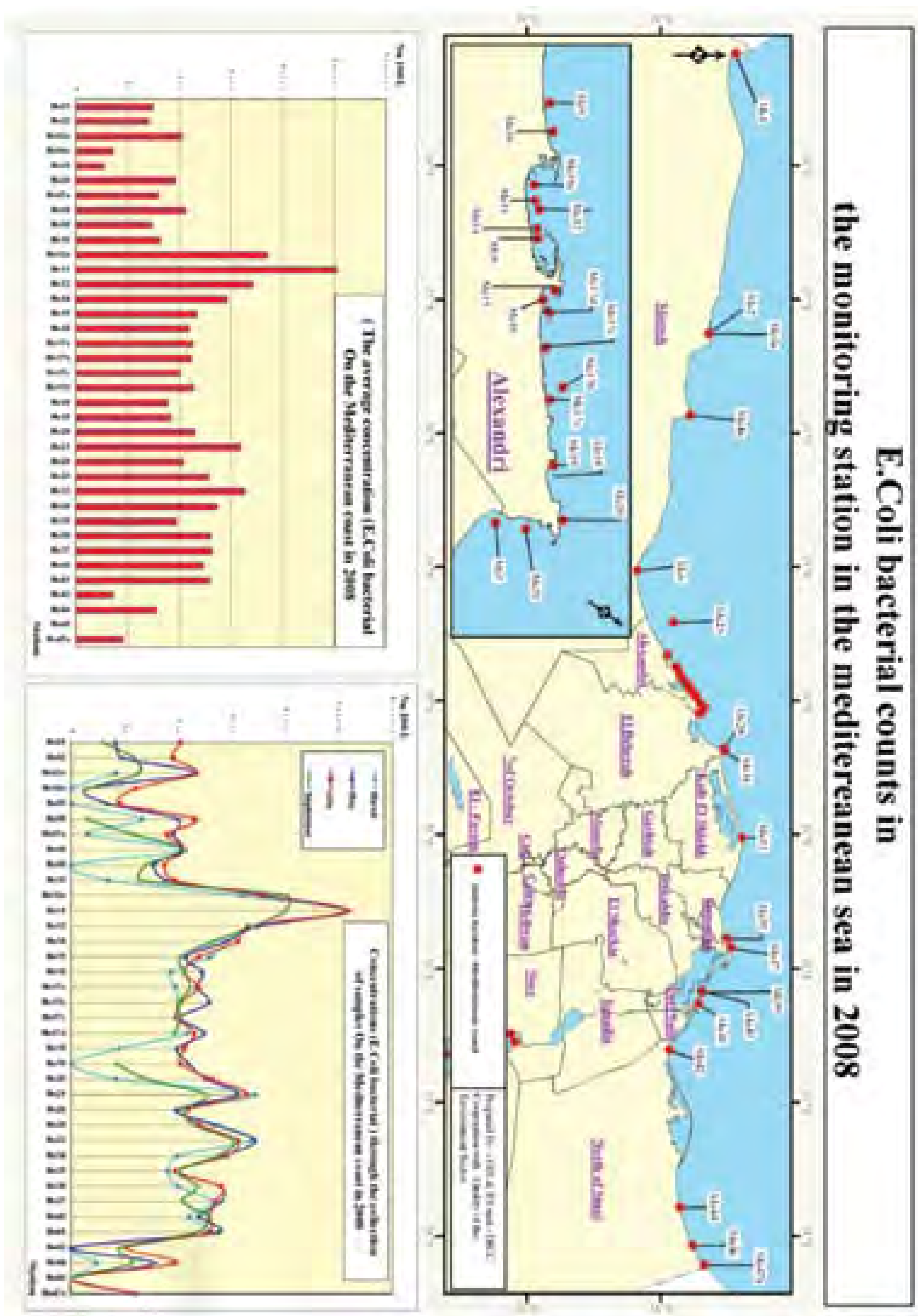


Fig (6-2) E-Coli bacterial counts along the Mediterranean Sea in 2008

6-4-1-3 Eutrophication parameters and Chlorophyll-a in 2008

Collected water samples were analyzed to determine the concentrations of ammonia, nitrate, nitrite, total nitrogen, total phosphorous, , silica, chlorophyll-a and particulate matter.

Ammonia (NH_4-N):

The spatial distribution pattern of ammonia concentrations along the Egyptian Mediterranean coast during 2008 showed that the lowest concentrations are found in the western region of the Mediterranean Sea, and the highest were recorded once in El Dekhila (Me 10a) (5.60 micromole/ L), Western Harbour (Me 12) & Electrical Power Station (Me 23), (Figure 6-3).

Nitrite (NO_2-N) & Nitrate (NO_3-N):

The distribution pattern of nitrite concentrations showed low levels during the period of investigation except at El Dekhila (Me 10a), Electrical Power Station (Me 23), Abu Qir (Me 20) and El-Maadia (Me 25). The very low concentration values were recorded at Matrouh (Me 2), Baghoush (Me 4a), Sidi Abd El-Rahman (Me 5), El Arish (Me 44) and Rafah (Me 47a).

The spatial distribution of nitrate content revealed higher levels in Sidi Kerir (Me 7a), El Nobareya (Me 8), El Dekhila (Me 10a), El Mex (Me 11) and Electrical Power Station (Me 23) compared to the determined concentrations in the other sites. The high values of NO_3-N were recorded during the period from May to July 2008, at El Dekhila (Me 10a) and Electrical Power Station (Me 23) where the concentration values ranged from 8 – 10 µM.

Total Nitrogen (TN):

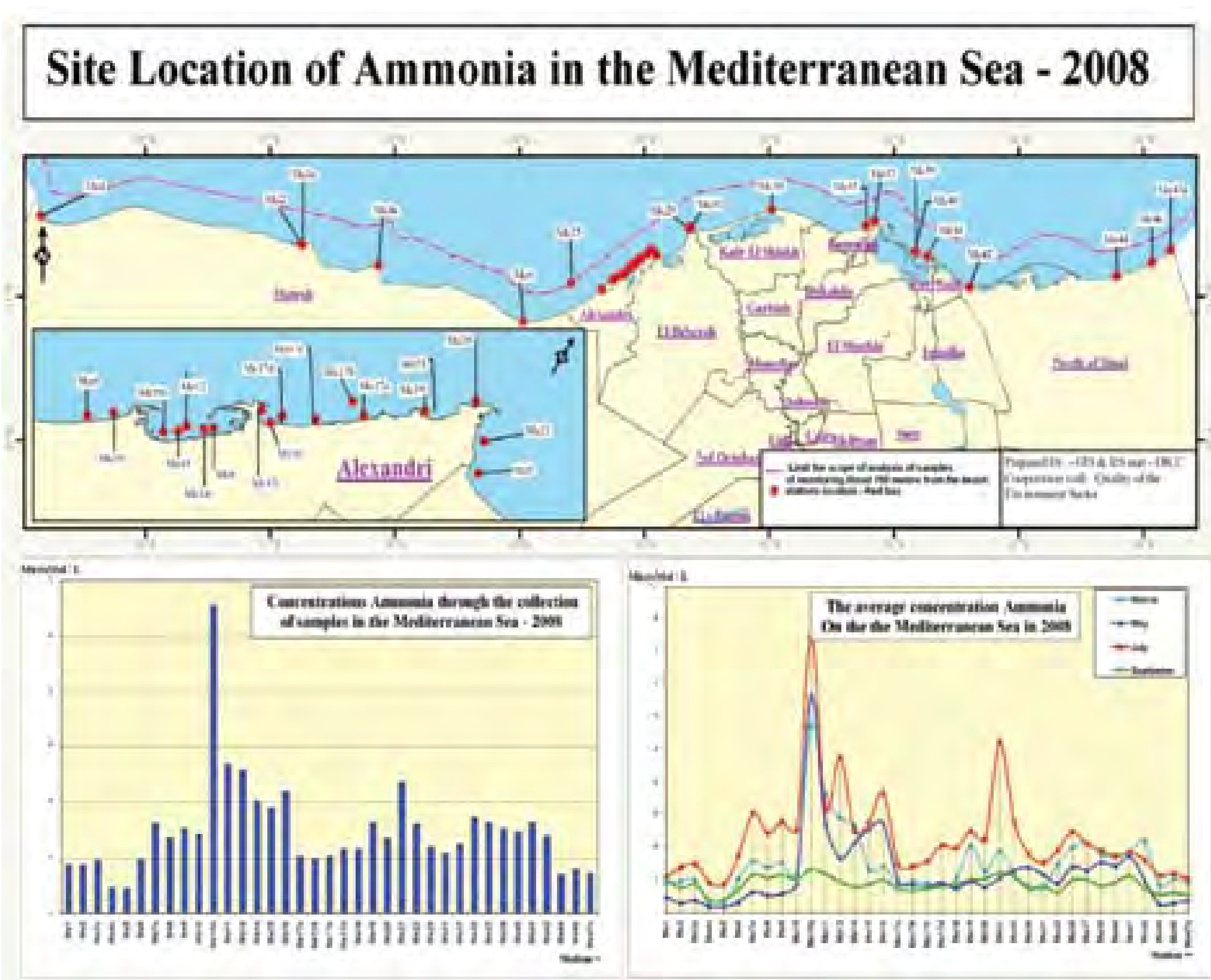
High total nitrogen concentrations were found in Sidi Kerir, El Nobaria, El Dekhila, El Max,Weatern Harbour, Electrical Power Station & El Madia. Average concentration values were 13.65± 4.46 µM for Alexandria region and 15.14± 3.06 µM for the Delta region, the area with the highest concentrations(Figure 6-4).

Total phosphorus (TP):

Results of the analysis of TP concentrations along the Mediterranean coastal area showed that the western part contains less phosphate and the concentrations were even lower than the previous years. Concentrations in Alexandria region were two times higher than that recorded in the western region. The high level in total phosphorus content is mainly related to the increase in concentrations of orthophosphate during this time of the year. Generally, the variations of total phosphorus at different stations of Alexandria region may be probably due to local wastewater discharge. Fredrik and Lars (1988) revealed that phosphorus is mainly brought from municipal and industrial sources, while agriculture and atmospheric contributions are minor.

Chlorophyll-a:

It has been noticed that Chlorophyll-a concentration and total suspended matter differ from one area to another and is highly dependent on the quality and quantity of wastewater discharged. Chlorophyll-a concentration in Bagoush (reference area) was (0.84 µg/l). In Alexandria region, chlorophyll-a concentration was six times higher than that found in Bagoush and even eight times higher in the coastal water of the Delta region, while it was four times higher in the Eastern area. In general, it can be concluded that concentrations of chlorophyll-a are relatively high in all locations (Alexandria area, Delta region and Port Said and Rafah). This may be related to the rich supply of dissolved inorganic nitrogen and phosphorus. These nutrients contribute to the high level of chlorophyll-a, which leads to eutrophication problems in several locations along the coastal areas of the Mediterranean Sea of Egypt, (Figure 6-5)



Fig(6-3) Variations in Ammonia concentrations at the monitoring stations in Mediterranean Sea in 2008

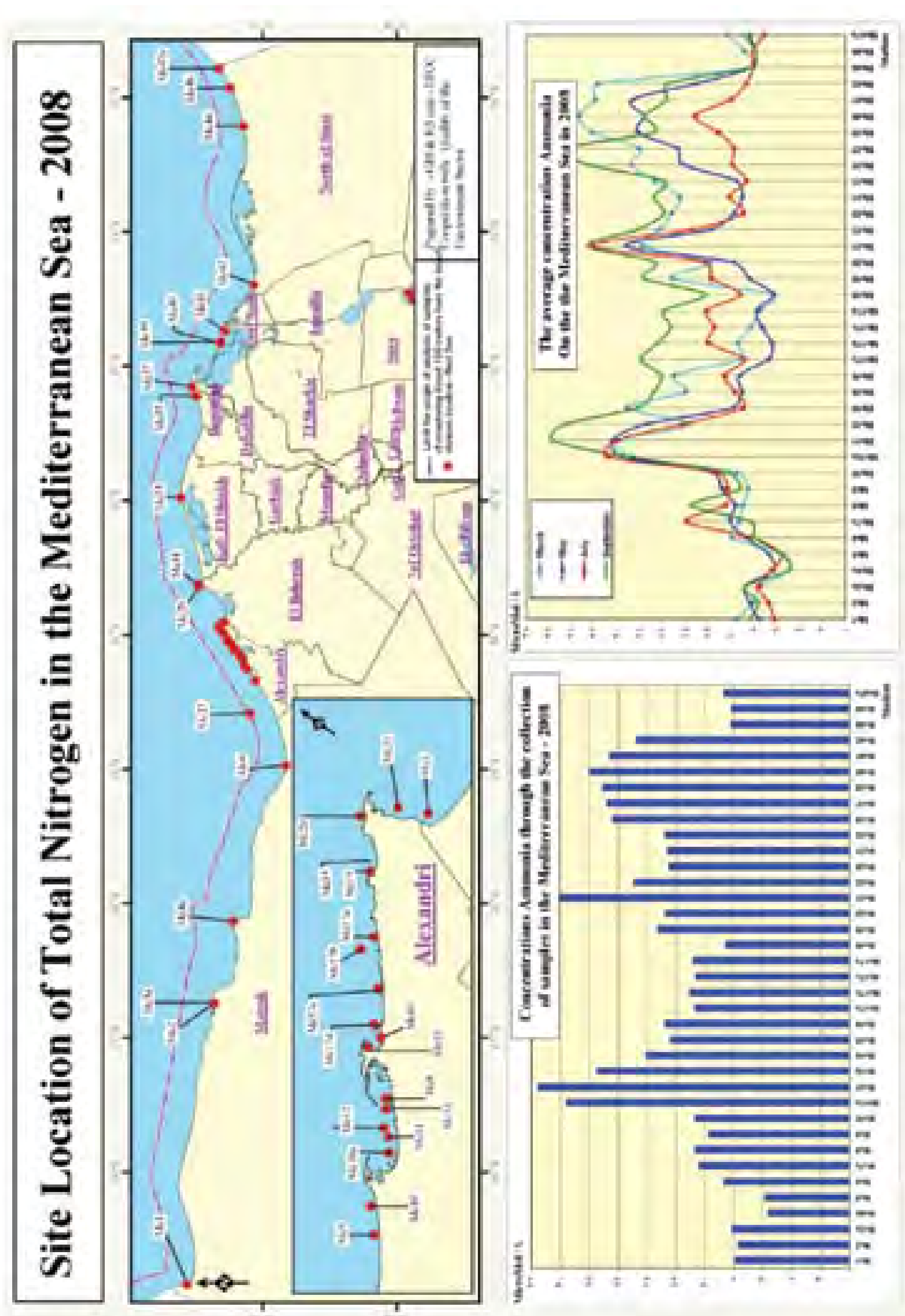


Fig (6-4) Variation in Total Nitrogen concentrations at the monitoring stations in the Mediterranean Sea in 2008

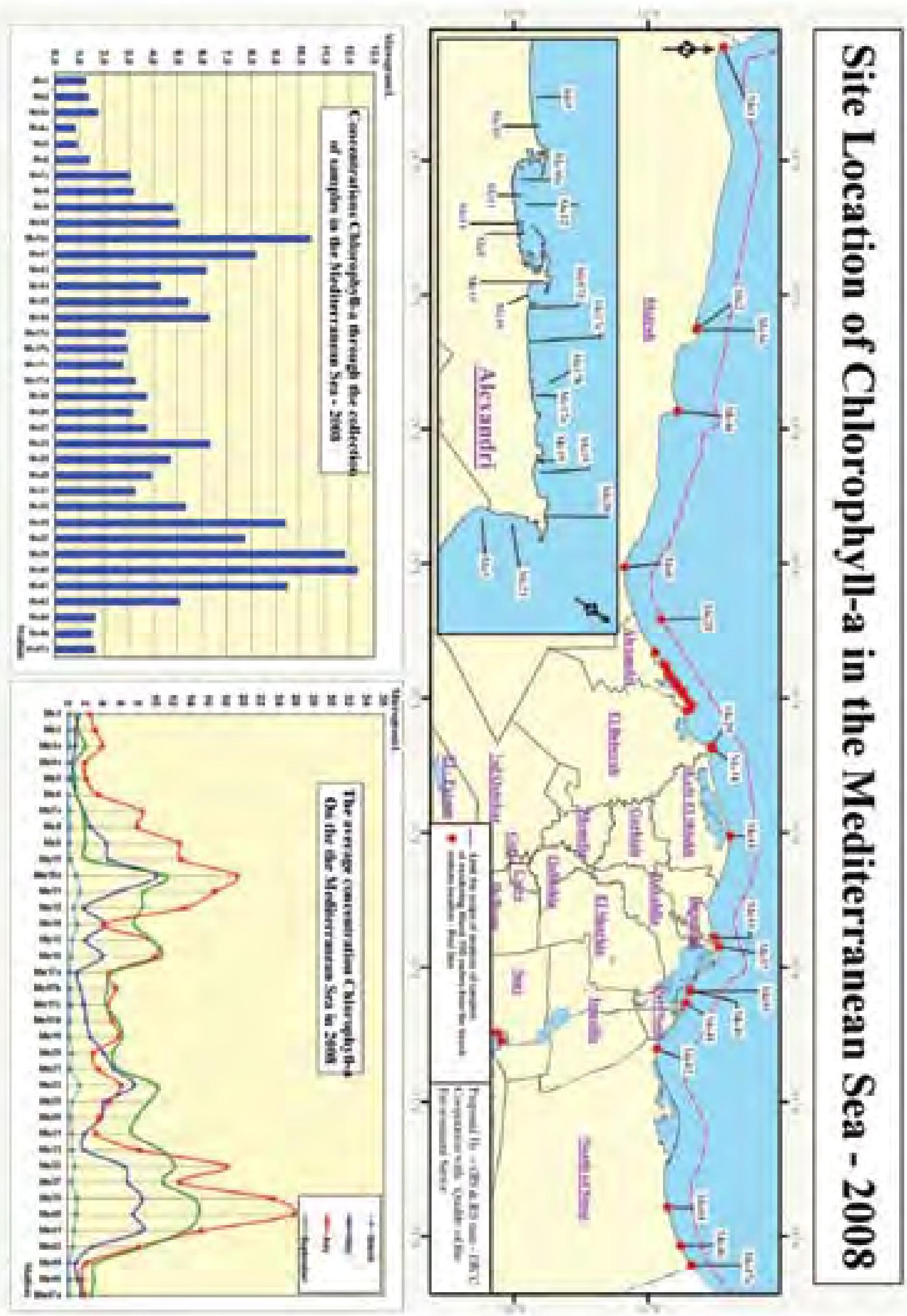


Fig (6-5) Chlorophyll-a Concentration at the monitoring stations in the Mediterranean Sea in 200

6-4-1-4 Conclusions

- The bacteriological results obtained this year showed an improvement in water quality as compared to previous years.
- Results of the analyses of the eutrophication parameters along the Mediterranean Sea coast of Egypt from Salloum (Me 1) to Rafah (Me 47a) showed that sea water samples taken at the fronts of the outlets and outfalls were characterized by increasing primary production (relatively high levels of chlorophyll-a). This may be related to the influence of domestic wastewater and/or agricultural drainage water (i.e. El Nobareya, Me 8) or to a mixture of industrial, agricultural and domestic wastewater (i.e. El Mex, Me 11, El-Tabia pumping station, Electrical Power Station Me 23 and El-Maadia Me 25). On the other hand , the water quality in the western region from Salloum (Me 1) to Marina (Me 6) and the eastern area from El Arish (Me 44) to Rafah (Me 47a) was characterized by low nutrient's content and relatively low chlorophyll-a and suspended solids concentrations. This indicates ecological stability and oligotrophic water character.
- MSEA exerted effort to monitor heavy metals, hydrocarbons and pesticides in sediment and biota through cooperation with international and regional organizations. In this regard a protocol has been signed between EEAA and UNEP – MED POL to analyze these parameters in ten stations along Egyptian Mediterranean Sea in 2009.
- In general, there were improvements in water quality due the cooperation between different organizations and exerted efforts through inspection of industrial and tourist facilities which discharge directly or indirectly on the coastal water to force them to comply with regulations. At the same time prepare EIA studies before issuing any permission to facilities to make sure they are not going to cause any harm to the environment.

6-4-2 Coastal water Quality in the the Red Sea

Four sampling campaigns were conducted during 2008 (March, May, July and September) to monitor sea water at forty sampling stations distributed as follows: (14) along the Suez Gulf, (11) along Aqaba Gulf and (15) along the Red Sea. Figure (6-1) shows the location of the sampling Stations in 2008. Within the framework of the monitoring program, visual observations (weathering conditions, oil pollution, sewage impact…), hydrographical conditions (water temperature, dissolved oxygen, salinity and pH), bacteriological parameters (total coliform, Faecal coliform and Faecal streptococci bacteria) and eutrophication parameters (chlorophyll-a, total suspended solid, transparency, total nitrogen, nitrate, nitrite, ammonium, reactive and total phosphate and reactive silicate) were investigated. Obtained results are presented in the following section.

6-4-2-1 Visual observations

Visual observations were used to assess the aesthetic quality of coastal beach zones especially those which are used for recreational purposes. The following observations have been recorded during the study period.

Gulf of Suez:

Lumps of old tar varying between low, moderate and high quantities were observed at the coast of Suez Bay (Su1 - Su3), Ras Gharib (Su7) and El Tour shipyard (Su13). Old tar and/or oil contamination was restricted within the areas of petroleum companies and/or harbors activities.

Gulf of Aqaba:

Coastal region of Gulf of Aqaba was generally clean except at Sharm El Shiekh Harbour (Aq2) which was found contaminated with different quantities of old Tars and oil films due to the increasing number of tourist boats. Once in the year, little quantities of oil were noticed in Dahab (Aq 5), Nuwaibea Harbour- El Saiadin (Aq 8) & Nuwaibea (Aq9).

Red Sea coastal regions:

The Red Sea Coastal regions were found almost clean from old tars except at Abu Shaar (Re1), Hurgadah - NIOF (Re 2), Qusair – North (Re11) and Marsa Alam (Re14) which were slightly contaminated for one time. Beer Shalatin fishing Harbour (Re15) was found contaminated for more than one time (Re15). Thin oil film was observed once in Safaga – middle (Re 8), El Hamrawin (Re 10), Quiser – South (Re13) & moderate quantities for one time in Beer Shalatin fishing Harbour (Re15).

Hydrographical conditions:

Water temperature showes no thermal stratification, due to the shallowness of the investigated coast lines. Slight decrease in temperature with the increasing water depth was recorded. The highest temperatures were recorded during July and September and the lowest during March. The southern part of Red Sea proper was characterized by a noticeable increase in its water temperature. No thermal regime was observed.

Water is normally fully mixed. Stratification of inshore water up to sampling depths is less pronounced or absent. The spatial, seasonal and vertical distribution pattern of salinity showed minor variations at different investigated regions. The pH values were always on the slight alkaline side. The general picture is high and well oxygenated water with a tendency towards a slight reduction in oxygen content with increasing water depth. However, concentrations of Dissolved Oxygen were never close to depletion in all stations monitored during 2008. Based on the mean annual values, the present data of different hydrographical conditions revealed that the impact of human activities on these variables is still insignificant. Depending on transparency values obtained during the present investigation, Aqaba Gulf is characterized by its high clear water followed by the Red Sea proper then Suez Gulf.

6-4-2-2 - Bacteriological parameters

The occurrence of bacteriological indicators of pollution i.e., totals coliforms, E.Coli and Faecal streptococci were used as sanitary parameters for the evaluation of water quality. The present interpretation of the determined counts of bacterial indicators during 2008 was made according to the European Commission (EC) standards 1998, which coincide with the Egyptian standards (Ministry of Health, Egypt 1996). The results of the present study indicated that the sea water collected from 18 stations, out of a total number of 39 (46%) stations surveyed during 2008 contained high bacterial counts that exceeded the acceptable levels. The presence of one or more indicator, during one or more sampling campaigns has been recorded. However, it is worth mentioning that this value is less than the percentages recorded during last three years (52%, 56%, and 56%). The results of Bacterial counts in 2008 are shown in figures (6-6, 6-7, 6-8, 6-9).

Gulf of Suez:

The Gulf of Suez showed bacterial counts within the acceptable levels in 8 of 15 monitored stations. However, the counts exceeded the limits in 7 stations where the water quality ranged from slightly to highly polluted. The results are as follows:

- Su7 (Ras Gharib) showed high counts exceeding the acceptable levels in all bacteriological parameters throughout the whole year. This was a result of the obvious source of untreated sewage in this area.
- Su1c (Suez - Kabanoon beach) E. Coli numbers up to 190 cfu/100ml and faecal streptococci up to 160 cfu/100ml were recorded in March ,July and September which is due to the presence of kabanoon drain containing slaughter-house wastewater. The drain is situated just north of the sampling site.
- Su1b (Suez – Rex beach) showed bacterial counts up to 180 cfu/100ml for *E. coli* and 115 cfu/100ml for feacal streptococci only in May and July which may be due to the near-by fishing harbour activity.
- Su3 (Adabia Port) due to the activity of Adabia Port (a lot of tankers and ships).
- Su10 (Ras Sudr) and Su13 (El-Tour) showed relatively high bacterial counts only in summer season because of the high numbers of swimmers/visitors
- Su 13 (El Tour- Public Beach) due to the high number of visitors and the nearby fishing harbor.

Gulf of Aqaba:

Because the Gulf of Aqaba has many protectorate areas along its shore, bacterial indicators were detected in only the following three sampling sites:

- In Aq2a (Sharm El-Sheikh - Marina Sharm, Travco), the high numbers of boats and tourists/ visitors was the reason of the high numbers of bacterial counts in May and July.
- Aq3 (Sharm-El-Sheikh – Neama Bay) due to the high number of visitors in July.
- Aq8 (Nuweiba harbour -ElSaiadin), recorded high bacterial counts in September due to the activity of Nuweiba harbor.

Red Sea Coastal regions:

Along the Red Sea proper, the counts of investigated bacteria were within the acceptable limits in 8 of the 15 monitored stations.

- Re15 (Bir Shalatin) recorded high bacterial counts throughout the whole year because of the fishing activity.
- Re11 (Qusier – Movenpik resort) showed high counts in March which may be due to the high numbers of tourists and swimmers. Also, horses and camels were usually seen near the beach.
- Re4 (Hurghada - Sheraton hotel) & Re 3 (Hurghada – public beach) showed high counts in March which may be due to the high numbers of tourists and swimmers.
- Re8 (Safaga–Middle) the high bacterial counts recorded during the year was due to Safaga harbour activity situated just south the sampling area.
- Re7 (Safaga north - Soma bay), recorded high bacterial counts in March, due to the recreational activities (swimming – diving – smorkling ….)
- Re13 (Quseir south - public beach) recorded bacterial counts slightly higher than the acceptable limits in July as it is a pulic beach with high rate of visitors.
- Re1 (El-Gouna resort), relatively high bacterial counts were recorded occasionally due to tourist activities.

6-4-2-3 Eutrophication parameters and Chlorophyll-a in 2008

Collected water samples were analyzed for ammonia, nitrate, nitrite, total nitrogen, total phosphorous, , silica, chlorophyll-a and suspended solids.

Inorganic Nitrogen (Nitrate, Nitrite & Ammonium):

The results obtained indicated the presence of high levels of inorganic nitrogen in the surface coastal water collected from the northern part of the Gulf of Suez at Region A (Su 1 – Su 3) and Ras Gharib Su7 as compared to very low concentrations in the rest of the Gulf (Region B), Gulf of Aqaba & Red Sea proper.

Ammonia (NH_4-N):

Annual mean values for Ammonia concentrations in coastal water were 9.31 and 2.90µM NH_4 –N in regions A and B for Suez Gulf respectively. The levels of ammonia were generally, low in the Aqaba Gulf and Red sea surface coastal waters, with an annual mean of 1.14µM NH_4-N for Aqaba Gulf. Corresponding value for the Red Sea surface coastal water was 0.64µM NH_4 –N, (Figures 6-10 & 6-11).

Nitrite (NO_2-N) & Nitrate (NO_3-N)

The annual means in coastal water for Nitrate were 1.92 and 0.42 14µM NO_2-N for Regions A and B of the Gulf of Suez respectively, Corresponding value for the Gulf of Aqaba and Red Sea surface coastal water were 0.42 µM NO_2-N & 0.17µM NO_2-N respectively.

From the distribution pattern of nitrate in Suez Gulf, it is clear that the upper part (Region A) is characterized by relatively high nitrate concentrations, ranging from 3.02 to 26.98µM NO_3-N at stations Su1 and Su3 during March and September, respectively. Annual mean was around 12.86µM NO_3-N. This area is an exception in the Red Sea Regions. In the lower part of the Gulf (Region B), nitrate concentrations ranged from 0.23 to 3.75µµM NO_3-N at stations Su9 and Su7 during July with an annual mean of 1.22µM NO_3-N. In the coastal water of Ras Gharib city, relatively high NO_3- N concentrations (2.29, 0.87, 3.75 and 2.71 µM NO_3- N), were recorded in March, May, July and September. These values are remarkably higher than those normally recorded in this region (B). This was accompanied by the relative increase in some other nitrogen and phosphorus forms as well as reactive silicate concentrations. This is attributed to the relative increase in human activities at these locations.

Total nitrogen (TN):

The distribution pattern of TN showed no trend. In the Suez Gulf, TN concentrations ranged from 81.51 to 304.06µM at station Su3 during May and September, with an annual mean of 169.03µM for Region A. whereas. In Region B, TN fluctuated between 37.56 and 215.49µM at stations Su8 during September and Su7 during March respectively, with an annual mean of 75.20µM. The annual means were 64.61µM & 42.48µM for Gulf of Aqaba & Red Sea proper respectively. Relatively, high concentrations of TN were recorded at station Aq4 during September (110.65µM) from Aqaba Gulf, Re1 during May (77.46µM) from the Red Sea coastal waters. These values were found remarkably high as compared with those of general trend and ranges of each of these regions. (Figures 6-12 & 6-13).

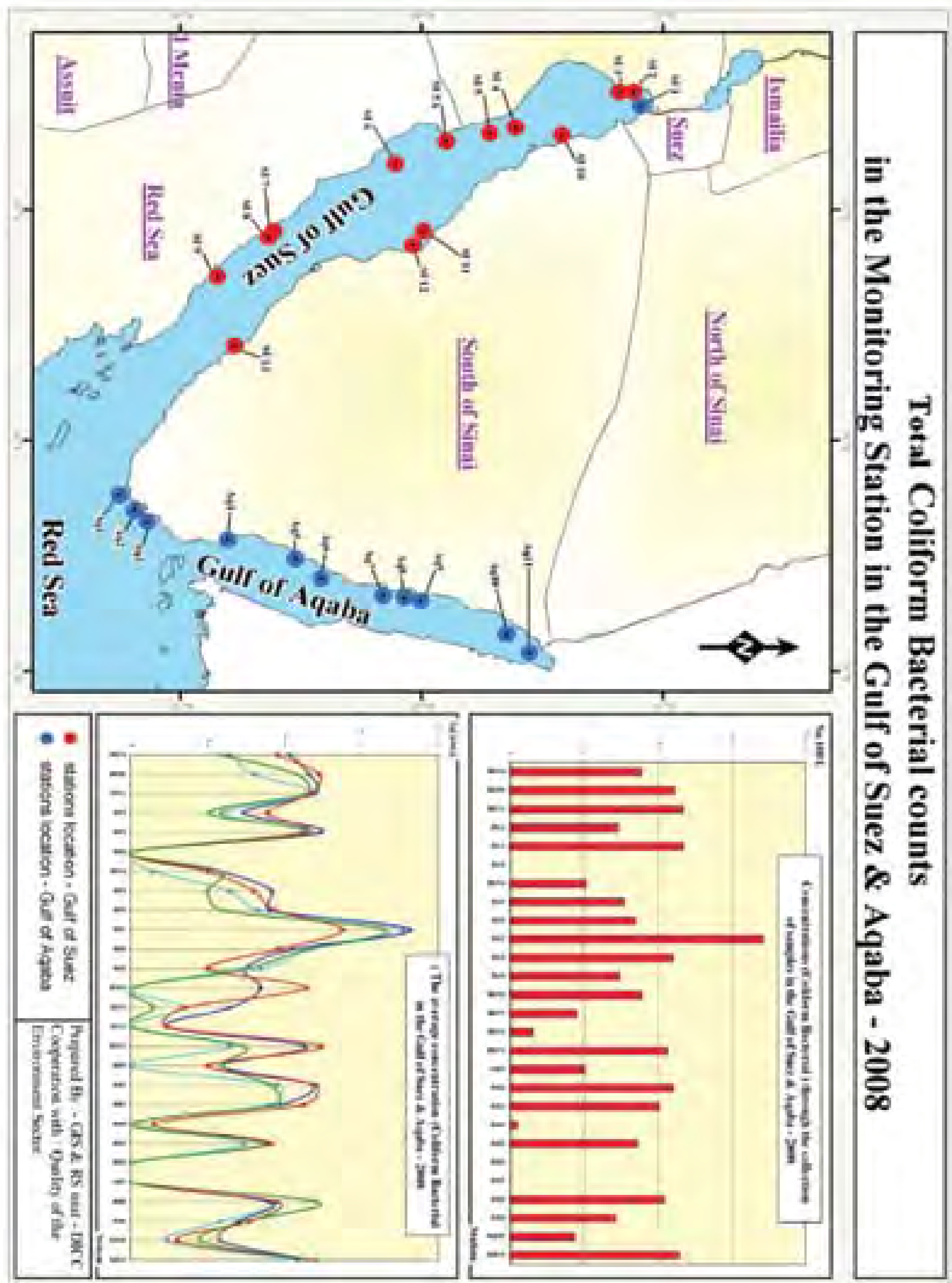


Fig (6-6) Total Coliform Bacterial counts along the Gulf of Suez & Gulf of Aqaba coasts in 2008

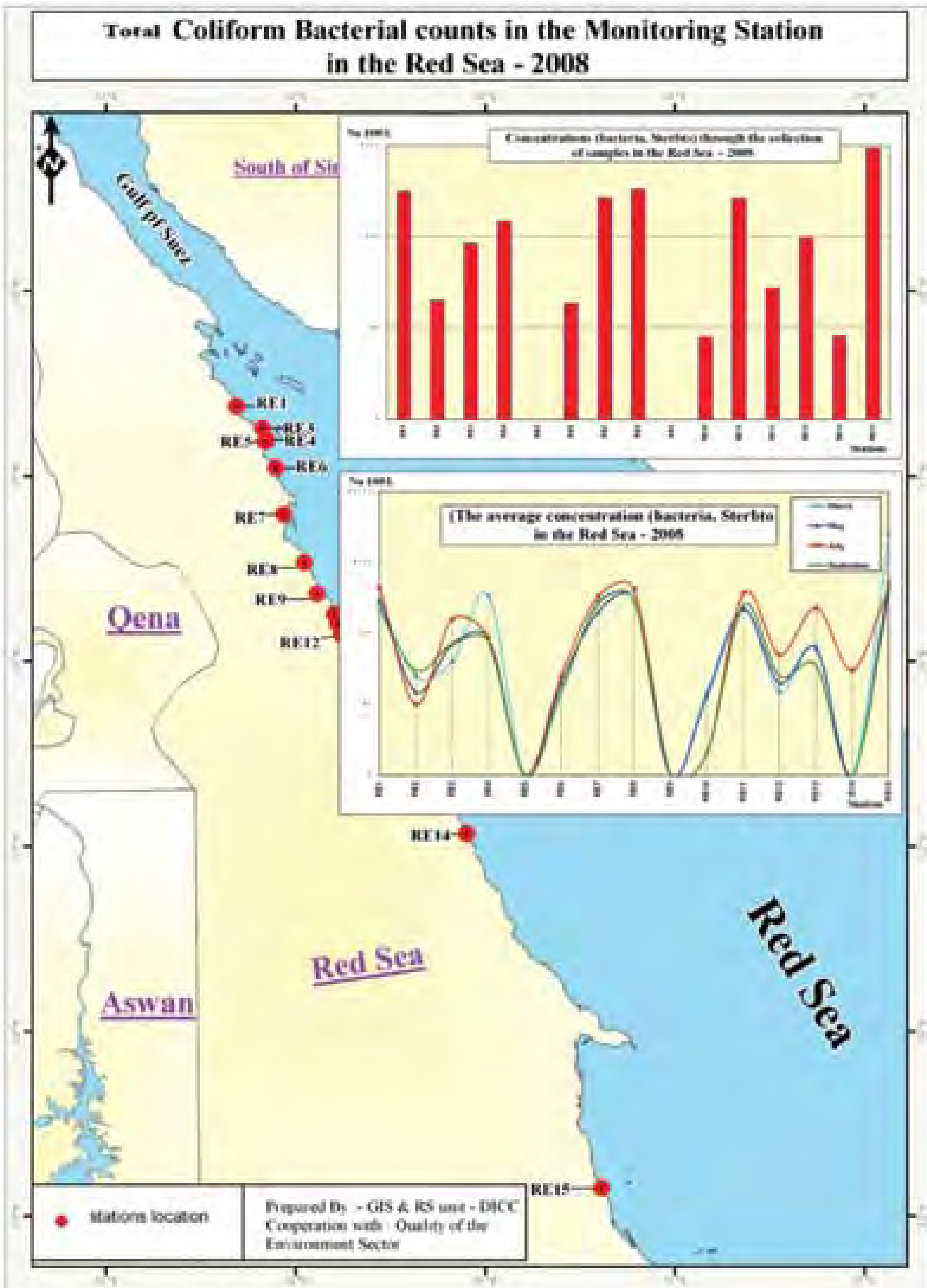


Fig (6-7) Total Coliform Bacterial counts along the Red Sea coast in 2008

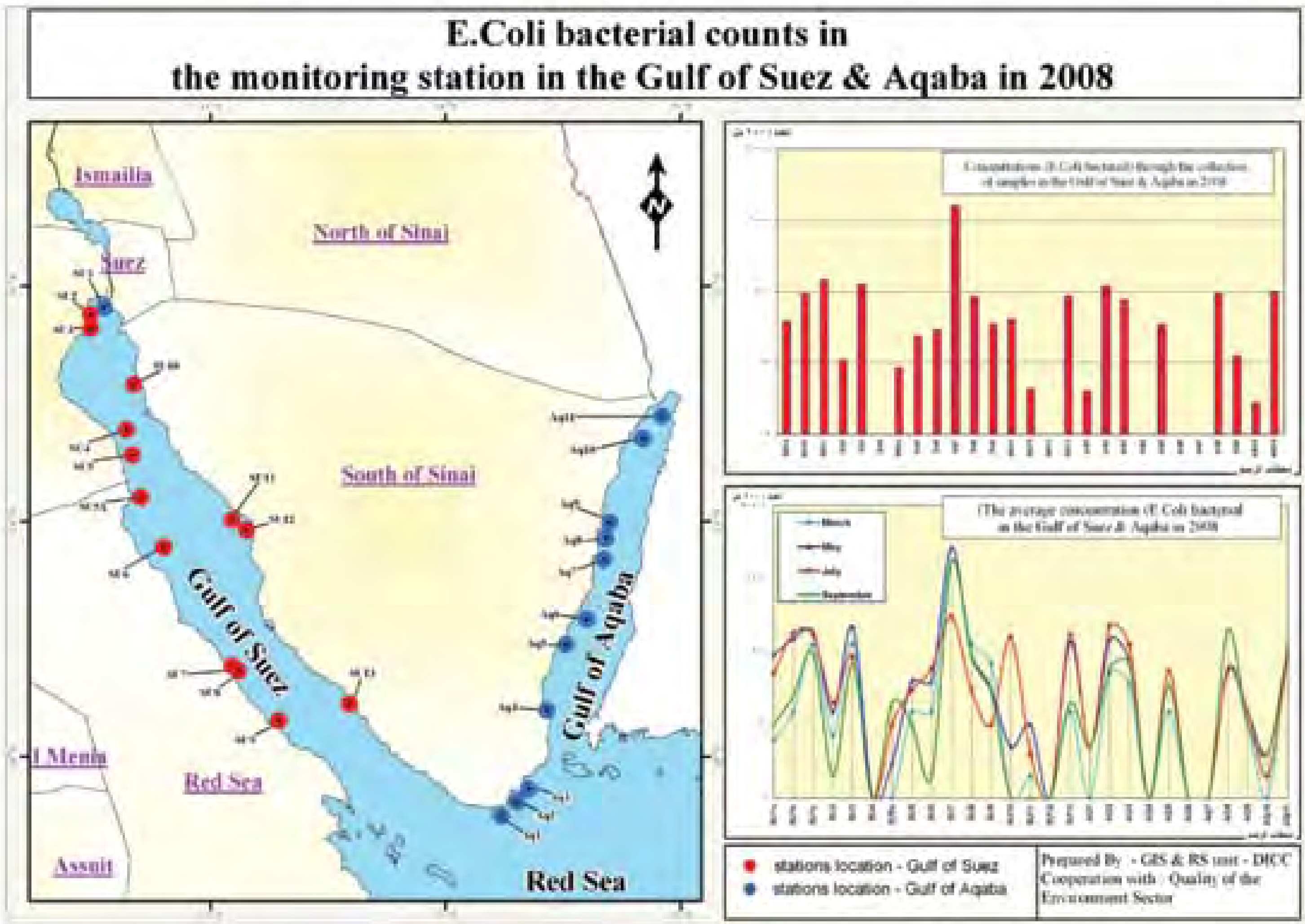


Fig (6-8) E. Coli Bacterial counts along the coastal water of the Gulf of Suez & Gulf of Aqaba in 2008

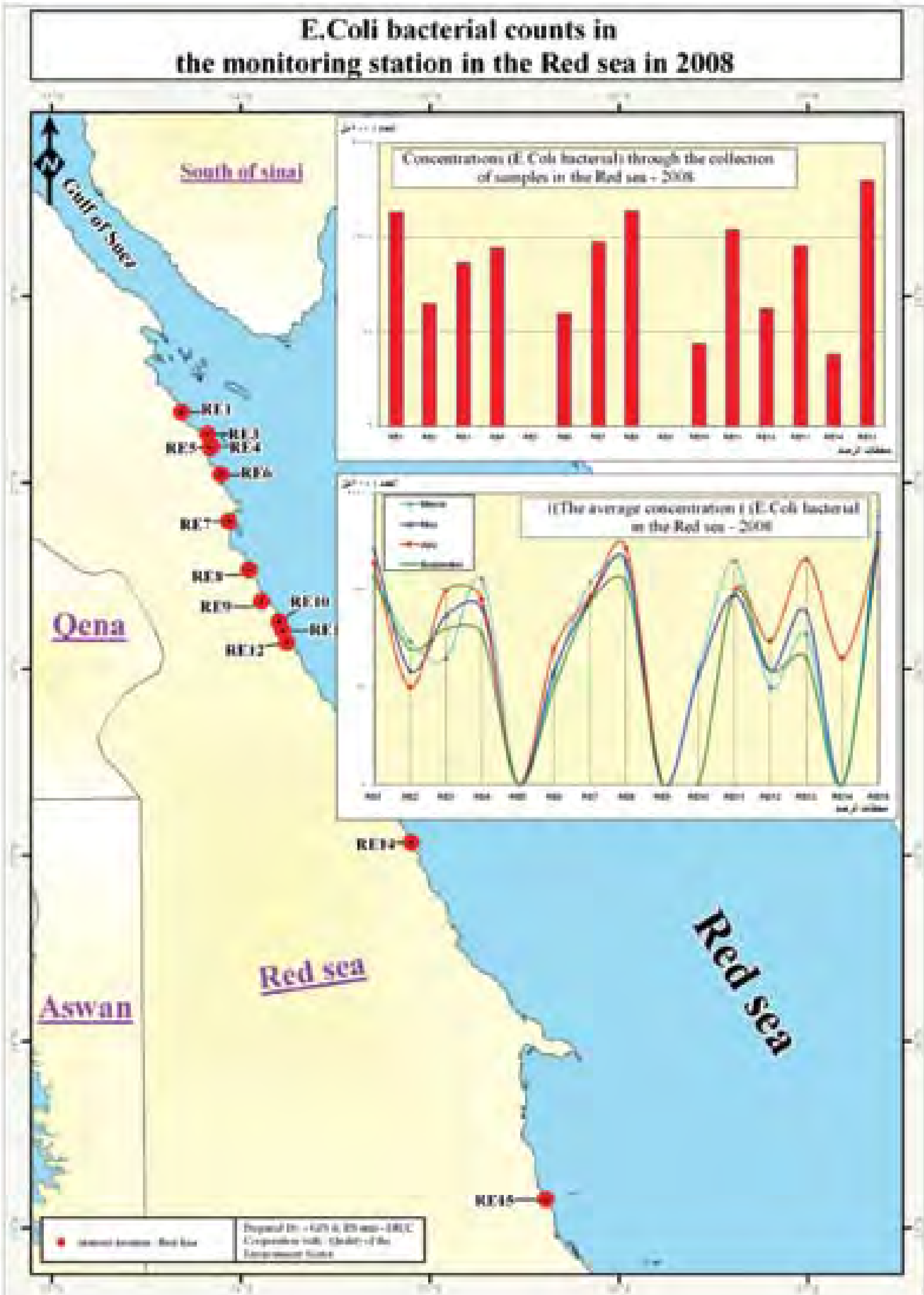


Fig (6-9) E. Coli Bacterial counts along the coastal water of the Red Sea Proper in 2008

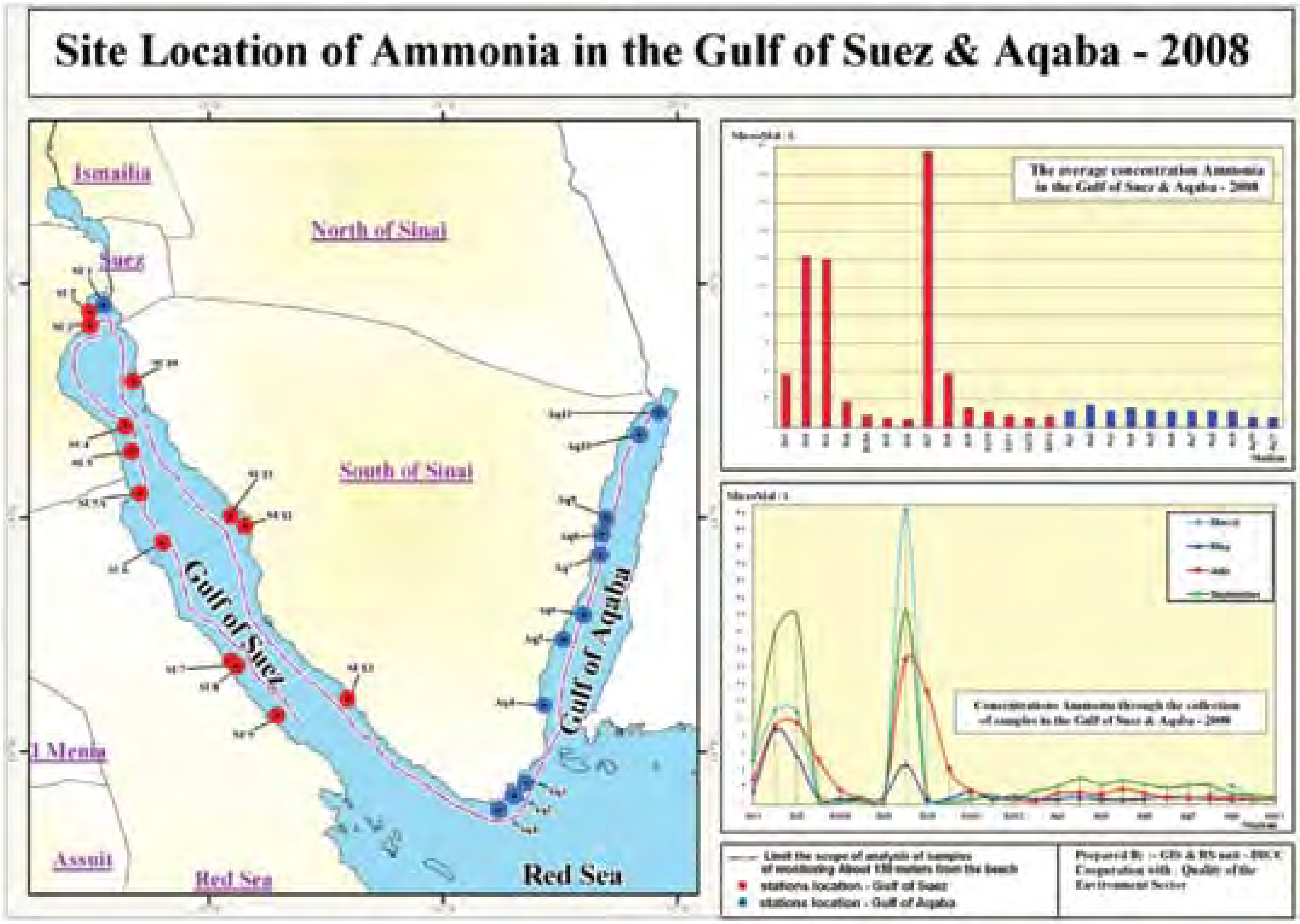


Fig (6-10) Distribution pattern of Ammonia Concentrations in the coastal water of the Gulf of Suez & Gulf of Aqaba in 2008

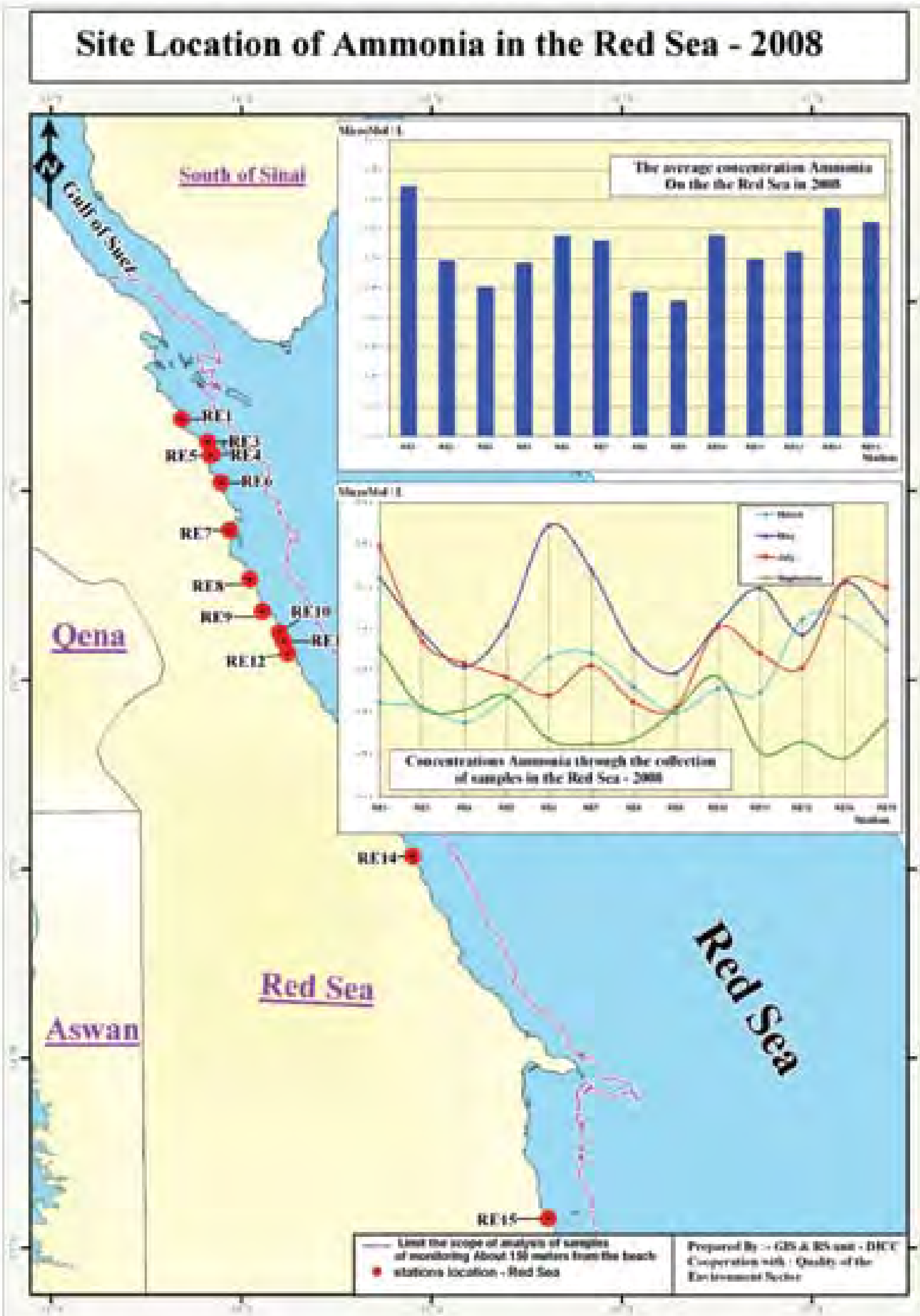


Fig (6-11) Ammonia Concentrations in the coastal water of the Red Sea Proper in 2008

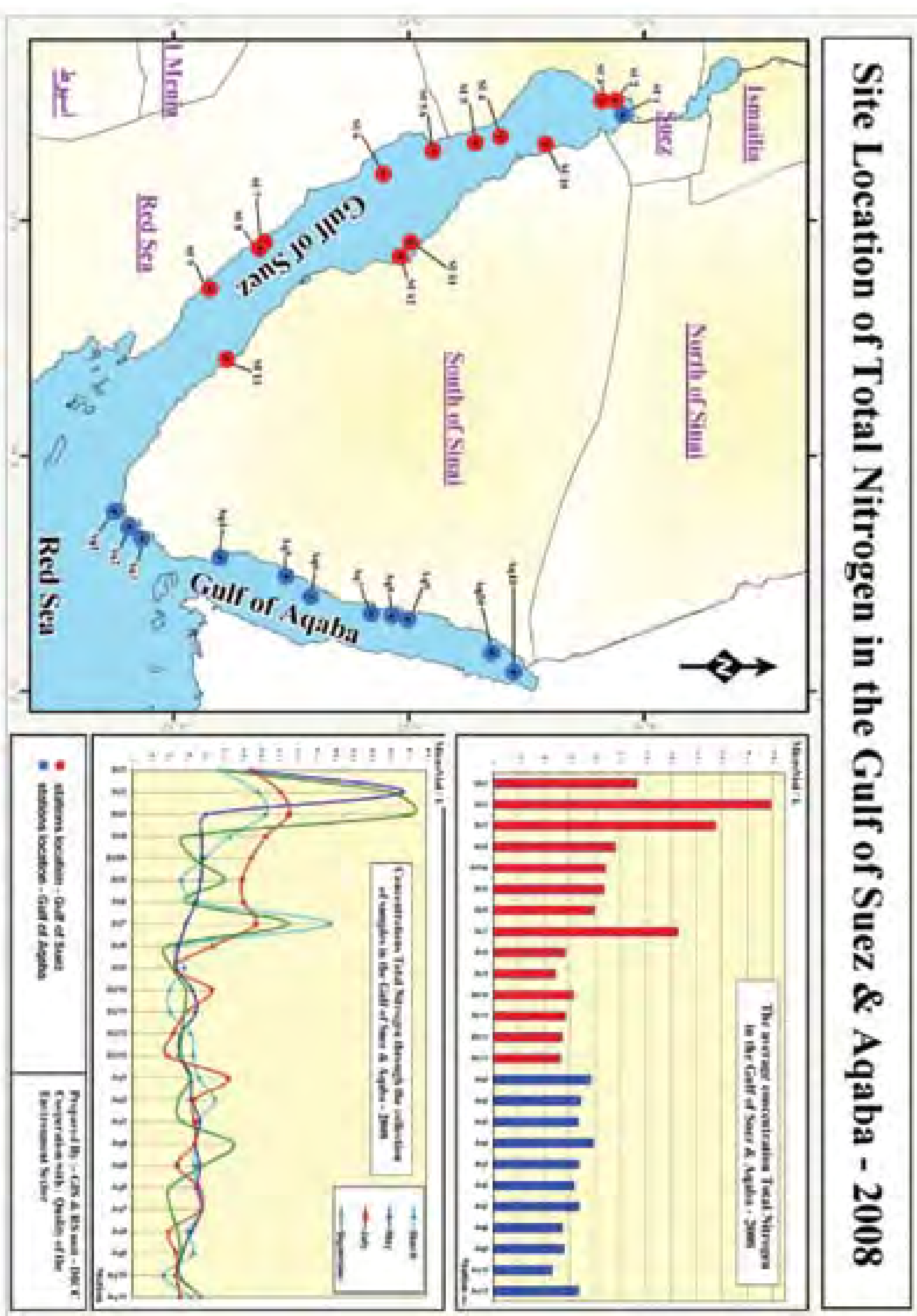


Fig (6-12) Total Nitrogen Concentrations in water at the monitoring stations in Gulf of Suez & Gulf of Aqaba in 2008

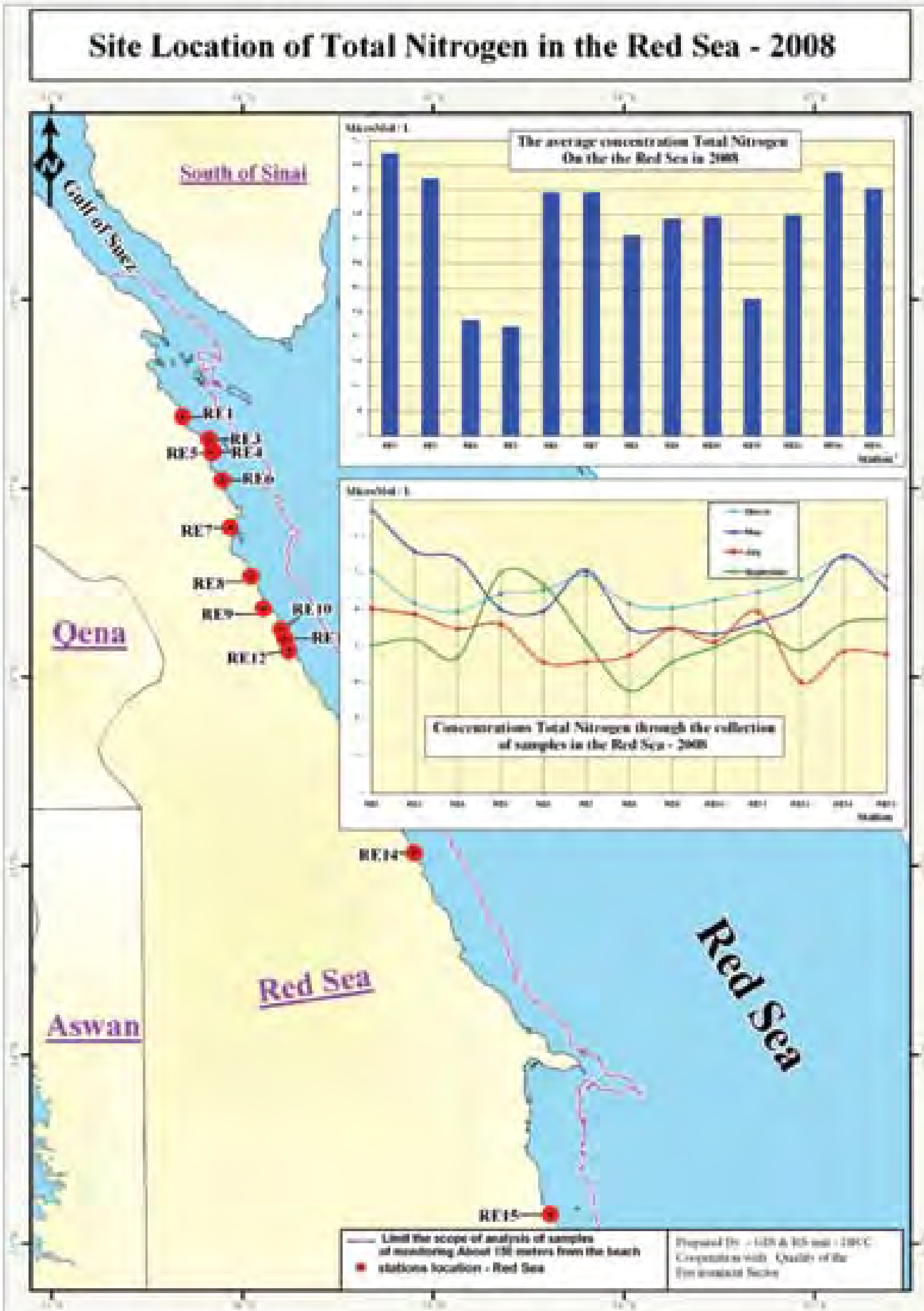


Fig (6-13) Total Nitrogen Concentrations in the coastal water along the Red Sea Proper in 2008

Total phosphorus (TP):

The spatial distribution pattern of TP showed relatively variable levels during 2008. The concentrations fluctuated between 0.71 and 25.57 µM P at stations Su1 and Su2 from the Gulf of Suez during March and May, respectively and from 0.34 to 4.62 at stations Su13 and Su7 during September and March with the annual means of 4.17 and 1.07µM for regions A and B of the Suez Gulf, respectively. The concentrations of TP in the surface coastal waters of Aqaba Gulf and Red Sea varied between 0.53 and 0.91µM at stations Aq9 and Aq7, from 0.50 to 1.0µM during September and May, respectively, with an annual mean of 0.69µM for Aqaba Gulf and from 0.62 to1.19µM at stations Re6 and Re11, 0.89-1.41µM during July and May respectively, with an annual mean of 1.13µM for the Red Sea coastal waters.

Chlorophyll-a:

Chlorophyll-a concentrations were relatively higher in the surface coastal waters of the three northern stations close to the urban areas of Suez city which comprises Region A (Su1-Su3) than those in the rest of the Gulf of Suez (Region B), the Gulf of Aqaba and the Red Sea proper. These can be signified from their absolute values in the Gulf of Suez surface waters which varied between 0.28-13.94µg/l at stations Su1 and Su2 during July and September, respectively giving an annual mean 2.50µg/l for Region A and 0.04-2.62µg/l at Ras Gharab (Su7) during March and May, respectively with an annual means (2.50, 0.28, 0.15, 014µg/l) for Region A, Region B (of the Gulf of Suez), Gulf of Aqaba and Red Sea proper respectively. The relative increase of autotrophic biomass recorded at Region A and Ras Gharab (Su7) from the Gulf of Suez is due to the rich supply of nutrient salts discharged with the untreated wastes into this area throughout the year, providing the favorable conditions for phytoplankton growth. This was indicated by the increase in amounts of total suspended matter (TSM) and decrease of water column transparency in these areas compared to the rest of the Suez Gulf, (Figures 6-14 & 6-15.

The load of Total Suspended Solids in the Gulf of Suez is relatively high as compared with those which found in the Gulf of Aqaba and the Red sea coastal waters. The high values were usually recorded at stations Su1-Su3 (Region A) from the Gulf of Suez, wlow values were generally observed at the rest of other locations. No big difference was found in TSS values between different locations of the Gulf Aqaba and the Red Sea Coastal waters, with an annual means (44.36, 20.44, 18.31 & 17.87mg/l) for Region A, Region B (of the Gulf of Suez), Gulf of Aqaba & Red Sea proper surface coastal water respectively.

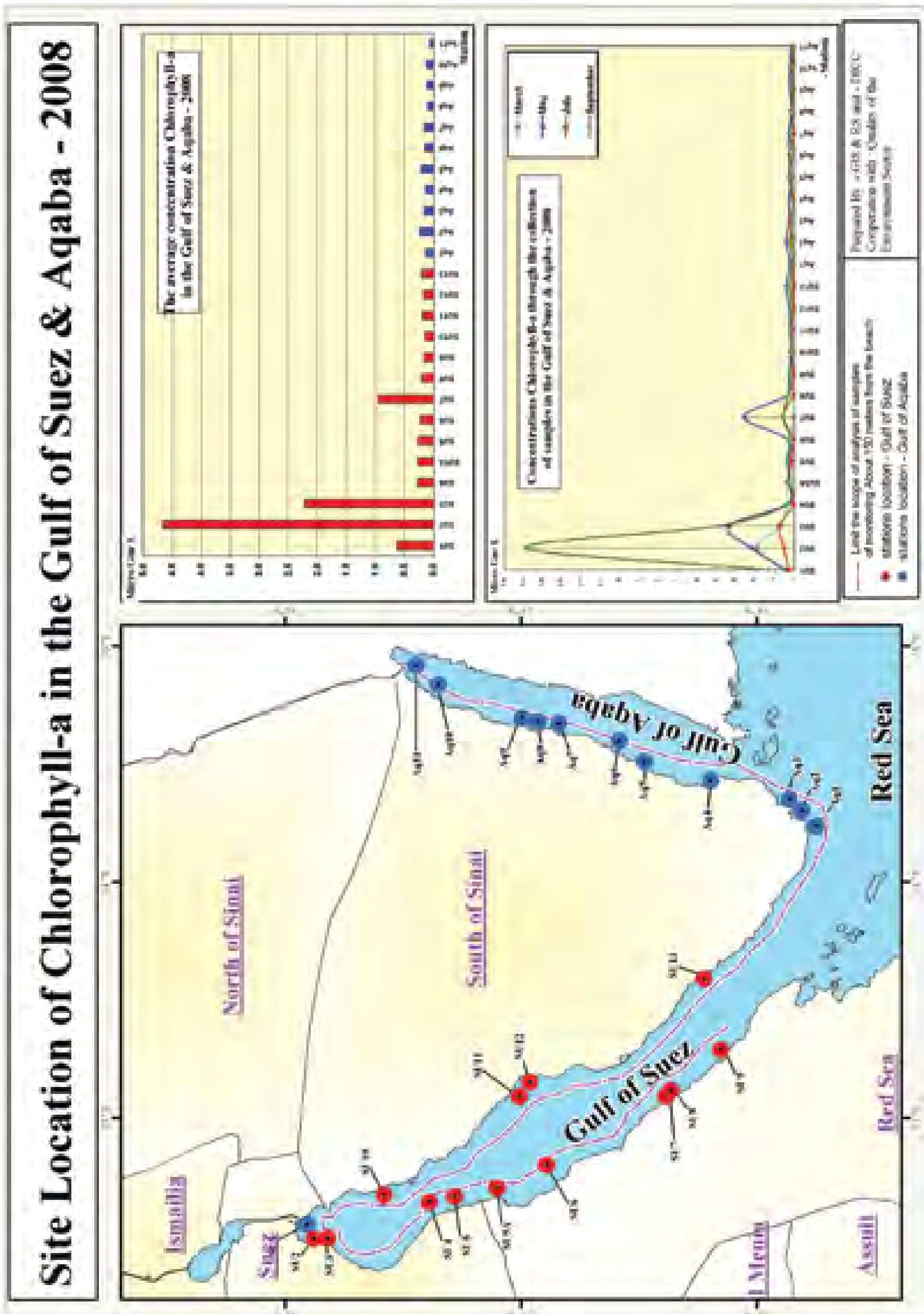


Fig (6-14) Chlorophyll-a Concentrations at the monitoring stations in Gulf of Suez and Gulf of Aqaba in 2008

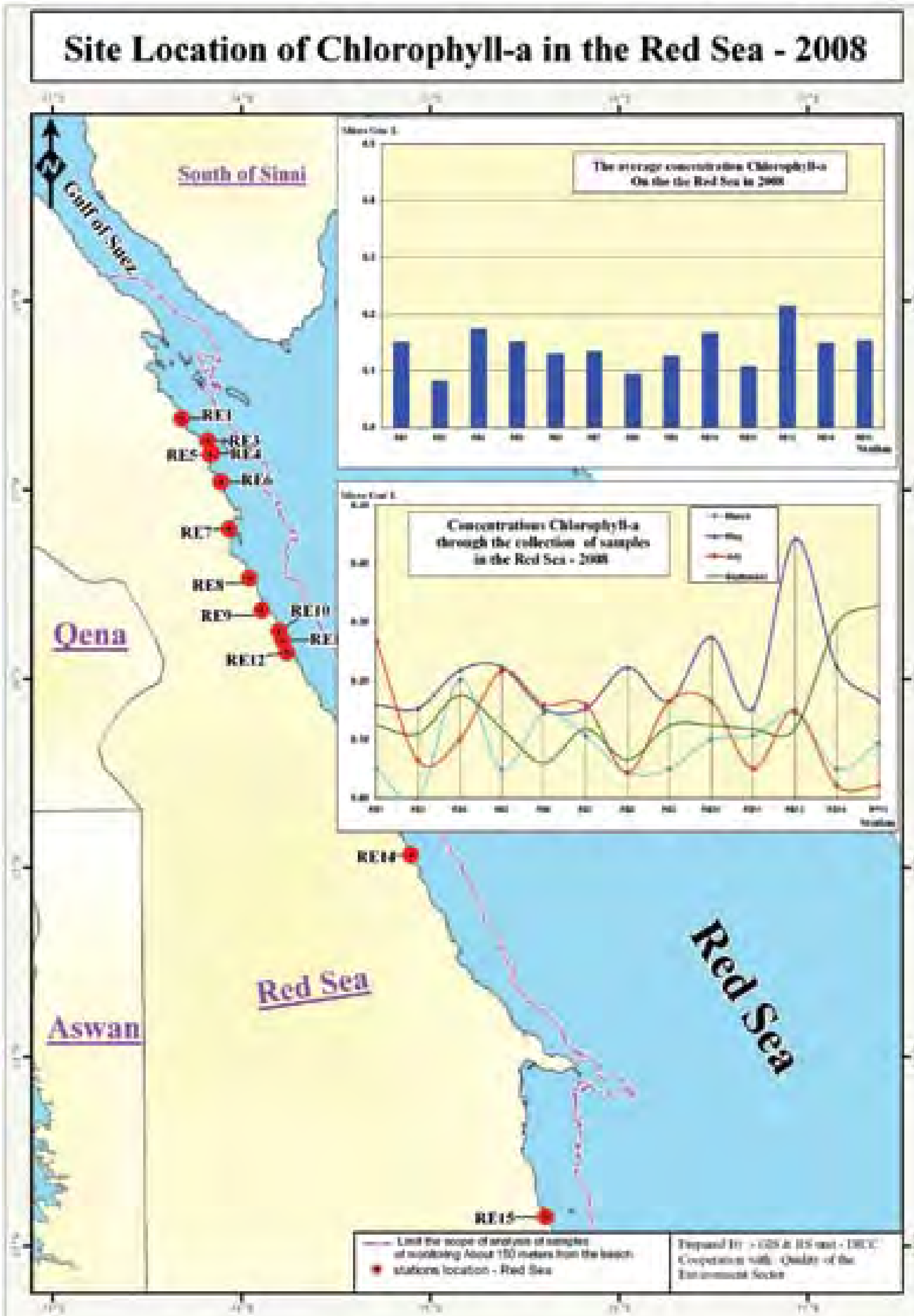


Fig (6-15) Chlorophyll-a Concentrations along the coastal water of Red Sea Proper in 2008

6-4-2-4 Conclusion

- In Qusier area, Re12 (middle) and Re13 (South) bacterial indicator numbers were remarkably decreased but still slightly above the acceptable levels only in summer months. This is due to the decrease in numbers of boats anchored in this area during that time.

- In Sharm El-Sheikh –Marina Sharm, Trafco (Aq2a), the establishment of a security installation to guarantee recovery of human and other wastes from being discharged into ships to secure no disposal of human wastes into the sea. This system led to a remarkable decrease in bacterial indicator numbers, however it still higher than the acceptable levels in many times.

- In Nuweiba area (Aq8) the bacterial numbers decreased to the acceptable levels during year 2008, coincided with the decreasing numbers of tourists and consequently the human impact onto this area except that which is affected by harbour's activity.

- According to the monitoring results; Egyptian Coast of the Red Sea Could be divided into two major regions as follows: The northern part of the Gulf of Suez: (Su1-Su3) located between two ports which are port Tawfik and El Adabia, this region is under the direct effect of different kinds of untreated or partially treated discharges of industrial and domestic waste water, which leads to the deterioration of the receiving water body converting it to eutrophid zone, and considered as polluted with nutrients salts according to the international standards. The second region consists of the rest of the Gulf of Suez (except Ras Gharab- Su 7), Gulf of Aqaba and Red Sea proper, where low nutrients salts concentrations have been recorded.

- Old tar and/or oil contamination was restricted within the areas of petroleum companies and/or harbors activities.

- The Gulf of Aqaba is characterized by the presence of large amounts of Coral Reefs compared to the Red Sea Proper and the Gulf of Suez.

- Visual observations in 2008 clarified that stations in Suez (Su1-Su3), Ras Gharab (Su7), in the Gulf of Suez, and Sharm El –Shkieh harbour – Nama Bay (Aq2) from Gulf of Aqaba, in addition to Safaga (Re8) north of Qusair city (Re11), Bir Shalatin fishing harbour (Re15) from the Red Sea Proper are highly subjected to the external effect due to the increase of human activities in these areas.

- In the framework of MSEA exerted efforts to monitor organic pollutants, heavy metals, hydrocarbons and pesticides in sediment and biota; a protocol has been signed between

EEAA and **the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA).** Its main objective, building capacities of EEAA's employees working in laboratories of Regional Branches of EEAA located in (Suez, Red Sea and Natural Protectorates) for the collection of sampling and analysis of sediments and biota for organic pollutants, heavy metals, and pesticides for seventeen stations divided as six stations in the Red Sea proper, six stations in the Gulf of Aqaba and five Stations in the Gulf of Suez in 2009.

- In general, there were improvements in water quality due the cooperation between different organizations and exerted efforts through inspections of the industrial and tourist facilities which discharge directly or indirectly in the coastal water. At the same time the necessity to prepare Environmental Impact Assessment studies before issuing any permission to facilities to ensure non existence of any negative impacts to the environment.

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Part 3

Land

Chapter 7
Biodiversity

7-1 Introduction

Biodiversity status cannot be isolated from human being especially local communities with their traditional knowledge and usage of biodiversity. Biodiversity is the sphere of life; diversity of species provides agricultural, livestock and medicinal services in addition to scientific research and cultural heritage. Some of fauna and flora species with their genetic components support development of medicinal, agricultural, industrial and basic daily needs of local communities. In addition to the fact that biodiversity supports and develops many new industries like ecotourism, which provides high economic return.

Egyptian biodiversity reflects several important facts among which its desert habitat, strategic geographic location among three continents "Europe, Africa and Asia" and its variant climate. River Nile with its unique habitat contributes greatly in improving biodiversity from freshwater habitat to wetlands with their international importance for migratory and resident birds. Egypt is bounded from north and east by two largely enclosed seas, Red and Mediterranean, connected through Suez Canal, which leads to wide diversity of coastal and marine faunal and floral species, particularly those migrated from the Red Sea through the Suez Canal and settled in the eastern Mediterranean.

Despite being dominated by desert and drought, Egypt's biodiversity has 143 unique species with global significance, in addition to species with limited geographical distribution to certain areas "Oasis, Elba Mountain and Sinai Mountains", as well as endemic species. Egypt is inhabited with about 20 000 faunal and floral species. Egyptians benefited greatly from this unique biodiversity in establishing civilizations from Stone Age till current Age.

2008 report highlights significant changes occurred in the status and trends of biodiversity and degree of improvement in comparison with last year ;as well as measures taken , affecting factors and exerted efforts to enhance Egyptian policies to conserve biodiversity within the framework of national biodiversity strategy and achieving 2010 global target which is to reduce biodiversity loss rate significantly .

7-2 Biodiversity efficiency Indicators

7-2-1 Ecosystems Health

This indicator follows up free services and products granted by ecosystems to support socio-economic development, improve Egyptian citizens' standard of living and health; particularly quantity and quality of water, food, energy, and different uses of biodiversity including traditional knowledge and intact ireplacibility areas.

This indicator is considered one of the most difficult indicators, as it requires huge mass of information available at concerned ministries such as “Agriculture, Health, Central Agency for Public Mobilization & Statistics, National Centre for Planning state Land uses, Egypt Human Development Report of 2008 and others”.

Egypt covers an area of about one million km^2; population is approximately 78 million, living on about 8% of Egypt’s total area after it had been 4% for long time. During the first decade of 21 century, cultivated agricultural land amounts 8.3 million Feddan (about 3.5% of Egypt’s area). Results obtained from the National Centre for Planning State Land Uses indicated that land used has reached approximately 14-15% of Egypt’s total areas, and if we add the 148,000 km^2 which is the total area of protected areas it will be discovered that currently used lands amounts to 30% which means about 70% of Egypt’s area are still intact ireplacibile areas.

Agriculture sector consumes the greatest amount of water, about 59.3 billion cubic meters representing 85.6% of all available water. The government is planning to reclaim 3.4 million Feddan by 2017 to satisfy Egyptians’ increasing need for food. Hence, there is a need for additional water resources for agriculture estimated by 20.4 billion cubic meters.

Results of water quality monitoring in Nile River and Lake Nasser conducted by Environmental Monitoring Centre affiliated to Ministry of Health and Central Laboratory affiliated to Egyptian Environmental Affairs Agency ,proved that fresh water quality is within the international permissible level (State of the Environment Report 2007).

Therefore, fresh water quality improvement programs were implemented, including preventing industrial water discharge into Nile River, reuse of treated sewage water in planting timber forests and rationalizing pesticides’ uses.

Agricultural, poultry, livestock and fish resources estimated with 92.2 billion LE, among which agricultural products share with 20% from the total exported goods; with about 30% employees from the total Egyptian man power “6 million” working in the agriculture sector; and about 2 million in tourism sector achieving more than 60 billion L.E. annually.

Incomes generated from mineral resources estimated with billion LE annually, in addition to Red sea “coral reefs and mangroves” estimated with 80 million LE / km^2; as well as the many invaluable benefits of biodiversity, such as the micro-organisms “biotechnology” and natural substances produced by coral reefs used in treating many diseases such as cancer.

Human development indicator of Egypt during 2008 refers to a remarkable improvement in basic features of human development such as an average increase in human age to more than 70 years,

individual quota from calories “4258 cal/ day”, education “91%”, GDP “6142 LE/per capita/year” , a decline in population growth with about “2.05%”, increase in electricity consumption per capita “1090 kw/h” ; in addition to the steady increase of tourists number with the exception of last quarter of 2008 due to the international financial crisis that has lead to a slight decrease in tourism income which is expected to extend along next year .Exporting rate of services and goods reach to about 276 billion LE during 2007/2008 and the unfavorable balance of trade amounted to 29 billion LE according to 2008 Progress Report issued by State Information Service . Central Agency for Public Mobilization & Statistics’ report referred to an increase in exports to 79 million LE during 2006 compared to 62 million LE during 2005, imports from 115 to 119 million LE, and the unfavorable balance of trade ranged from 53 to 50 billion LE.

Poverty alleviation’s field data indicates a decrease in percentage of people with income less than one dollar daily from 40% to 25%, which is expected to reach 16.5% by 2015. Percentage of population who suffer malnutrition had declined from 25.6% to 14%.

The above mentioned data, clarifies that Egypt is facing many challenges due to the steady increase of population and expansion of industrial, agricultural and touristic activities to achieve economic development. This leads to intensify pressures on renewable natural resources. Internal debt has increased to 666.9 billion LE (74% of GDP) during 2006 – 2007 according to Central Agency for Accounting report.

7-2-2 Status of Habitats

7-2-2-1 Marine Habitats:

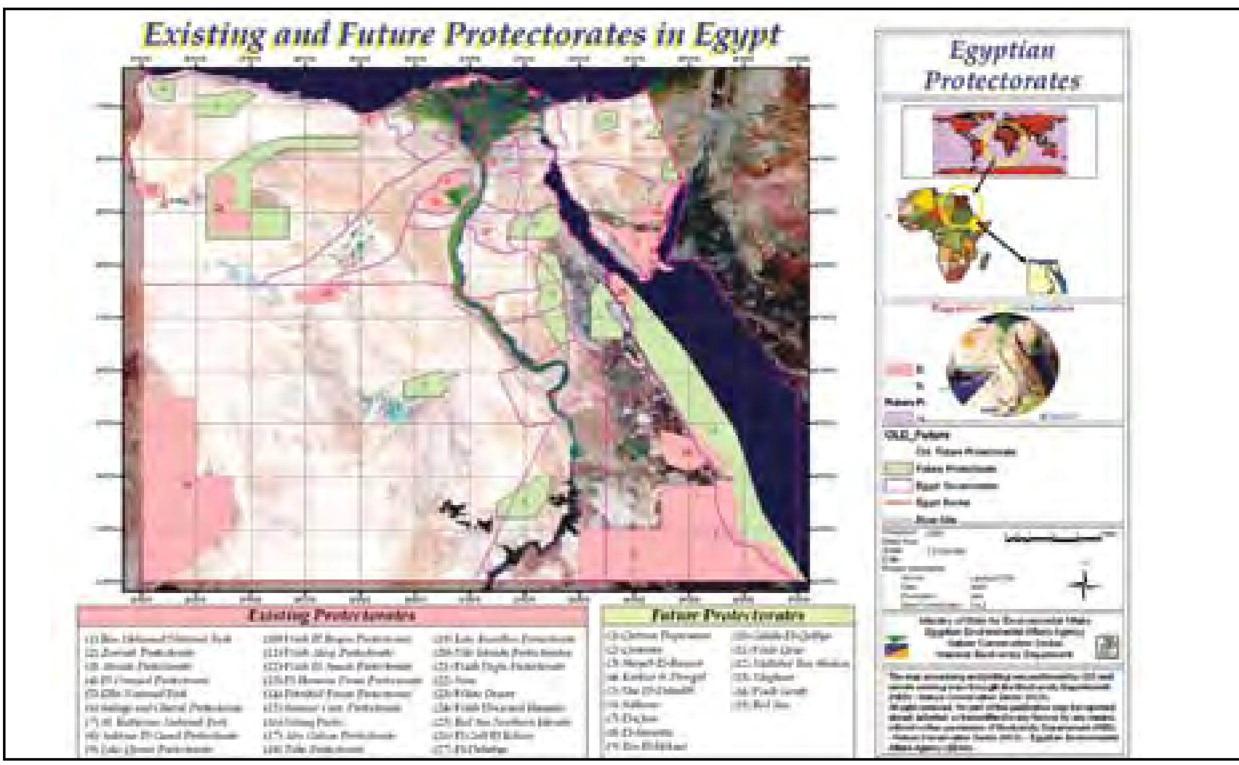
Biodiversity Assessment Report issued last year has shown that available information about Red Sea is more than Mediterranean Sea information. Therefore, a study about the Mediterranean was conducted this year, with concentration on the area located between Mattrouh and Salloum in order to be declared as a marine protected area according to the National Biodiversity Strategy and Action Plan. Meanwhile, monitoring of Red Sea biodiversity is going on with a focus upon its most important habitats and species.

a) Biodiversity in the Mediterranean:

About 10000 marine species have been recorded in the Mediterranean, “including 8500 fauna species and more than 1300 flora species” this represents approximately 8%– 9% of the total known global marine species, although Mediterranean represents only 1% of the total marine areas .Its endemic species reaches to about 8-9% from the total number of species, including 600 fish species, 3 marine turtles, 33 marine bird species, 22 marine mammals, and thousands of invertebrate species. There are also some endangered species with extinction , due to the increasing human exploit of marine environment, for example monk seal which was living in all areas of

the Mediterranean ,currently available in Greece and Turkey only.
The Mediterranean Sea is facing many threats, like coastal soil deterioration, coastal erosion, climate change, over-exploitation of marine resources particularly fish resources and biodiversity loss.

Recent studies conducted upon the area located between Mattrouh and Salloum (Environex, Egypt 2008) have shown the great importance of its coastal and marine environment and the sensitivity of its habitats including sea grass, fisheries, and sponges; in addition to the presence of 5 marine and 11 terrestrial endangered species. Despite the fact that Salloum Gulf is one of the richest areas with marine biodiversity in terms of habitats and species, however this study shows the presence of 55 commercial species compared with 89 species in the previous surveys. Therefore, it is essential to declare this site as a marine protected area to be managed on scientific basis.



Map (7.1) Existing and Futuer Protectorates

b) Biodiversity in the Red Sea:

Monitoring Program of coral reefs continued during 2008, as 72 sites (permanent quadrates) were assessed in north and south Hurghada. Results of northern area around Hurghada were classified into 3 main groups: the first shows an increase in percentage of coral reefs up to 15% from 2001 till 2008, the second shows an average increase 4 – 7%, whereas the third group which is one of the areas that attract considerable number of divers shows a decrease in coral coverage (4– 5%), (Fig. 7.1).

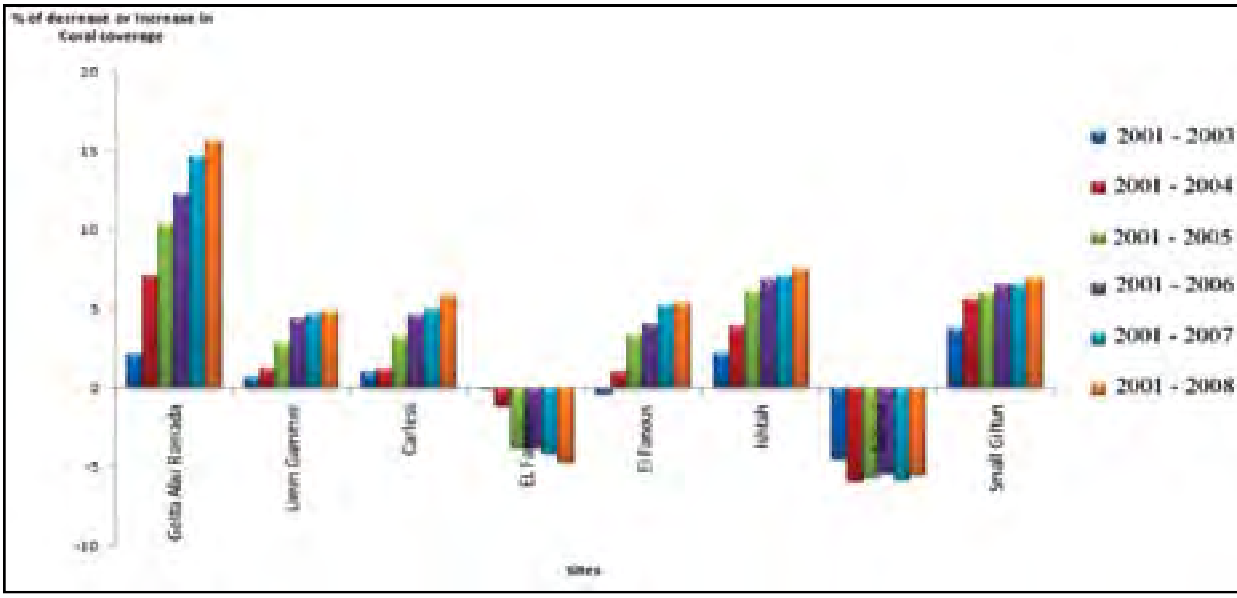


Fig (7.1) Change in coral community during 2001-2008 in Hurghada

Results of southern sites “2003 till 2008” are less than those of the northern ones. They were also classified into three groups: the first group shows an increase in coral cover “4 - 5%”, the second group shows an increase from “1 - 3%” ,whereas an increase in coral reefs of the third group that did not exceed “1%”, (Fig. 7.2).

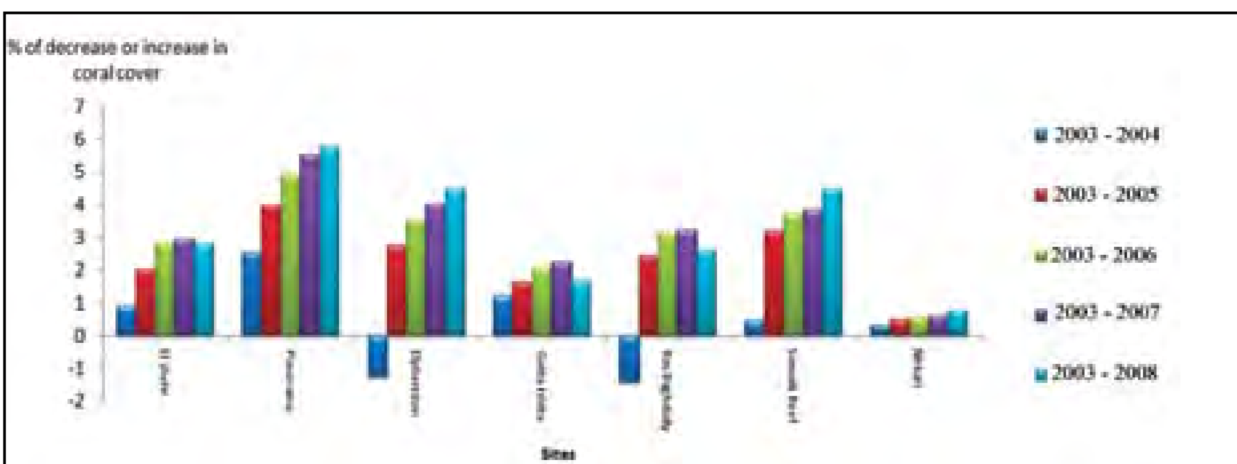


Fig (7.2) Change in coral community at southern area during 2003 - 2008

Applied protection procedures such as moorings and patrolling had succeeded in increasing coral cover in Protected Areas. Monitoring results had shown a significant difference in species indices (number of species / area unit) ranging between 10 - 20 species in the northern sites, and 4 – 15 species in the southern sites. (Fig. 7.3)

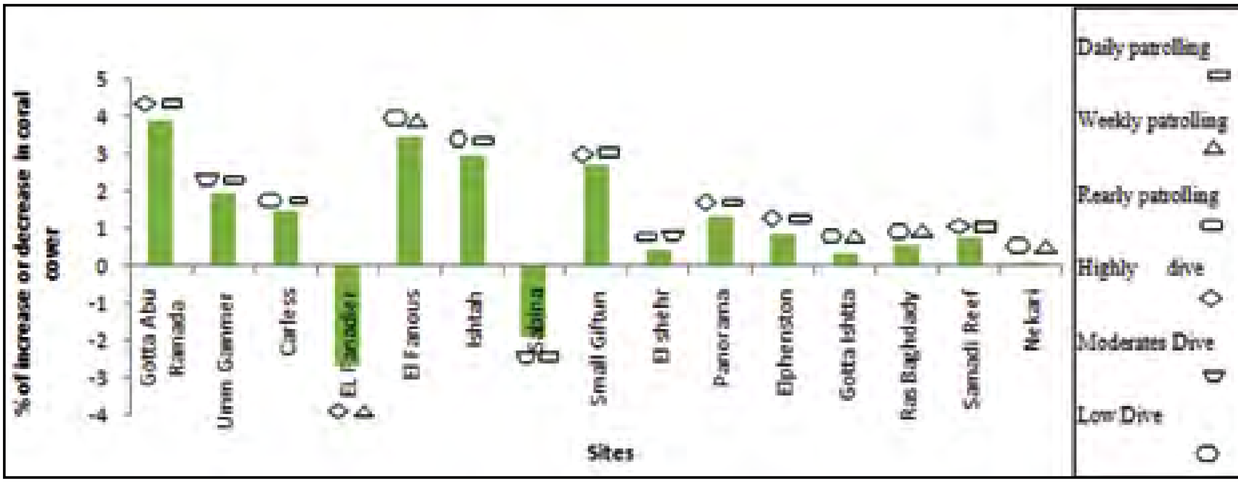


Fig (7.3) Change of coral community in the Red Sea (Hurghada) 2001-2008
and the effect of patrolling and diving pressure

Mangroves monitoring program continued in 28 sites with an area exceeds 700 hectare along Red Sea coasts, islands and Gulf of Aqaba . Results showed that mangrove status has improved considerably compared with previous years; as the average tree height has reached to 2.7 m, stem 1.8 m and trees' density reach to 313 trees / hectare. Mangrove transplantation continued, reaching 80 Feddan with 15% increase during 2008.

7-2-2-2 Wetlands

Monitoring biodiversity of Wetlands continued in "Zaranik, Brullus, Qaroun, Wadi Rayan, Siwa, Salough and Gazalla, Ashtoum El-Gamil, and Wadi Allaqi". Past years witnessed monitoring of bird species in 4 sites of Zaranik Protectorate.

Data refers to a remarkable increase in birds' numbers and species. For example birds recorded during 2005 were 111 species with total number of 51152; whereas during 2008 the number had increased significantly to 174 species with total number of 156860. This increase is due to the accuracy of monitoring programs, prevention of bird hunting since 2006 till now and the considerable increase in some migratory birds.

There were also considerable differences in numbers of birds observed monthly during the past 4 years. For example, summer and autumn recorded the largest number of birds "159 species with total number of
70 000 birds", (Fig. 7.4).

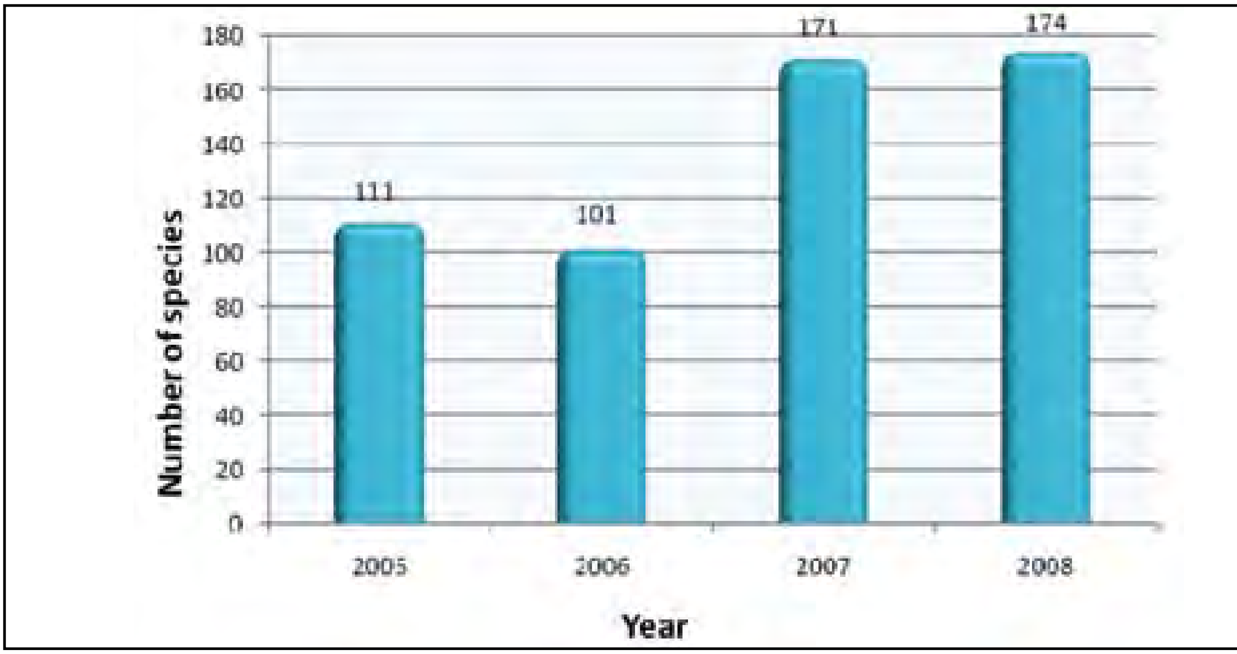


Fig (7.4) Number of birds species observed in Zaranik PA during 2005 - 2008

Studies clarified that monitored number of the most frequent bird species were 68 species with total number of 103067, whereas birds that were observed once only were 69 species. The most common birds recorded in large numbers were herons, cormorant, quails, corn crake, kingfisher, and little stint.

7-2-2-3 Agro biodiversity

Agro biodiversity in Egypt faces many challenges, mostly fauna and flora genetic resources and over use of chemical fertilizers and pesticides, leading to the disappearance of most of its wildlife like "owl, fox, mongoose and wild cat". Other factors contributed to wildlife loss like lack of agriculture rotation that is useful to land and cultivation of some high yield crops due to their high economic revenue. In addition to the fact that total average of effective compounds in fertilizers used in Egypt annually were about 5800 tons containing large amount of sulphur and copper compounds over last four years (2005 – 2008), with an average of 414 g/ Feddan/year (Ministry of Agriculture and Land Reclamation 2008).

Over grazing of natural grasslands and their conversion to agricultural lands, lead to biodiversity loss. Furthermore, threats of illegal urbanization and building on agriculture lands are greatly increased, although legislations prohibit these actions ; this leads to a considerable loss of fertile lands with an average of 47.7 thousand Feddans annually, (Osama Bedeir 2008).

Invasive species are from the other threats facing agro biodiversity, especially Red Palm Weevil pest that lead to the loss of more than 10 million trees, in addition to different weeds and agricultural pests that had caused considerable economic loss.

Fragmentation of agricultural tenure, poverty in rural areas, marketing problems due to low quality of agriculture products have led to migration from rural to urban areas, leading to an increased pressure on Egypt's natural resources.

7-2-3 Fauna status and trends

Depending upon monitoring programs over a certain period of time, different uses and threats species exposed to. This indicator requires maps of distribution, extent, and changes' species exposed to over time. In addition, there is a need for species' indicator in each habitat as well as indicators for national species such as "Egyptian Gazelle and Accacia tree".

A brief about status of certain species monitored during 2008*:*

Egyptian wild tortoise: Egyptian wild tortoise monitoring program is considered one of the most important monitoring programs since 2003. Egyptian wild tortoise existence is limited to Zaranik Protected Area in four sites: Makhaied Island, Sheikh Salama, Khoianat and El-Mehasab. Continuous monitoring, clarifies that wild tortoise uses up to 54 flora species for feeding and hiding. Makhaied Island is considered one of its most important sites, where 70 tortoises recorded during 2003 which was increased to 151 tortoises during 2008. The same was observed in Sheikh Salama area where 15 tortoises were found during 2003 then increased to 57 by 2008. Its numbers in Khoianat, were almost constant 43 individual over the last 5 years, whereas in El-Mehasab its number ranges from 4 - 8. Although 259 tortoises were recorded over the past 5 years, number of dead animals' especially young one had reached 120 tortoises. By marking female tortoises it was observed that each female lay down between 3 to 5 eggs / year, and mostly one egg succeeds in continuing its life cycle. 67% of tortoise preferred plants with heights ranges from 62.41cm to 74.09cm with an average of 68.25 cm either for feeding or protection. It was also found that tortoise uses plants with densities that ranged from (71 – 86 cm). Despite the fact that tortoise can live up to 50 years, but El-Zaranik's study showed that most tortoises did not exceed 15 years old and its average age is 8 years old. It was also found that grazing and cutting trees are main threats facing tortoise. (Fig 7.5)

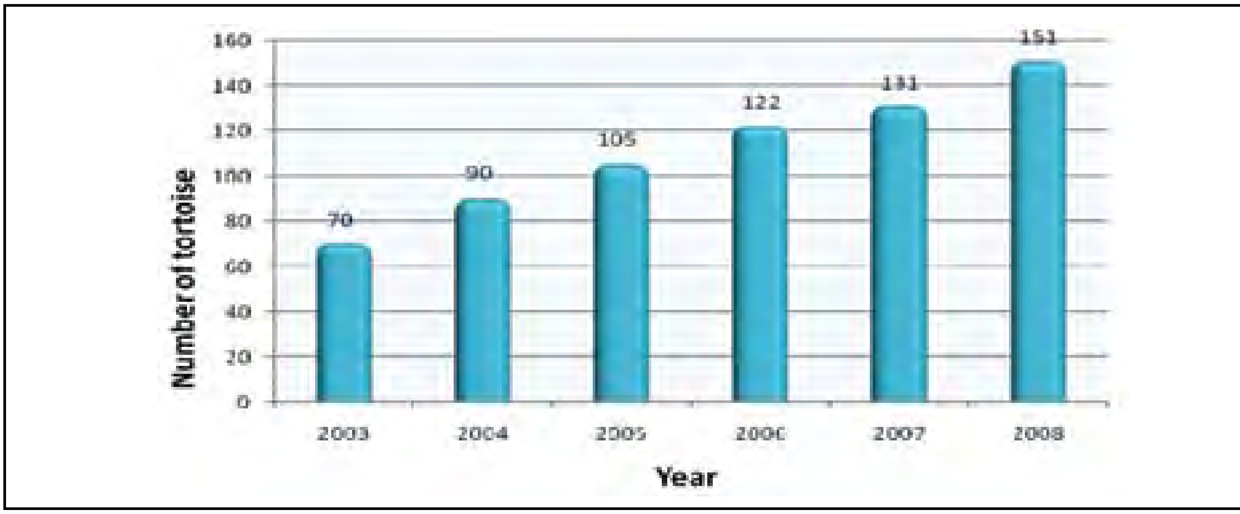


Fig (7.5) Number of Egyptian tortoises in Makhaied Island in Zaranik PA during 2003-2008

- Monitoring of **Egyptian gazelle** continued in Wadi Gemal, Elba, St. Catherine, Nabq, and Wadi Assouti Protected Areas. A remarkable increase of Gazelles' number in Elba protectorate had been observed during January which were 70 then increased to 125 during May and July, due to the successful breeding as it is known that delivering time in March and April.
- The total number of Gazelles observed in Protected Areas varied between 200 - 250 individuals every month. (Fig 7.6)

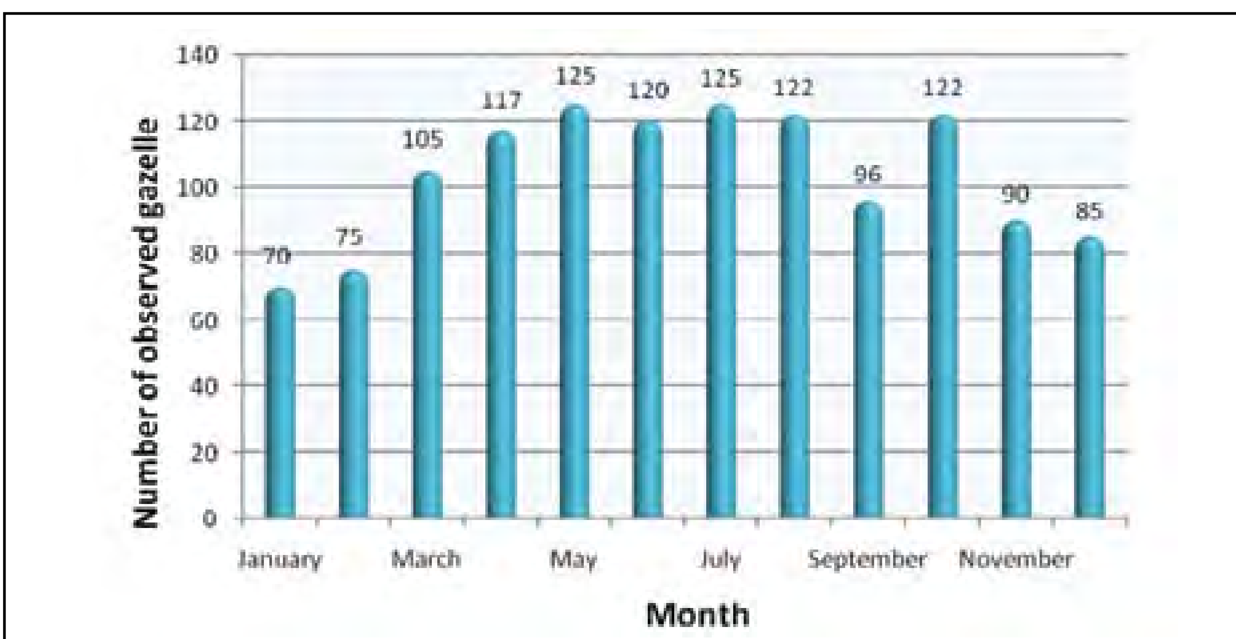


Fig (7.6) Number of Gazelles observed in Elba PA during 2008

- **Ibex and Barbary sheep** continued their increase in Elba, reaching more than 200 individual during 2008.

- **Lappet-faced vulture** was monitored in Elba protectorate during 2008; its observed number ranged from 4 - 16 birds monthly. **Egyptian vulture** was observed with range fluctuate between 12 -42 birds monthly.

- **Bird monitoring:** more than 200 bird species were monitored during 2008, with observance of at least one million birds in Zaranik, Brullus, Omayed, Ahrash, Ashtoum El-Gamil, Siwa, Ras Mohamed, Sallouga and Ghazalla, Allaqi, Wadi Gemal, Elba, and Northern Islands of Red sea. **Corn crake** which is considered endangered specie had shown an increase in Zaranik, reaching to more than 6000 bird during autumn and spring migration. **Sooty falcon *(Falcon concolor*)** in Wadi Gemal is also globally endangered specie, its numbers ranged between 300 - 340 birds, with a remarkable increase in their nests with about 94 nests during 2008 compared to 73 nests during 2004.

- **Aquatic birds** were observed both in coastal and inland lakes reaching more than 50 000 during 2008. Little egret was observed in more than 50 sites in Damietta and Fayoum with numbers exceeding more than 30 000 birds. In Zaranik more than 70 000 birds were recorded, representing 104 species during autumn migration, among which more than 30 000 birds belong to quail species. In addition to monitoring of different species in different areas as follows: 33000 birds belong to 40 species observed in Ashtoum El-Gamil, 28000 birds belong to 117 species observed in Brullus, 8000 birds belong to 50 species observed in Wadi Rayan; whereas 150 000 birds belong to 36 species observed in Ras Mohamed including149 422 from white stroke bird in addition to the observance of one bird belong to the rare **Namaka Dove** for the first time in South Sinai and Wadi Al-Arish.

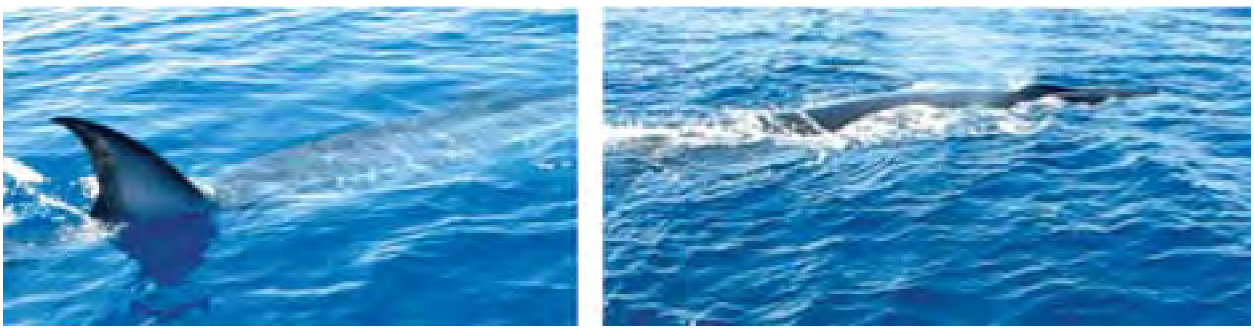
- **Crocodiles** in Lake Nasser were also monitored with the assistance provided from IUCN and an expert from Florida University, where 280 crocodiles were recorded.

- **Marine turtles** Monitoring programs in the Red Sea and Mediterranean are considered one of the most successful programs. Four species of turtles (Green, loggerhead, hawksbill and leather back) were observed in more than 20 sites along coasts and islands. El-Zabargad Island in the Red Sea had recorded a high percentage of green turtle nesting with about 7000 nests during 2008 compared with only 438 nests during 2001; whereas El-Giftun Island is rich with hawksbill nesting where255 nests were observed during 2008 compared with only 21 nests during 2001. Zaranik Protectorate is on the richest areas with Marine turtles in the Mediterranean.

- A total of 35 **whale sharks** were observed during 2008 in Dahab, Sharm El-Sheikh, Hurghada, Kosseer, Marsa Alam, Port Ghalib, Sayal Islands. About 50 dugongs were observed in 15 sites

in the Red Sea. There is also remarkable increase in numbers of spinner dolphins especially in Samadi area. Fin whale (about 17 meter long) was observed for the first time near Gamsuah along the Mediterranean coast in addition to the observance of dugong in the Red Sea, Marsa Alam and Shalateen.

- (Sei whale *Balaenoptera borealis*) belongs to (Balaenoptiidae) family, endangered with extinction, observed for the first time at Elba Protectorate. (Picture 7.1)



Pic (7.1) Sei whale

7-2-4 Red List of Endangered Species

This indicator relays on the applicable lists from IUCN and other related conventions (e.g. CITES), it is concerned with extinct species, endangered species and least vulnerable species. Database that was established by BIOMAP Project, including approximately one million records collected at different times and locations from Egypt were used in the evaluation. . Egypt was divided into squares according to longitudes and latitudes, each square with an area of 4.2 km², with total area of 227446. The extent of distribution of each species was determined according to individuals' occupancy of each species at different times. An advanced prediction program was applied based on information collected from satellite pictures, radar topographic maps, geological map, and actual distribution of each species. (Map 7.2 & 7.3)

Map (7.2) Occupied area by individuals of a species

Map (7.3) Actual distribution of the species

During 2007 the red list was published including mammals (111 species), insects mainly butterflies (63 species) and *odonata* (40 species), in addition to two plant families *Apocynaceae* (22 species) and *Euphorbiacea* (51 species).

Based on the above, the following actions were taken:

- Continuation of monitoring and assessment programs of endangered species
- Law enforcement , prevent hunting and trading of endangered species
- Studying genetic structure of some important species
- Participation of local communities in conservation activities
- Joint coordination between national and international agencies to reduce impacts of climate change.

During 2008 setting Red List for species of both, Primulaceaa (9 species) and *Amaranthaceae* (25 species) were completed. Most species of the first family concentrated in St. Catherine Mountain in South Sinai and the northern coast of Mediterranean, where its endangered species represent 34%, critically endangered represent 11%, and the rest species with data deficient for assessment. (Fig 7.7)

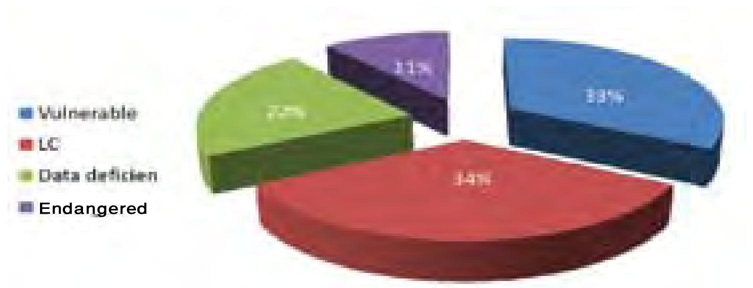


Fig (7.7) IUCN red listing of Primulaceaa Family

With regard to *Amaranthacea*, 4 species (17%) are endangered, 2 in critical status, 11 less threatened and the remaining with data deficient. Currently, efforts are undergoing to assess other groups including medicinal plants, birds, reptiles, and some insects' families. (Fig 7.8)

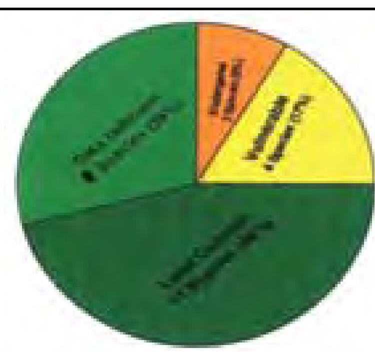


Fig (7.8) IUCN red listing of Amaranthaceae Family

Our previous information about endangered species (134 faunal species and 82 floral species) were not accurate, as recent studies proved that endangered fauna and flora species are much more , and require much efforts during the coming few years. It is noteworthy that all efforts made by IUCN over the past 30 years, represent only 10% of known species.

7-2-5 Black list (Invasive species)

This indicator reflects the extent and spread of invasive species and measures taken to limit their spread.

During 2008 number of invasive species reached to 110 species. The recorded species including (14) aquatic plants, terrestrial plants (7), crustaceans (16), insects (14), spider (1), fish (31), mammals (3), birds (3), reptile (1), amphibian (1), viruses (8), nematodes (3), mollusks (4), echinodermates (1), coelenterate (1) and polychaetes (2).

The decrease of invasive species during 2008 compared to previous year is due to the fact that the preliminary list was sent to experts for revision to ascertain the accuracy of registered invasive species ,so some species were deleted upon their recommendations ; and efforts are groining on to insure accuracy of the current list.

A National Action Plan was prepared depending upon national requirements and priorities, reviewing existing policies, legislations and concerned agencies; in addition to encourage cooperation with different sectors, enhance public awareness, participation of different stakeholders, and collaboration with neighboring countries. However, exerted efforts during 2008 were still limited in spite of the fact that invasive species represent real threats to the Egyptian ecosystem, economy and human health. Avian flu is a good example of invasive species, together with water hyacinth (*Eichhornia crassipes*), freshwater crayfish (*Procambarus clarkii*) and red palm weevil; as their estimated damage may cost billion LE.

Exerted efforts were focused on the current status of invasive species in terms of their identification, determine economic cost of some species, combat bird flu, gather available legislations and participate in training courses and conferences. Combating Invasive species is beyond our current potentials in terms of human, financial and technical resources, and requires participation of all concerned agencies.

Table (7-1) Provisional list of Invasive species in Egypt

S	Common name	Species	Arabic name
Aquatic plant			
1	Water hyacinth	Eichhornia crassipes	نبات ورد النيل
2	Hypnea (alga/seaweed)	Hypnea musciformis	طحلب هايبنيا
3	Azolla Fern azolla Pacific azolla Pacific mosquitofern	Azolla spp (Azolla filiculoides)	نبات الأزولا – سرخس الباعوض
4	Caulerpa, Killer alga	Caulerpa taxifolia (algae)	طحلب كوليربا تكسيفليا
5	Grass Caulerpa	Caulerpa prolifera (Green algae)	طحلب كلربا برولفيرا
6	Red tide	Gymnodinium mikimotoi Karenia mikimotoi	طحلب كارينيا ميكيموتوى – المد الأحمر
7	Feathered Water Fern	Azolla pinnata (aquatic plant)	سرخس الماء
8	Fairy moss Mosquito Plant Carolina Mosquito Fern	Azolla caroliniana	سرخس باعوض كارولينيا
9	Sea lettuces	Ulva ohnoi	طحلب خس البحر
10	Tape-grass American Wildcelery, Eel Grass	Vallisneria spiralis (weeds) Vallisneria Americana	العشب الشريطى
11	Brown Algae	Stypopodium schimperi	الطحلب الأسمر
12	Red Algae	Antithamnionella elegans	
13	Foxtail Flatsedge, Mat Sedge	Cyperus alpecuroids	
14	Star- fruit	Damosonium alisma	
Land plant			
15	Giant reed	Arundo donax	الغاب البلدى - غاب هندي
16	Mesquite, ironwood	Prosopis juliflora	نبات المسكيت - شجرة الغاف – نبات السول
17	African foxtail grass	Pennisetum ciliare	حشيشة الفيل
18	Indian bassia – Quail plant	Bassia indica	

19	broad-leaved pepperweed broadleaf pepperweed	Lepidium latifolium (herb)	نبات الثفاء/ حب الرشاد
20	Shrubby morning glory Bush morning glory	Ipomoea carnea (plant)	زهرة مجد الصباح/ نجمة الصباح/عوير
21	Narrow Leaved Aster Annual Saltmarsh Aster Swamp Aster	Aster squamatus (plant)	نبات زهرة النجمة
DECAPODA, DECAPOD CRUSTACEANS			
22	The freshwater crayfish	Procambarus clarkii	أستاكوزا المياه العذبة
23	White River Crawfish	Procambarus zonangulus Procambarus acutus	أستاكوزا النهر البيضاء
24	Green crab	Carcinus maenas	الكابوريا الخضراء الأوروبية
25	Blue crab	Callinectes sapidus (crab)	الكابوريا / السرطان الأزرق
26	Portunid crab Indo-Pacific Swimming Crab	Charybdis hellerii (crab)	الكابوريا السابحة
27	Tiger Prawns & Endeavour Prawns	Marsupenaeus japonicus	جمبرى النمر/ القريدس/ الروبيان العملاق
28	Ginger prawn Speckled prawn	Metapenaeus monoceros	الجمبرى الخشن
29	Peregrine shrimp	Metapenaeus stebbingi	الجمبرى الأبيض
30	Green tiger prawn	Penaeus semisulcatus	ربيان النمر الأخضر/ الجمبري السويسي
31	Penaeid prawn	Trachysalambria palaestinensis	
32	Coastal mud shrimp Red Prawn	Solenocera crassicornis Solenocera subnuda	الجمبرى الأحمر/ جمبرى الطين الساحلى
33	Snapping shrimps	Alpheus audouini	
34	Snapping shrimps	Alpheus migrans	
35	Pebble crabs	Leucosia signata	
36	Pebble crabs	Myra subgranulata	
37	Giant river prawn	Macrobrachium rosenbergii	الروبيان النهرية الكبيرة
Land invertebrate - Arthropoda (Insect)			

38	Mediterranean fruit fly	Ceratitis capitata	ذبابة الفاكهة
39	Khapra beetle	Trogoderma granarium	خنفساء الحبوب الشعرية
40	Sweet potato whitefly	Bemisia tabaci	ذبابة البطاطس/ الطماطم البيضاء
41	Castor bean whitefly	Trialeurodes ricini (Misra 1924)	ذبابة الخروع البيضاء
42	Red palm weevil	Rhynchophorus ferrugineus	سوسة النخيل الحمراء
43	pink hibiscus mealy bug	Maconellicoccus hirsutus	البق الدقيقي/ البق الدقيقي القرنفلي
44	Encyrtid Wasp	Anagyrus kamali	
45	Southern house mosquito	Culex quinquefasciatus (insect)	الباعوضة خماسية الخطوط بعوضة كيوليكس
46	potato tuber moth	Phthorimaea operculella	فراشة درنات البطاطا
47	Egyptian cottonworm	Spodoptera littoralis	دودة ورق القطن
48	peach fruit fly, Guava fruit fly	Bactrocera zonata (insact)	ذبابة الجوافة/ ذبابة ثمار الخوخ
49	leopard moth, wood leopard	Zeuzera pyrina (insect)	حشرة حفار ساق التفاح
50	Ash whitefly Pomegranate whitefly	Siphoninus phillyreae (insect)	ذبابة الرمان البيضاء
51	Leaf-mining fly Chickpea leaf miner	Liriomyza cicerina (Insect)	حشرة حفار أنفاق ورق الحمص
Land invertebrate - Arthropoda - Arachnida (Acari)			
52	Glasshouse spider mite Two spotted spider mite Carmine spider mite Red spider mite	Tetranychus urticae Koch	سوسة العنكبوت الاحمر العادى
Vertebrates (Bony fishes)			
53	Common carp	Cyprinus carpio	سمكة المبروك الشائعة
54	Nile perch	Lates niloticus	سمكة قشر بياض
55	Western mosquito fish	Gambusia affinis	سمكة الجمبوزيا
56	Mozambique tilapia	Oreochromis mossambicus Oreochromis korogwe Tilapia mossambica	سمكة بلطى موزمبيقى

57	Large mouth bass	Micropterus salmoides	سمكة القاروص كبيرة الفم
58	Silver Carp	Hypophthalmichthys molitrix	سمكة المبروك الفضى
59	Grass Carp	Ctenopharyngodon idella	سمكة مبروك الحشائش
60	Bighead Carp	Hypophthalmichthys nobilis Aristichthys nobilis	سمكة المبروك كبير الرأس
61	Black or Snail Carp	Mylopharyngodon piceus	المبروك الأسود
62	Sabaki tilapia	Oreochromis spilurus	بلطي سبيلورس
63	Red Tilapia	Oreochromis mossambica	البلطي الأحمر
64	Blue tilapia	Oreochromis aureus	البلطى الأزرق
65	Slender yellowtail kingfish Shrimp scad	Alepes djedaba	الدراك أصفر الذيل
66	Bignose Shark, Knopp's Shark	Carcharhinus altimus	القرش ذو الأنف الكبيرة
67	Gobies	Coryogalops ochetica	
68	Karenteen Seabream, porgies	Crenidens crenidens	دنيس
69	Fringelip Tonguesoles	Cynoglossus sinusarabici	
70	Spotback herring & Herrings & Sardines	Herklotsichthys punctatus	السردين منقط الظهر
71	ponyfishes	Leiognathus klunzingeri	
72	Keeled mullet	Liza carinata	أسماك البورى
73	African sailfin flyingfish	Parexocoetus mento	السمك الطائر
74	Fourlined terapon	Pelates quadrilineatus Holocentrus quadrilineatus	
75	Bartail flathead	Platycephalus indicus	
76	Narrow-barred Spanish Mackerel	Scomberomorus commerson	أسماك الماكريل الأسبانى/ الكنعد
77	Silver sillago	Sillago sihama	سمكة حاسون
78	Small-scaled terapon	Terapon puta	
79	Broad-Banded Hardyhead Hardyhead silverside, Whitebait	Atherinomorus lacunosus	سمكة بزري كبيرة
80	Karateen Seabream	Crenidens crenidens	سمكة الدنيس

81	Spotback Herring, Spotted Berring, Spotted Herring	Herklotsichthys punctatus	سمكة الرنجة المنقطة
82	Bar-tail flathead	Platycephalus indicus	سمكة الوحره
83	Channel Catfish, Graceful Catfish	Ictalurus punctatus	سمك القط، قرموط القنوات، سلور القنوات
Mammal			
84	House mouse	Mus musculus	الفأر المنزلى
85	Black rat Ship rat	Rattus rattus	الفأر الأسود
86	House shrew Asian musk shrew	Suncus murinus	زباب المنزل
Birds			
87	Cattle Egret	Bubulcus ibis	أبو قردان، بلشون القطعان
88	Rock Dove Rock Pigeon	Columba livia	الحمامة البرية، حمام دحل
89	Indian House Crow	Corvus splendens	غراب المنزل الهندى
Reptile			
90	Red- eared slider	Trachemys scripta	السلحفاة ذات الأذن الحمراء
Amphibian			
91	Cane toad	Bufo marinus	الضفدعة الأسترالية
Micro- organism			
92	bunchy top virus	Banana bunchy top virus	فيروس تورد القمة
93	Rinderpest virus	Rinderpest virus	فيروس طاعون البقر
94	Plum pox virus, PPV, Sharka disease	Potyviruses: Potyviridae	فيروس جدرى الخوخ، مرض الشاركا
95	Banana streak virus	Banana streak virus, Badnavirus	فيروس تخطيط الموز
96	Cucurbit yellow stunting disorder virus	Crinivirus CYSDV	فيروس التقزم الشاحب
97	Squash leaf curl virus, SLCV	Begomovirus	فيروس تجعد أوراق الكوسة
98	Faba bean necrotic yellows virus		فيروس التقرح الأصفر

99	Avian flu virus – H5N1		فيروس انفلونزا الطيور
Nematodes			
99	Rat-lung Nematode	Angiostrongylus malaysiensis	دودة رئة الجرذ الخيطية
100	Rice white tip nematode	Aphelenchoides besseyi	نيماتودا الأوراق والبراعم
101	Soybean Cyst Nematode	Heterodera glycines	نيماتودا فول الصويا
Molluscs (Gastropoda)			
102		Helisoma duryi	
103	Blood fluke planorb	Biomphalaria glabrata	قوقع بيومفلاريا جلبريتا
104	Blood fluke planorb	Biomphalaria alexandrina	قوقع بيومفلاريا الكسندرينا
105		Bulinus truncates	قوقع بولينس ترنكاتس
Invertebrate (Echinodermata)			
106	Crown of thorn starfish	Acanthaster planci	نجم البحر الشوكى
Coelenterata, Cnidaria (Jellyfish)			
107	Indo-Pacific nomadic jellyfish Mediterranean medusa Nomad jellyfish	Rhopilema nomadica	قنديل البحر روبيليما نومادیكا
Annelids (polychaetes)			
108		Pseudonereis anomala	
109	Fouling serpulid worm calcareous tube worm	Hydroides elegans Protohydroides elegans Uchinda	

7-2-6 Resilience ability

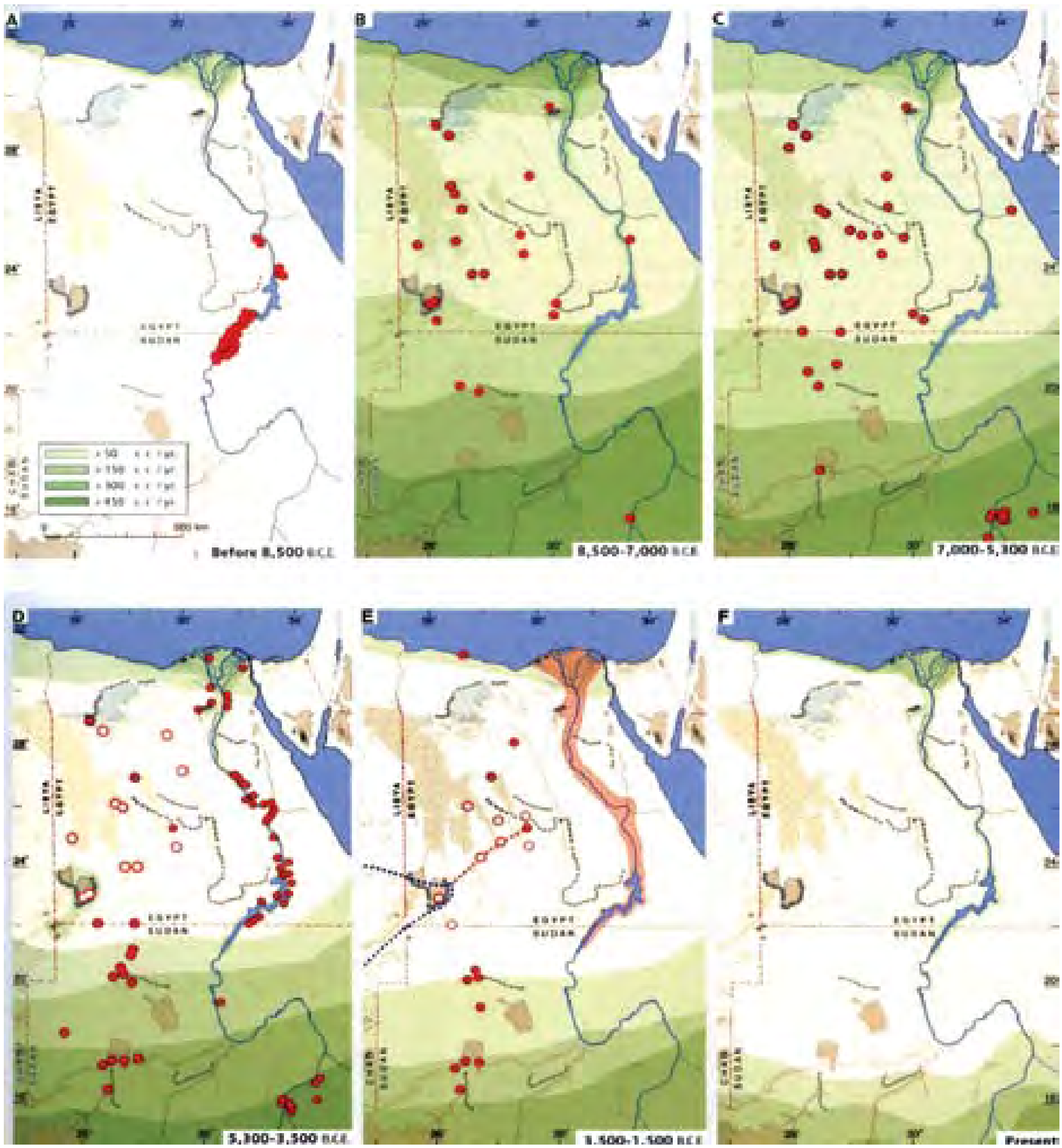
This indicator requires monitoring of all climate phenomena such as rainfall and its relation with green coverage; in addition to climate change and different human activities that can affect Resilience ability, habitat loss, movement of animals and plants to other appropriate places (such as movement of certain plants with different densities to higher areas in Elba Mountain and South Sinai Mountain; while shriveling in lower areas due to the very arid climatic conditions).

Different studies of climate change impacts on various Egyptian ecosystems (arid, coastal and marine, mountains) were collected. In addition to mainstream activities related to climate change within work programs of CBD and coordinate between Climate Change and Desertification Conventions through (GEF Project on capacity building to monitor and report multi environmental conventions known as Rio Conventions),with focus on the following :

- Determining most vulnerable sites,
- Mainstreaming mitigation and adaptation measures into biodiversity activities
- Assessing threats and potential impacts on biodiversity
- Determining and approving monitoring programs on the most likely vulnerable sites by climate change.
- Enhancing scientific tools and practical information about responding to climate change impacts on biodiversity including its impacts on social, economic and cultural approaches.
- Involving stakeholders in decision making related to impacts of climate change on biodiversity.
- Take appropriate measures to deal with and monitor impacts of climate change on biodiversity

Studies carried out by experts and scientists interested with different fields of paloecology, archeology, biology and geography (Bubenzer,et al 2008) had shown that Egypt's climate had changed greatly over the last

10 000 years, as it turned gradually from wet climate (rainfall was more than 300 mm/year) to arid climate (less than 50 mm/year) which is prevailing till now. During these rainy ages, vegetation cover was enough for human being and his cattle that he brought from the north (Syria now). Human relationship with his surrounding environment was intimate where many animals like giraffes and elephants were living at that time, then disappeared later on due to the arid climate; human relationship with his environment deteriorated leading people to migrate where water exists, thus history of settled civilization began. (Map 7.4)



Map (7.4) Climate Change in Egypt During the last ten thousand years

The following procedures were recommended for mitigation and adaptation with climate change to achieve sustainable development:-

1- The International Road:

It is recommended that the international road along the Mediterranean will be the main front in dealing with the expected rising of sea level, and directing all development activities during the next 50 years south this road.

2-National Plan for Land-Use:

National Plan for Land Use should consider the expected impacts of climate change; infrastructure should be away from the coast by 1 km, and focusing on the Western desert in future developmental activities. All future developmental projects must be committed to include the expected impacts of climate change within their strategic environmental impact assessment studies.

3-Conservation of Mountain Areas:

Mountains in Egypt represent less than 1% which considered the strategic reserve for biodiversity (Elba and South Sinai Mountains).

4-Reconsider existing and future network of Protected Areas:

To deal with expected impacts of climate change on human settlements and biodiversity.

5-More Rehabilitation and Restoration Programs for long-lived trees such as acacia and mangroves

6- Conducting more Scientific Researches on genetic resources of inhabiting plants in arid habitats particularly medicinal plants that can resist drought, diseases and require less amount of water. Identifying appropriate measures follow up procedures, traditional knowledge, appropriate technology transfer, capacity building, development and application of ecosystem and precautionary approaches.

7-More marine Protected Areas along the Mediterranean and conducting scientific researches in deep waters.

8-Implement Marine Culture Program, due to the fact that most of current fish produced from freshwater fish farms.

9-Mainstream biodiversity activities within climate change activities.

10-Using modern awareness tools to disseminate information and raise public awareness such as, websites, clearing-house mechanisms, and environmental forums.

7-2-7 Socio-economic status of Biodiversity

MESA has prepared several socio-economic and cultural studies about biodiversity by using models of Protected Areas that represent different ecosystems; such as Omayed Protected Area (representing desert ecosystem) that provides agricultural activities estimated with 33 million LE annually and rangelands with revenue valued 8 million LE annually. El- Brullus Protected Area (representing wetlands) providing services for more than 350 000 person like fishing which estimated with billion and 168 million LE; while agriculture, rangelands, salt extraction, and reeds providing services estimated with 200 million LE annually. Services provided by marine ecosystems (Red Sea) are so variable and estimated with hundreds billion pounds annually, they include coral reefs,

mangroves, islands, beaches, sea grass, fish, reptiles, birds and marine mammals.

Local communities include tribes of Bedouins in Sinai, (Ababda, Bishariah and Rashida) in the Eastern Desert; and (Sons of Ali and Barber) in the Western Desert. Their traditional knowledge includes all sciences and experiences in memories of local communities, represented in their daily life activities such as agriculture, fishing, grazing, folklore dances, customs and traditions, languages and natural tools derived from plants and animals. The importance of this traditional knowledge is the experiences provided for new generation about life styles of old generation and their adaptation with environment. They also provide practical solutions for problems facing man in dealing with environment to ensure human survival depending upon his understanding of various integration methods with environment.

Therefore, Egyptian government has paid special attention for protecting and documenting all traditional knowledge to include them while preparing legislations through series of workshops. Traditional knowledge of large numbers of plants' species had been recorded. They included those in South Sinai (38), North Sinai (45), Halayeb (19), Western Desert (13), and Eastern Desert (16).

A draft law has been prepared for protecting traditional life, together with a national strategy for medicinal plants that depend on local communities for their implementation.

7-2-8 Threats

This indicator requires identification of all threats affecting biodiversity, whether natural or human, underlying factors of these threats and their negative impacts on life style, social and economic development.

Biodiversity is facing many threats including population growth, hunting, removal of wild plants particularly medicinal plants, cutting of trees in many important habitats, globalization and its negative impacts on exploitation of biological resources, limited human and financial resources, habitats' deterioration due to pollution resulting from agricultural and industrial activities and habitats' fragmentation because of large projects. In addition to the intentional introduction of many fauna and flora species to Egypt over the last two centuries to increase agriculture, animal and fish production; due to their economic significance such as cotton, fruits, fish, chickens, and cattle. This resulted in neglecting many Egyptian species, became so rare and are about to disappear (agriculture genetic resources); while some other flora and fauna species were introduced unintentionally through (Suez Canal and bird migration), leading to the spread of many invasive species which negatively affects agriculture production (pests such as Red Palm Weevil), and aquatic habitats (water hyacinth, freshwater crayfish). Consequently, biodiversity suffers greatly from the introduction of these invasive species to Egypt.

Based on the above, it can be said that all ecosystems, habitats and plant species are no longer enjoying ecological balance; due to the fact that all habitats of Egypt whether wetlands, inland, agricultural, deserts or even mountains as well as deep habitats in the Mediterranean Sea had been greatly impacted by human interventions; with exception of the protected areas which represents about 15% of Egypt's total area, where many activities are executed to limit habitats' deterioration and biodiversity loss.

7-2-9 Protected Areas Management Effectiveness

This indicator includes number and size of Protected Areas including human resources, training and budget compared to international standards; in addition to assessment of Protected Areas management efficiency at the level of all Protected Areas, status of conservation and monitoring, education and public awareness programs, environmental impact assessment reviews, patrolling efficiency, environmental laws enforcement, Egypt's adherence to international conventions, performance of international cooperation projects and achieving sustainability of projects.

Egypt has 27 Protected Areas, covering 15% of Egypt's area; their employed staff reached about 650 employees compared to 4000 employees at the international level. 50% of staff received intensive training programs inside and outside Egypt, including biodiversity monitoring methods, Protected Areas management, use of modern techniques such as remote sensing, GIS in Protected Areas management, invasive species, preparation of management plans and public awareness programs etc. However, more training programs are required on how to attract investors and treat visitors to protected areas, preparation and implementation of investment projects inside protected areas in order to achieve partnership with civil society and business men, (Fig 7.9).

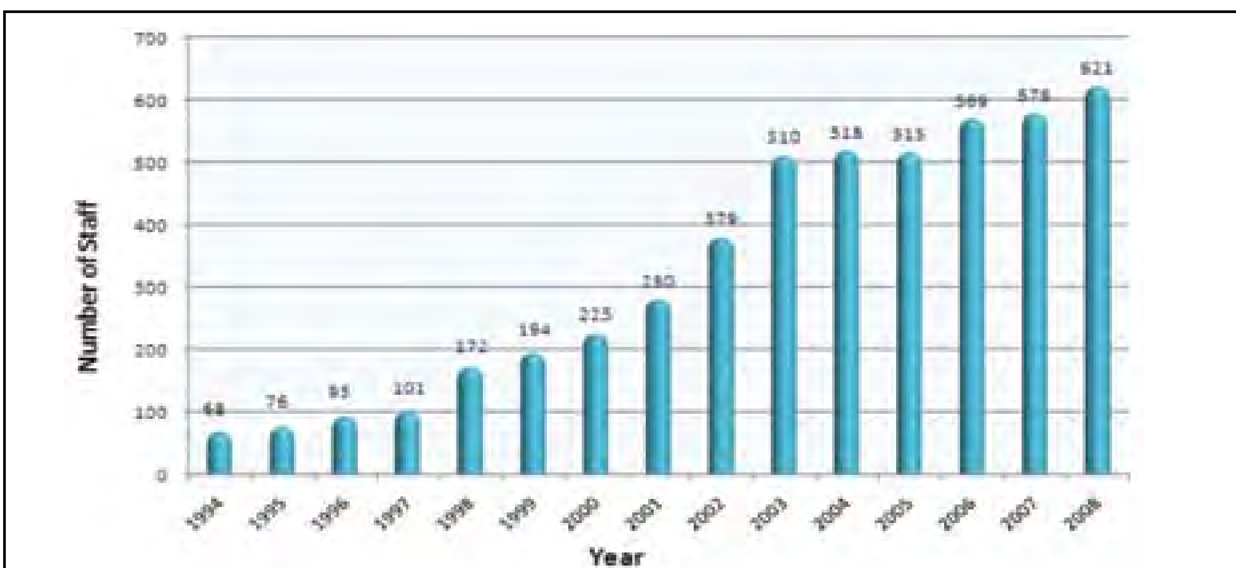


Fig (7.9) Increasing number of NCS staff from 1994 to 2008

With regard to financial expenditures, the governmental budget amounted 23.2 million LE during 2008 compared to 8 million LE during 2007 used in purchasing equipments, upgrading infrastructure in the Red Sea, South Sinai, Wadi Rayan and White Desert protected areas; in addition to establishing Biodiversity Information Centre and Natural History Museum in Sharm El-Sheikh; as well as finalizing the preparation of Salloum Gulf's file to declare it protected area. However, some protected areas are still suffering from shortage of human and technical resources as well as infrastructure such as Abu Galloum and Gilf El-Kabeer protected areas.

During 2008 a study was conducted on management efficiency of 4 protected areas, (Wadi Rayan, Qarun Lake, St. Catherine and Ras Mohamed). Assessment process included staff performance in implementing conservation, monitoring programs, communication and public awareness in addition to investment projects inside these four Protected Areas. Management plans were already finalized for 60% of Protected Areas in addition to economic plans for 3 protected areas as a start to lay down the base to achieve sustainable finance and development of Protected Areas. In addition to the above, 280 Environmental Impact Assessment studies were completed, review enforcement of environmental laws and environmental damage assessment, following up coordination with governmental and non-governmental agencies as well as Egypt's adherence to international conventions such as Biodiversity, Ramsar (wetlands), and Animal Migration (Fig 7.10).

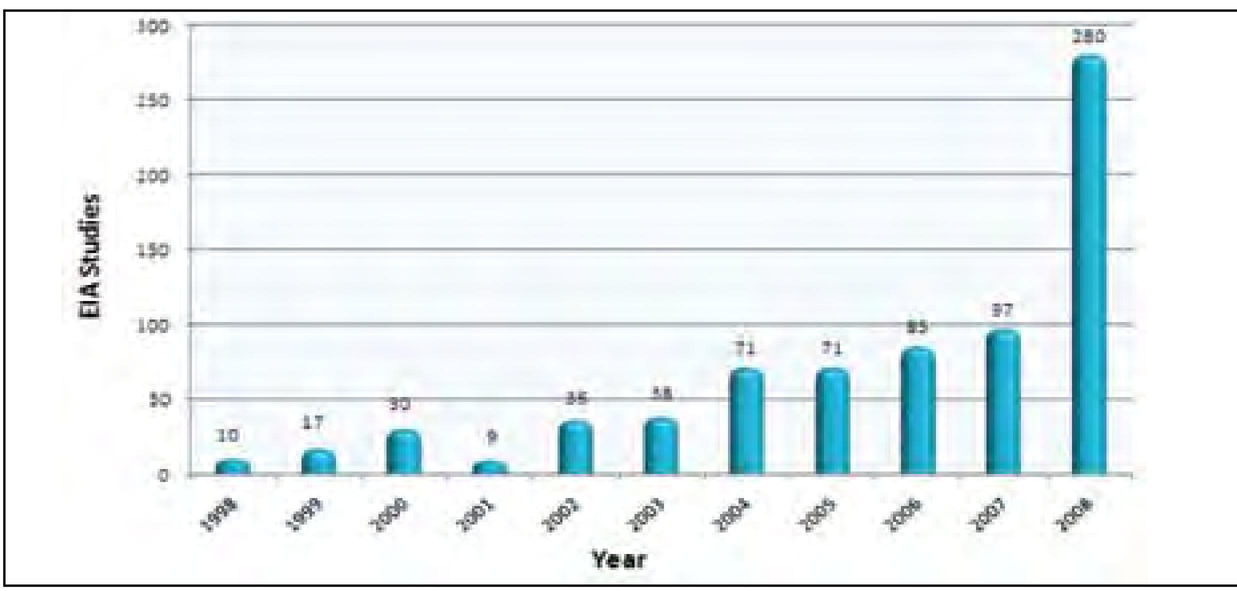


Fig (7.10) Increasing of EIA studies from 1998 to 2008

7-2-10 Special measures and procedures for Biodiversity conservation outside Protected Areas

- This requires continuing monitoring and assessment of biodiversity status, law enforcement, hunting and overgrazing prevention ; prepare policies and legislations to organize introduction of Modified Genetic Organisms , bio safety ,biological resources and their related traditional knowledge; coordinate with concerned agencies with international trade concerning illegal trade of endangered fauna and flora species (Ministries of Agriculture and Interior etc.) and conservation of biodiversity outside its natural habitats (ex-situ conservation).The following are some of the applied measures :

- Patrolling and law enforcement programs (day, night, marine and pedestrian patrolling) have shown continuous occurrence of violations in spite of applied legal procedures and assessment of environmental damages. Most of violations concentrated in boat accidents in coral reef areas (16 violations), oil pollution, illegal fishing, mining and quarries' violations, use of pesticides in agriculture, over collection of wild flora particularly medicinal plants, cutting trees for fuel, overgrazing, illegal use of lands in Protected Areas and constructions along exclusion zone of shoreline .

- Studying status of Genetically Modified Organisms (GMOs) in Egypt within a national framework concerned with safety handling, consumption and usage of (GMOs) through the Bio-safety project funded by GEF/UNEP. This project aims at preparing terms of reference(TOR) for implementing studies to identify status of living modified organisms (current status ,role of National Bio-safety Committee, related legislations , human capacities, experiences and financial potentials ,translation of bio-safety draft law into English , organizing a workshop in preparation for the first draft of Executive Regulation and participate in workshop of bio-safety projects in African countries).Dealing with licenses' requests "reviewing protocols of risk assessment", control and inspection "facilities that should be available at reference laboratories" in addition to communication and public awareness. The draft law has been prepared and approved by the Ministry of Justice prior its submission to People's Assembly and Shoura Council.

- Preparing a new draft law on "Access and Fair Benefit Sharing" of biodiversity and its resources, finalizing a Strategy on Medicinal Plants and improving partnerships with private sector and civil society. Establishment of National Biodiversity Museum at Sharm El-Sheikh is undergoing in addition to activation of Ecotourism Strategy in both Wadi Rayan (Wadi Hitan) and white Desert Protected Areas.

- During 2008, ex-situ biodiversity conservation efforts resulted in the success of captive breeding for several endangered species for the first time in Egypt. These efforts included

Oryxdammah and Arabian Oryx (four new births), Caracal, and porcupine. Cheetah was introduced for the first time since 40 years, in addition to breeding the fourth generation of Egyptian Gazelle. African turtles are also available in large numbers. The total number of individuals had reached 1469 animals compared to 113 previously, representing 17 species. As well as, medicinal plants, acacia trees, El Ombet and mangroves were cultivated successfully in several Protected Areas.

- Concerning Avian flu, the Ministry prepared a report including measures that were taken during 2008 to combat it through monitoring programs by examining 4150 samples of wild birds like (aquatic birds, herons, quails, sparrows, wades, and gulls).In addition to Ministry's efforts to transfer pig farms from Cairo, Kalyobiah and Giza Governorates, implement public awareness program, exchange experiences with other Arab countries, participate in preparing national plan for regional and international cooperation. In spite of the above mentioned efforts with all concerned institutions, avian flu represents a great danger in Egypt.

- Nature Conservation Sector has participated in many activities with the National Centre for Planning State Land-Uses to settle many disputes aroused as result of interventions among governmental agencies, investment projects related to agriculture, fisheries, tourism, mineral resources and new industrial cities.

- All available data about Egypt over 30 years at CITES have been examined, including Egyptian species registered at CITES, exported and imported species in terms of their quantities and the current status of international trade in endangered fauna and flora species.

This effort resulted in discovering that, Egyptian list combine 355 species including (352) fauna species among which 296 in annex"2" and 3 flora species only. After examining this list, it was found that registered species contain 43 mammals species only out of 120 species, 75 bird species only out of 480 migratory and endemic species, 28 reptile species only out of 112, 10 fish species only, 3 bivalves and the remaining majority belongs to sanitarians species (367) which includes most of coral reef species registered in Egypt, (Fig 7.11)

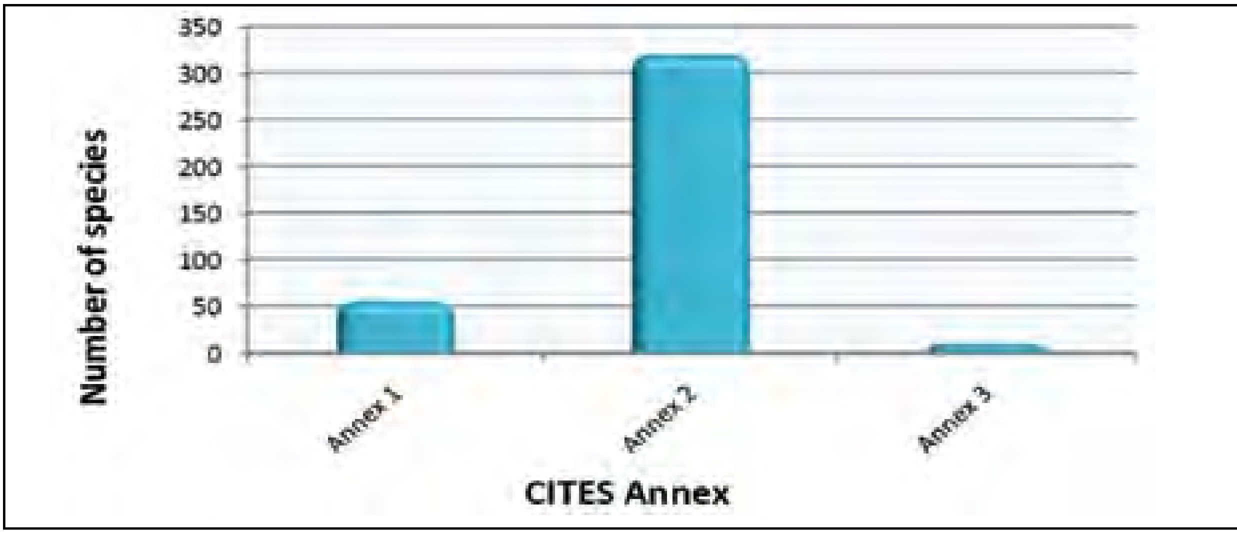


Fig (7.11) Number of Egyptian animals listed in CITES convention (352 sp.)

Previous information clarifies that there is an urgent need to reconsider Egyptian list as some species had disappeared completely like Hippopotamus and Oryxdammah. In addition that most of Egyptian mammals and reptiles are considered endangered species. Furthermore, there is no scientific basis for the Egyptian list as it almost includes all coral reefs species while many fish, mollusks and echinoderm species must be included.

By examining registered species over the past 30 years, it was clarified that registered species reached to 236 out of 355; wheras imported species reached to 61 only .List of exported species include 32 species registered in annex I, 181 species in annex II and 18 species in annex III.

Previous information clarifies that Egypt is one of the most important countries in the international trade of migratory species whether through direct export of its natural resources which are mostly endangered or through being a transit country for many species that come from Africa or being smuggled through illegal trade. The illegal smuggle of Gorilla and Chimpanzee which are listed in annex I have caused many problems with CITES Secretariat. In spite of all exerted efforts since early 2000 to form administrative and scientific committees to regulate and strict control over all Egyptian "seaports and airports", prohibit trading of these endangered species, inspection campaigns on hotels and bazaars selling these endangered species or their derivatives (leather and ivory handicrafts); however due to the limited qualifications and capacities of committees' members and customs' employees (mostly veterinarians) they require enhancement of their technical and institutional capacities ; as well as conducting scientific surveys on current status and trends of these endangered species, in order to issue exporting permits on a scientific basis. There is also a need to implement education and public awareness campaigns at all levels. Currently Nature Conservation Sector "NCS" affiliated to Ministry of State for Environmental Affairs "MSEA"

with its available scientific experiences is preparing lists of all endangered species and finalized lists of Mammals, butterflies and some plant families. However, this task needs further efforts beyond capabilities of NCS.

7- 3 Exerted Efforts

During 2008, Nature Conservation Sector's priorities were executed through plans based upon the following three pivots:

- Development and management of the existing protected areas and declaring new ones.
- Continuing assessment of biodiversity trends through environmental monitoring and updating information system.
- Supporting measures for biodiversity conservation through institutional reform, improving capacity building, partnership with civil society, media, marketing and sustainability of projects funded by countries and donors.

With regard to development and management of protected areas, patrolling and securing programs are already implemented, in addition to documenting protected areas boarders and finalizing all researches and field studies of natural protectorates which will be declared as natural protectorates in the near future (Salloum and Qattara Depression); as well as improve management efficiency of protected areas in Red sea and south Sinai protectorates, establishing Scientific and Administrative Center for Northern Island and Wadi Rayan protectorates , getting new equipments , devices and transportation means in addition to enhance communications, education and public awareness programs.

As for program of information, monitoring and assessment biodiversity; websites, clearing house mechanism and biodiversity forum are updated regularly. Preparation of a unified monitoring system for all protected areas, following procedures of combating bird flu, invasive species and bio-safety measures; as well as regular monitoring of captive breeding programs for endangered species.

With regard to biodiversity conservation supporting measures, on going projects were executed successfully, activate implementation of newly established projects , prepare more projects concerned with enhancing economic activities in protected areas to reach self-financing, launch implementation of bio-safety project in addition to Egypt's international and regional commitments ,drafting new legislation concerned with "Access and Fair Benefit Sharing" of biodiversity and its resources ,finalizing Medicinal Plants Strategy; improving partnership with civil society and private sector , Biodiversity Museum in Sharm El-Sheikh is almost finalized , activation and implementation of Ecotourism Strategy in Wadi Rayan (Wadi Hitan) and White Desert protected areas.

7-4 Future Vision

Next phase will focus on the following:

1. Achieve and support sustainable development of protected areas to realize economic and social development.
2. Integrate national activities to conserve biodiversity and decrease its loss rate (2010 target).
3. Enhance institutional, technical, legislative and executive capacities to conserve nature.

This will be achieved through the following main components:

- **Protection of biodiversity components** through enhancing biodiversity conservation.

- **Diversity of ecosystems and habitats with international importance,** through enhancing the existing situation of endangered species, habitat rehabilitation and restoration, and sustainable use of biological resources.

- **Address biodiversity threats,** through decreasing pressures arising from loss and deterioration of habitats, unsustainable use of biodiversity, control invasive species, and address potential negative impacts of climate change and pollution on biodiversity.

- **Preserve services and products derived from biodiversity** for human well-fair, through preserving capacities of ecosystems to sustain provision of their services and products.

- **Preserve cultural and social diversity** of local communities, through protecting their traditional knowledge, practices and rights to sustain their traditional knowledge.

- **Access and fair benefit sharing** on the use of genetic resources, through ensuring that all genetic resources transferred in accordance with Biodiversity Convention and other related international conventions.

- **Provision of appropriate financial resources,** through enhancing financial, human, technical and technological resources to conserve biodiversity.

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Chapter 8
Afforestation, forests, green belts and landscapes

8-1 - Introduction

Ministry of State for Environmental Affairs and Egyptian Environmental Affairs Agency organize and support many activities for implementing afforestation ,green belts , landscapes and cultivation of timber trees by the safe usage of treated waste water .These trees and green landscapes contribute in environment protection as they absorb amounts of CO^2 resulted from different development activities .

8-2 Exerted Efforts

From the respect of using vegetation coverage as a method to mitigate extent of Carbon dioxide emissions, Ministry of State for Environmental Affairs executes many activities to reduce negative effects of pollution on environment as follows:

8-2-1 Green belt around Greater Cairo

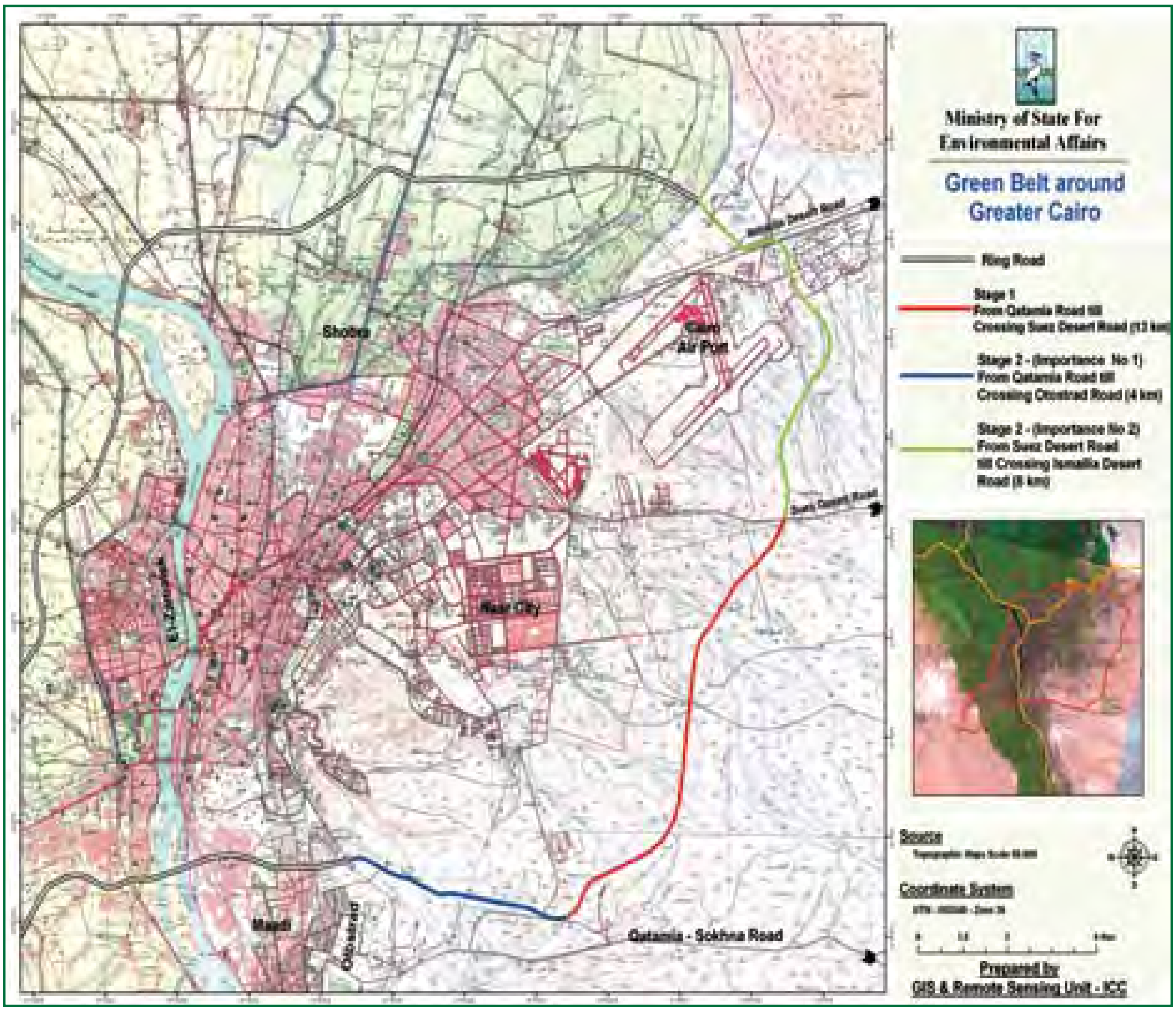
This project aims at planting condense green belt of trees around the Ring Road of Greater Cairo with length of 100 km by planting 500 thousand trees to benefit from treated waste water instead of its spending uselessly in desert , provide youth with job opportunities and to achieve economical revenue.

The project started in 2005 and by 2008, about 70 thousand trees were planted. Daily and permanent follow up of trees' irrigation, looping and maintenance of drip irrigation networks carried out. Trees of Bougainvillea were added to the first row to grant aesthetics appearance with the various colors of flowers (pic. 8-1)

According to the protocol of implementing second phase of the project between EEAA and Military Works Department which include plantation of 12 km in which 50 thousand trees will be planted (map 8.1).

Pic. (8-1) Flowering of trees in the Green belt

2008 witnessed finalizing the establishment of two main reservoirs for treated waste water in addition to installation of 160 mm pipes for discharge line. Work is going on to flatten land in preparation to start plantation.



Map (8-1) Green belt around Greater Cairo

8-2-2 Plantation of Timber trees by using treated waste water

By the end of 2007 the planted forests area reached to 11176 Feddans in 34 forests in 17 governorates. In 2008 work is going on to plant 16984 Feddans in 27 forests in 8 governorates (table 8-1)

Table (8-1) : Timber trees currently under plantation and irrigated by treated waste water in 2008

Governorate	Plants› discharge (thousand m^3 / day)	Forests› number	Areas under plantation (Feddan)
Minia	110	2	1400
Beni Suef	41	2	560
Assuit	223	4	4936
Sohag	416	6	3218
Qena	274	10	5070
Luxor	55	1	200
Red Sea	94	1	800
Matrouh	50	1	800
Total		27	16984

Source : Ministry of Housing ,Utilities and Urban Development .

Through the pilot project of Integrated Management of Water Resources (LIFE) implemented by MSEA in Luxor on 10 Feddans and finalized this year; plenty of botanical species producing bio-fuel mentioned in the Egyptian Code issued in 2005 were planted by using treated waste water such as (Jatrova – Jogoba) linen , Fodder Sorghum, some of ornamental plants among which Roses ,Bird of Paradise ,Duranta, Mulbery, Affrican Mahogany, Dalbergia Sisso and Olive . Economical evaluation for many of these species were carried out ; in addition to training 17 genders on all activities on methods of using this kind of water starting from planning and implementation of irrigation networks till production and effects of irrigation with this kind of water on the environmental aspect of the area .

8-2-3 Afforestation and plantation of green landscapes and gardens during 2008

a- During celebration of World Environment Day in 5th June 2008 , its logo was (Towards Less Carbon) EEAA granted and planted 200 thousand tree for all governorates, youth participated in that celebration by planting these trees in their governorates. 22 botanical species were selected carefully for their economical value and appropriateness for ecological conditions (soil and climate), (pic. 8-2).

Pic. (8-2) Youth Participation in Planting Trees in Hurghada during World Environment Day

b- In the framework of developing some schools in the neediest areas under the auspices of First Lady of Egypt ,to be implemented in educational departments of (El-Marg ,El-Salam,El-Nahda and El-Zatoun) in coordination with Heliopolis Services Development Society by planting trees , bushes ,climbing plants, internal indoors plants and green areas . In 2008 Execution of 60 schools were completed by planting 53 thousand trees and an area of 21 thousand m^2 of green areas. 11 schools of these schools acquired certificate of Quality and Accreditation from the National Authority for Ensuring Education Quality and Accreditation (pic. 8-3).

Before Planting After Planting

Pic. (8-3) Hadayek El Zeitoun Primary Joint School

c- To urge spirit of donation and belongingness among youth in cooperation with some NGOs, Arab Union for Environment and Youth affiliated to Arab League participated in planting and butifiying Nweaba port as it is considered to be one of the most important marine access , in context of the Milliard Trees Campaign implemented during the first International Environmental Camp which held in July 2008 Nweaba City- South Sinai Governorate.

d- Plantation and butification of some universities, Faculties and institutes among which El-Mansoura and Tanta Universities in addition to Faculty of Translation affiliated to El-Azhar University ,Faculty of Home Economics affiliated to Helwan University , Faculty of Essential Education affiliated to El-Fayuom University and Education Institute for Girls in El-Ayatt .
e- Afforestation of many NGOs among which El-Salam Society for Environment and Development in El-Mansoura , El-Nour Waelamnal for Blinds and Christian Youth Society in Aswan . Plantation in front of mosques and inside monasteries and hospitals, among which Nasser Institute, El-Rasoul Mosque in Embaba , Coptic archbishopric for Orthodox in Tama ,in addition to establishment of a garden in the Care Center for Children with Special Needs .

f- Afforestation of many local units and villages such as El-Shobek El-Sharky in El-Saf ,El-Gifgafa village in north Sinai Governorate , El-Othmaniya Village - El-Badary Center in Asuitt, butification of Basyon City , also plantation and establishment of gardens on covered drainages and canals such as villages of Meat Ghamr , Balmon, Deqernes Center in Dakahlia , Al-Osiratt , El-Monshaa in Sohag . EEAA granted these local centers with 32 thousands trees.

g- Establishment of governmental and NGOs nurseries in many governorates with areas ranged from 1-10 Feddans for each nursery. This year EEAA participated in the establishment of 7 nurseries for the production of timber trees and ornamental plants among which Nursery of Environment Protection and Development Society in Baer El-Abd in North Sinai governorate, in addition to the expansion of the central

Pic. (8-4) Development of EEAA central nursery in Katamia

Pic. (8-5) Development of EEAA Children Garden h- Suzan Mubark›s Garden for Families in New Cairo , established on an area of 60 Feddans is considered to be the newest garden in Egypt . During 2008 continuation of planting green areas, palms, palms-like ,trees, bushes, climbing plants and ground cover in that garden. About 98 species of different botanical families are planted in the garden. (Pic.8-6)

Pic. (8-6) Entrance of Suzan Mubarak's Garden

I – Due to the importance of conserving Sinai distinguished genetic resources and biological diversity and to the importance of botanical gardens, Ministry of State for Environmental Affairs established the Botanical Peace Garden in Sharm El-Sheikh on an area of 33 feddans ;in which genetic resources of medical and aromatic plants of South Sinai governorate were collected and raised starting from 2006. Plantation of green areas, trees, bushes, climbing plants and different kinds of palm, olive and cactus were conducted in the garden. This year 2008 witnessed the addition and development of new botanical species (pic.8- 7).

Pic. (8-7) Botanical Peace Garden in Sharm El-Sheikh

j- During 2008, 145 schools were planted with 18200 trees and indoor plants in different governorates, in addition to plantation of green landscapes in these schools. Due to the numerous positive effect of planting roofs in purifying air in cities, improve the atheistic appearance and getting clean production, preserving environment from pollution and stimulate the spirit of team work, five schools' roofs were planted . (Pic.8-8).

k- In accordance with Mubark-Kaul Initiative which aims at providing practically and scientifically qualified technicians on methods of production and technology coping with needs of labor market. As this kind of technicians needed for forest plantation with treated waste water is rare and not available ,and with the expansion in planting forests by using treated waste water, particularly in upper Egypt , MSEA inaugurated training classes in Louxor Forest through which 25 students completed their study after 3 years of training and education .

8-3 Future plan till 2012

With the continuous increase in amounts of treated waste water and construction of new treatment stations in all parts of the country , MSEA gives great attention to programs of afforestation ,

Pic. (8-8) planting roofs of Ismail El-kabany Secondary School

plantation of green landscapes , green belts and timber forests irrigated by treated waste water , in addition to plantation of high economical revenue plants such as Jatrova – Jogoba which were mentioned in the Egyptian Code.

Efforts are going on to add more of green areas and trees to improve environment by condensing afforestation efforts and establishment of gardens and nurseries whether in old cities or in new urban communities for their healthy , environmental , touristic and aesthetic great benefits . MSEA is concerned with sustaining its programs of developing schools in the neediest areas in different governorates by planting them with green areas and afforestration.

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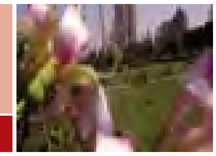
Part 4

Urban &Industrial Environment

Chapter 9
Environmental Development of Slums



9-1 Introduction

Slums issue is one of the most important challenges on the national level which occupies a top priority in government work because of the severe problems facing their residents ; resulting from establishing theses areas in absence of governmental public planning and sometimes as an infringement on state property . In this regard a Prime Ministerial decree was issued during 2008 to establish a special Fund for slums development; this action confirms the strong determination of political leadership to solve this problem. Their number were estimated with 184 areas with 6.5 million residents in Greater Cairo only , according to Shoura Council's report issued during 2008 by the Joint Committee from both Housing , Public Utilities and Reconstruction Committee ; Bureaus of Arab ,Foreign Affairs and National Security in addition to the Committee of Industrial Production and Energy.

9-2 Major environmental problems facing slums

Slums severely suffer from environmental deterioration due to the increase of population density in addition to lack of necessary and appropriate environmental services; the following are their major environmental problems:

9-2-1: Solid wastes

Most important problems are represented in the following:

- Haphazard disposal of wastes and their accumulation near residential areas.
- Open burning and self-ignition of waste accumulation which is considered one of the main causes of air pollution in these areas.
- Wastes' recycling by using unsound sorting methods by children and different age groups.
- Wastes accumulation in some areas near waterways, which directly affects water quality.

Throwing wastes in waterways that cause severe consequences including waste accumulation in front of bridges' slots ,detention networks of culverts and coverage practices causing obstruction in water course that lead to raise water levels and increase groundwater levels in nearby lands; this phenomenon has caused environmental hazards in some antiquities areas at Giza during 2008.

9-2-2 Domestic Wastewater

Domestic wastewater is disposed haphazardly by using non-insulated ground tanks or tanks connected with groundwater; these methods lead to consequential environmental and health damages as a result of ponds and marshes creation, in addition to the enormous environmental problems caused as a result of dumping products of septic tanks in watercourses.

9-2-3 Industrial activities

Informal industrial activities spread in slums and considered one of the main sources of air pollution in those areas and their surrounding environment; thus affecting residents' health in these areas, these activities include:
- Small and Medium sized industries (potteries -foundries- kilns)
- Craft workshops
- Areas of storing quarries products
- Areas of sorting and recycling household wastes .

9-2-4 Environmental awareness

- Lack of environmental awareness among most residents of slums.
- Weakness of public awareness programs and capacity building for their dwellers.

9-2-5 Noise

Residents of slums suffer from increasing level of noise intensity as a result of the spread of informal industries and workshops within residential areas as well as the unregulated traffic movement.

9-3 Exerted efforts to achieve environmental development in slums

The following summarize most important exerted efforts to improve environment quality and achieve environmental development in slums:

9-3-1 Finance transfer and development of polluting activities in governorates to reduce their negative environmental impacts on slum areas

State has paid great interest with implementing programs for transferring and developing polluting small, medium and craft industrial activities outside slum areas; it allocated a total of 362 million LE for this purpose to implement specified projects in 10 governorates under the direct supervision of governors through Ministry of International Cooperation as follows:

a – Cairo governorate (Development of pottery industry in Misr El-kadima area):

In 2004, 104 million pounds were allocated to develop pottery industry in Fustat area - Misr El-kadima district fully funded by the State, its first phase included the construction of 100 workshops and 52 ateliers with their utilities and services; implementation indicators show that 70% of this phase was conducted by the end of 2008. Second phase of the project include the construction of a Technology Center for Traditional Industries and Development of Pottery Industries, an Administrative Building and residential community for workers (about two thousand units).In Al-Mothaltha area in Misr El-kadima district 30 potteries were demolished , reconstructed and developed to be operated with natural gas.

Pic. (9-1) One of developed potteries in Misr El-Kadima

b – Giza governorate:

In 2004, 70 million pounds were allocated to establish artisans' city on an area of 122 Feddan on Cairo-Fayoum road to transfer and develop 49 foundries, 2534 handicraft workshops in addition to other industrial and service activities. Area planning and preparation of the EIA study for the project have been completed, in addition to utilities and services are currently connected to the area and by the end of 2008 about 50% of these activities shall finalize.

c- Qliubia governorate (99 foundries):

In 2004, 61.5 million pounds were allocated to establish Al-Safa Industrial area in El-Khanka city on an area of 142 Feddan to transfer and develop foundries. EIA study of the project and connection of basic utilities and services such as roads and electricity had been finalized by the end of 2008; while work is going on to supply area with water networks and natural gas. 7 foundries were transferred and 25 plots of lands have been allocated for establishing 25 foundries.

d - Helwan governorate (clay brick factories):

In 2008, Ministry of State for Environmental Affairs in cooperation with Ministry of Petroleum and Canadian International Development Agency CIDA implemented a project (Climate Change Initiative) to develop 50 brick factories in Arab Abu Saed by converting them from diesel fuel to natural gas, which will decrease their emissions from carbon dioxide by 37% annually, in addition to transferring modern technologies in this field with total investment of 45 million pounds. The project aims at improving working conditions in these factories, preventing emissions of contaminated gases, which will have a positive impact on the environment of Arab Abu Saed area.

Second phase of the project is currently undergoing to convert the remaining 206 factories in Arab Abu Saed area to be operated with natural gas instead of diesel fuel through the second phase of Industrial Pollution Abatement Project with total value of 137 million pounds as soft loans to factories' owners and 20% grant up to 27.5 million pounds. It is expected to complete this phase during 2009.

e - Establishing zone for marble and granite activities (Shak El-Thoaban area):

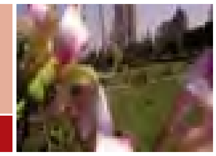
- Collecting activities of marble and stone crushing workshops in Shak El-Thoaban area in Helwan governorate (254 units)
- The area is currently under development, about 60% of the utilities and services had been completed , which is expected to finalize by the end of 2009.
- All stone crushing mills are currently working with electricity and their owners are committed to install dust- control systems.
- Coordinate with Helwan governorate to legalize status of non-licensed facilities.

f - Resettlement of Misr El-kadima tanneries:

A project to resettle Misr El-kadima tanneries in Al-Rubiky region on an area of 533 feddans along Cairo-Suez desert road has been approved so as to reduce adverse social, economical and environmental impacts of current tanneries. Total cost of the project is about 800 million LE, about 320 tanneries are found in Misr El-kadima area built on an area of 72 feddans producing 75% from the current production of tanned leather in Egypt ; in addition to leather and chemicals stores, maintenance workshops and production units of glue and gelatin. The project consists of production units (tanneries), Technology Center for Leather Production and a Central Treatment Plant for industrial wastewater in addition to utilities and services.

Current implementation of the project refers to the following:

- Finalize entire works of internal infrastructure (water systems, sanitation, natural gas, electricity and telephone) during 2008.
- During 2008, finalize establishment of 29 model tanneries with varying sizes and during 2009 start in establishing another 7.
- Establishment of Maintenance Center for Tanning Equipments is undergoing.
- Initiating a feasibility study to exploit an area of 830 feddans in cultivating Jatropha used in the



production of bio-fuels to produce about 600 tons of biodiesel.
- A feasibility study is currently undergoing to establish a factory for the production of compost from remnants of leather industry to treat 65 thousand tons of solid waste along project's three stages on an approximate area of 45 thousand meters.

g – Menya governorate:

21 million pounds were allocated to establish a zone for craft industries on an area of 22 Feddan located on the east of Nile (Zawyat Sultan). The project will include the establishment of 193 handicraft workshops, 193 apartments in addition to building a shopping mall. 40% of the construction had been completed with all utilities and services connected for the region.

h – Matrouh governorate:

25.336 million pounds were allocated for the establishment of Developing Center of Environmental Industries and comprehensive development of Siwa Oasis. The project shall be implemented through three phases; first phase included the establishment of a Center for Handicrafts, Laboratory for Quality Control in addition to other activities that entirely completed; implementation of the second and third phases will start recently.

I – Sohag governorate:

1 - 26.599 million pounds were allocated for the establishment of artisans' village in Awlad Azaz area in Sohag on an area of 70 thousand meters to establish 382 workshops. EIA study of the project and first phase implementation (establish 110 workshops and 16 shops) had been finalized. 100% constructions of roads, drinking water and sanitation have been completed and second phase implementation is under studying.
2 - 26.255 million pounds were allocated for the establishment of weavers' village at Al-Kawthar district in Sohag governorate to be provided with necessary utilities and services .Almost all planned activities for the project such as works of utilities and services in addition to the establishment of 122 handmade fabric units and rural houses have been completed .

j – Alexandria governorate:

In 2007 , 30 million pounds were allocated to establish a complex of foundries (240 foundries) in the petrochemical area located in El-Nahda Road on an area of 34 feddans ; EIA study and about 70% of utilities , services and construction works had been completed during 2008.

k – Menoufiya governorate:

In 2007, 6 million pounds were allocated to establish a complex to transfer crafts workshops from residential areas of Menouf, Ashmun, and Shebean El-Kom cities; the project has been entirely completed and a study is currently undergoing to allocate another 10 million pounds to establish a line for sugar production.

l - Ismailia governorate:

In 2007, 10 million LE were allocated to establish an area to transfer 1159 industrial workshops to Al-Mostakbal city on an area of 25 feddans; an EIA study of the project is currently undergoing to start its execution.

9-3-2 EEAA's programs to support Small and Medium sized industries and major industries adversely affecting slums

a - Industrial Pollution Abatement Project (IPAP) -Phase II (2007-2012):

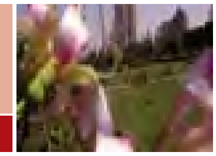
IPAP total investments is 1 billion pounds, it provides soft loans for industrial facilities to support industrial pollution abatement projects. High-density areas in Greater Cairo and Alexandria are the project's main focus in terms of large industrial facilities that produce large amounts of air and water pollutants.

b- Cleaner Production Project in cooperation with Federation of Egyptian Industries (Office of Environmental Compliance):

79 industrial establishments participate in the project, where soft loans were provided with about 104 million pounds to participate in environmental projects with investment cost amounted 180 million pounds in chemical, engineering, food, metal and fabric sectors in order to achieve environmental compatibility of these facilities and develop their productivity to achieve cleaner production.

Pic. (9-2) Plantation of the Surrounding area of Cement Plants

Pic. (9-3) recycling of rubber wastes in cement Plants



c - Environmental Impact Assessment (EIA) for projects and industrial areas:

87 EIA studies were conducted in all parts of the country, stop issuing licenses for any industrial plants established outside approved industrial zones and prevent establishing any new nonofficial plants; all these efforts had a positive direct and indirect impact on environmental quality and living conditions as a whole in slums. During 2008, 700 EIA studies had been conducted in slums of Greater Cairo.

d - Environmental Inspection:

During 2008, 1800 establishments in various industrial, tourism and services activities in addition to workshops, small and medium sized industries have been inspected to ensure their application of environmental laws and regulations which led to the reduction of adverse environmental effects of artesian workshops in slum or adjoining areas.

9-3-3 Pilot projects to achieve environmental development for slums in cooperation with Association of Integrated Care in Greater Cairo, namely

1 - Environmental development of El-Masara and Ezbet Al-Walda and building capacity project of NGOs in cooperation with European Union during 2008:

Ministry of State for Environmental Affairs implemented an integrated set of programs starting from raising environmental awareness, capacity-building for citizens and improving their incomes through implementing set of procedures for achieving wastes' integrated management with the removal of their accumulations ;as well as tree-plantation and beautification activities .These activities include the following:

- **Parks**: Establishing two parks, the first in Ezbet Al-Walda located in Helwan on an area of seven feddans and the second on an area of four feddans in El-Masara area on the Autostrad ,they are equipped with variety of services' activities in addition to a Center for Environmental Awareness and Developing Women's activities.

- **Afforestation**: Cultivating about 1200 trees in Ezbet Al-Walda as well as more than thousand meters of green landscaping during the second phase.

- **Beautifying facades of houses (paintings)**: Painting facades of 948 houses with total area of about 91 thousand meters, benefiting more than 30 thousand people occupying around 4217 residential units.

Pic. (9-4) Beautifying Facades of Houses

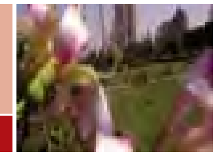
- **Removing solid wastes (accumulations):** Getting rid of more than one million cubic meters from El-Masara and about 200 thousand cubic meters from Ezbet Al-Walda.

Pic. (9-5) Removing Solid wastes

- **Paving and constructing roads:** Cement dust was used to pave 18500 m of roads in El-Masara and Ezbet Al-Walda, with the participation of youth after being trained and qualified to work in the project.

Pic. (9-6) Paving and Constructing Roads

-**Establishing Centers for Environmental Awareness**: Centers for Environmental Awareness in Ezbet Al-Walda & El-Masara were established, they composed of different sections such as the Green Corner for environmental awareness, NGOs section, crafts' and raw materials activities section, environmental



awareness and women's building capacities section ; in addition to a training and conference rooms where about 100 training courses were held concerning women's role in the development and environmental field as well as environmental education and development of handicrafts.

B – Environment development for Ezbat Khair Allah -Misr El-Kadima:

Set of programs is currently executed to achieve environmental development of the area through the following:
- Prepare environmental description for the area.
- Prepare environmental community action plan with the participation of residents of the area to identify environmental action plan priorities.
- Support, activate and build capacities of NGOs.
- Support waste management system with necessary vehicles and equipments in participation of a serious NGO working in that field.

C – NGOs building capacity project in cooperation with European Union:
The project aims at:

- Strengthen NGOs, private sector and civil society capacities to implement environmental activities in slums and support sustainable development objectives.
- Transfer experiences of slums development to other sites.

About 36 NGOs from different slums in Greater Cairo participated in the project

9-4 Future vision for slums environmental development

Ministry of State for Environmental Affairs is directed to implement more activities in other slum areas in light of learned lessons from the previous implemented procedures and projects ; in this framework, a unit has been established within EEAA for environmental development of slums on December 2006 , aiming to replicate and spread conducted activities in both Ezbet Al-Walda & El-Masara in all the other slums ; to achieve this goal unit's specific tasks have been identified through which the unit will prepare local community to execute its role in slums' development ,relying on determining development needs of these areas , develop plans ,participate in their implementation and follow-up . Work priorities during next five years can be summarized as follows:

- Implement projects financed by Slums Development Fund.
- Exchange experiences between Ministry of State for Environmental Affairs and Slums Development Fund.
- Building capacities of selected NGOs for project management in slums.
- Organize campaigns in collaboration with Slums Development Fund to raise environmental awareness among their residents.

Chapter 10
Energy

10-1 Introduction

Energy is considered Egypt's significant challenge because of its limited depleted conventional energy sources, at the same time Egypt needs relatively much energy resources to achieve its economic growth and social development.

Due to that fact and in light of the economic and social development plans which are being implemented to improve Egyptian citizen's quality of life, Egypt's demand for energy is growing with rate up to 4% annually in general and up to 9% for electric power consumption annually in particular. Table (10-1) shows the most important electric power indicators in Egypt during 2007-2008 which indicate the increasing total energy production from 114260 (KWh) in 2007 to 125145 (KWh) in 2008, as well as increasing consumption of electric energy rate per capita from 1450 (KWh) in 2007 to 1565 (KWh) in 2008 with about 8% increase, the table also shows a slight decrease in the average fuel consumption from 120 to 117 (gm oil equivalent per KWh).

These higher rates of annual energy consumption requires the application of an effective national energy strategy aiming at providing necessary energy for the integrated development plans with the lowest possible cost, at the same time reducing its burden on economy. Rationalizing energy consumption, improving energy efficiency, maximizing utilization of environment-friendly sources (new and renewable energy sources) in all economic and social sectors are the key components of this strategy.

Table (10-1): Electricity production indicators in Egypt during 2007-2008

Technical indicators for electricity production sources		2006/2007	2007/2008
Peak load (MW)		18500	19738
Total installed power (MW)		21944	22583
	Thermal*	18936	19431
	Hydro	2783	2842
	Wind Farm (Al Zafarana)**	225	305
	Wind Farm (Hurghada) «not connected to the unified grid»	5	5
Total produced energy (GWh)		114260	125145
	Thermal***	100708	108788
	Hydro	12925	15510
	Wind Farm (Alzafarana)	627	840
	Wind Farm (Hurghada) «not connected to the unified grid»	8	7
Fuel consumption rate (gm oil equivalent / KWh generated)		219.6	217.3
Rate of electric energy consumption per capita (KWh)		1450	1565
Total sales of produced energy from wind stations (million LE)		68	96.8

* includes the installed power from private sector plants «BOOT».
** 55 MW was added and connected to the grid on December 2008 to become 365 MW.
*** includes the energy produced from private sector (BOOT) and also the purchased from industrial facilities› excess.

Source: the annual report 2007-2008 of New and Renewable Energy Authority. http://www.nrea.gov.eg/annual report

10-2 Current status:

10-2-1 Oil and gas projects:

During 2008, MSEA issued environmental approvals for 209 onshore and offshore nationwide projects for oil and gas concession areas. Environmental approvals included 49 seismic survey projects to determine potential of oil and gas reservoirs, 116 exploratory wells to examine earth layers and its contents of oil or gas, 32 development wells to extract oil/gas, 6 projects of gas pressure stations networks, 6 projects to extend natural gas distribution pipelines to Cairo, Beni Suef, Assuit, and South Sinai governorates.

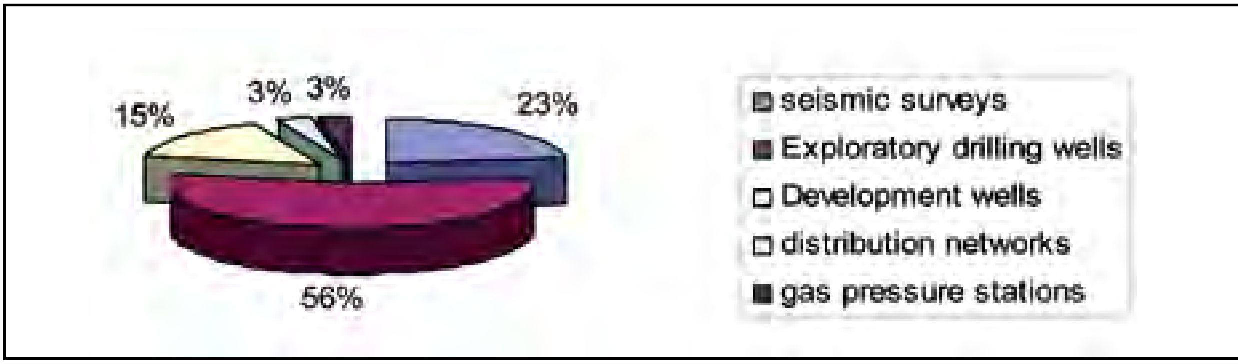


Fig (10-1) percentages of oil and gas projects that have been environmentally approved in 2008

10-2-2 Electrical energy

Ministry of State for Environmental Affairs issued 6 environmental approvals for power generation stations operated by natural gas and diesel, 2 wind farms, 2 small stations affiliated to private sector companies, 2 voltage power lines, 2 transmission and distribution lines and 3 transformer stations.

Moreover, MSEA has prepared Environmental Impact Assessment Guidelines for Wind Energy Power Plants to be distributed to concerned entities, investors, developers, and consulting offices to be followed while preparing environmental impact assessment studies for Wind Energy Power Plants.

10-2-3 New and renewable energy projects

MSEA has implemented 2 projects for air conditioning and cooling by using solar energy.

- **Solar air conditioning project:**

The project demonstrates new sustainable solar cooling techniques that can be used in small offices or larger dwellings.

Cooling with solar energy is demonstrated in EEAA’s Sharm El Sheik building which combines Sinai park management, training halls and sleeping rooms for students. The system uses 3 absorption chillers and 21 solar collectors; absorption chiller uses heat of the sun to generate cooling energy, which is efficiently collected with evacuated tube solar collectors. Apart from the pump-energy to drive different circuits of the system no additional energy is needed. In addition to installing the solar absorption chillers, building improvements were carried out such as the application of thermal insulation paint on the roof of the building, installation of well sealed windows and sheds and the use of solar water heaters and energy saving lamps. All these measures reduced energy consumption of the building with 40%.

This project will play a leading role in the coming years by improving energy efficiency of buildings, rationalizing electric consumption, and mitigating Green House Gases.

- **Solar cooling of food industries "MEDISCO":**

This project aims at identifying best technologies used in solar freezing& cooling of food and agro products:

MSEA participated in designing the project in cooperation with 6 agencies and research centers from France, Italy, Germany, Spain, Tunisia and Morocco; project's component were recently supplied to Tunisia to be installed in soft drinks factory and to Morocco to be installed in dairy products factory .

10-2-4 Industrial projects

MSEA issued 4 environmental approvals, three of them for cement industrial projects which their average consumption from natural gas per line is approximately 0.5 million m^3 / day other than electricity consumption, which is estimated with 170 million kwhr; the fourth approval was issued for Suez Iron and Steel Factory with average consumption from natural gas amounted with 2,928 million m^3 / day.

10-3 Exerted efforts to reduce adverse impacts

MSEA requires the following conditions before issuing its environmental approval for the industrial energy-intensive projects to insure energy efficiency and reduction of natural gas consumption in new establishments:

- Each establishment provides its needed electricity at its own expense through constructing power plant for its own consumption, in addition to applying European Standards regarding rates of consumption.
- Avoid purchase of used production lines, machines and devices,
- Qualifying technical staff with the purpose of improving energy efficiency.

Egypt also supports projects aimed at rationalizing energy use, including Energy Efficiency Improvement Project funded by Global Environment Facility (GEF) and United Nations Development Program UNDP which aims at reducing greenhouse gases emission resulting from electric power generation using non-renewable fuels, through supporting energy saving technologies. An annual decline rate of carbon dioxide equivalent emissions had been recorded amounted 3 million tons over last year in addition to similar decline in energy consumption amounted 1 million tons equivalent.

Source: Annual followup report of energy efficiency improvement project and green house gases emissions reduction- Developing programme of United Nations 2008

10-4 Future Vision

During recent years environmental and climate change issues have acquired much attention in addition to the necessity of achieving balance between development plans and their impact on environment. Concepts of energy, development and environment are interrelated in the framework of the growing global economic change, so it becomes substantial to consider energy consumption rationalization, as it is a natural wealth supportive to the economy.

In the framework of MSEA's program to reduce electric consumption in industry and buildings ; and approval of the Supreme Council of Energy on the Strategy of Renewable Energy in Egypt, to increase proportion of energy generated from renewable energy to 20% of the total energy generated in 2020 ,MSEA has submitted a proposal to the Ministry of Finance (under studying) for exempting energy-saving products, environmentally friendly products and energy consumption devices from custom duties including :

1. Solar thermal energy:

- Solar evacuated tube collectors.
- Solar thermal storage tanks with or without heat exchanger.
- Circulating pumps withstanding temperatures from 120 ºC and more.
- Solar systems' control and operation systems.
- Thermal insulation of pipes, selective coating for absorption plates, tampered glass and absorption sheets.
- Solar air-conditioning system and its components including cooling tower, fan- coil units and heat exchanger.
- Solar cooling and refrigerating system of food industries.
- Solar water distiller.
- Solar cookers.

2. Solar electric power:

Photovoltaic panels and their components such as: storage batteries, converter, inverter, etc….

3. Wind energy:

Multi blades wind turbines including gearbox, generator, brakes, tower, rotating main shaft and direction control systems.

4. Energy efficiency equipments inside buildings & factories

Materials of thermal insulation for roofs and walls of buildings, insulating glass windows, energy-saving light bulbs, intelligent meters, infrared sensors , power factor capacitors .

Chapter 11
Industry

11-1 Introduction

Industry is one of the major pillars of national development and also the largest source of environmental pollution. According to World Bank's reports, it consumes 4.8 % from the annual gross domestic product (GDP). Industry produces many pollutants, the main and most dangerous pollutant is by-pass dust, which is produced from cement industry in addition to wastes generated from metallurgical and chemical industry and liquid wastes which are considered very dangerous on nature and human health as they contain oxygen depleting substances, biochemical, harmful salts and mineral compounds such as water generated from tanneries and spinning &weaving industry.

Similar to other sources such as transportation and open burning, different industrial fields for instance "cement, fertilizer and metallurgical industries" generate large amounts and multiple air pollutants which cause respiratory diseases and increase rates of Green House Gases (GHG) emissions.

Environment Law No.4/1994 is one of the most important tools to achieve environmental compliance; the new amendments of its Executive Regulation, which concerned with maximum limits of environmental pollutants, not only play a very effective and important role in activation of the Law but also achieving environmental compliance for industrial establishments.

MSEA handles an important tool which provides soft financial packages to support environmental compliance through financing pollution abatement and cleaner production projects, which have great importance as they are one of the most important methods to achieve Sustainable Development, reduce loads of industrial pollutants, cope with global industrial policies, spread of cleaner production, and emergence of new global concepts depending upon product quality control.

11-2 MSEA exerted efforts to control industrial pollution

Implementation of 120 industrial pollution abatement projects had been finalized under MSEA's auspices through two pilot projects as represented in table (11-1).

Table (11-1): MSEA›s exerted efforts in pollution abatement projects

Project	Project duration	Number of Establishments	Cost (Million EGP)
Public Sector / Facility program (Kfw)	1996 – 2008	24	550
Environmental compliance project (Egyptian Industries Federation)	2002 – 2008	79	104
TOTAL		103	654

Source: EEAA (Central Department for Industry – December 2008)

Most important projects and current programs

11-2-1 Egyptian Pollution Abatement Project- Phase II (2007 – 2012)

The project applies soft financial packages to support pollution abatement projects in industrial sector by providing financial package (20% grant, 80% loan); phase II concentrates on highly polluted zone combining huge industries with greater loads of air and water pollutants such as Cement , Iron &Steel, Chemical Industries and tanneries located in Greater Cairo & Alexandria that include the following areas:

- Helwan governorate: Helwan- Tabbien- Maddi (Cement, Iron & Steel, Coke industry and Brick Factories in Arab abu saed).
- Giza Governorate: El-Howamdia (Sugar Companies), El-Saff and Atfih (more than 200 Brick Factories).
- El-Qaliobia Governorate: Shubra El-Khima, Qaliob, Abu-Zaabal, El-Qanater, and El-Khanka (including great number of Chemical, Spinning and Weaving industries).
- Alexandria governorate: Abu-Qir (Paper, Food, and Chemical industry); El-Max (Tanneries, Foundries, and Petrochemical industries); Mariout (suffers from sewage, industrial, and agricultural wastes).

Total amount of financial packages are about 185 Million US$ (one Milliard L.E). Assistance provided by the program composed of the following:

1. Financing Component:

Providing soft financing package to support industrial establishments, through re-lending by the National Bank of Egypt (NBE) (20% grant, 80% loan)

Total budget of this component is:

- World Bank (WB) for Construction — 20 Million US$
- Japan Bank for International Cooperation (JBIC) — about 40 Million US$
- European Investment Bank (EIB) — 40 Million €
- French Development Agency (AFD) — 40 Million €

2. Technical Support Component:

Technical support component provided to industrial establishments that will be funded by grants through financing component.

Current Status (2008):

28 projects for 16 major companies and 206 brick factories are currently listed in the second phase with 125.32 Million US$ divided as shown in table (11-2); this table shows that 40 % of the available finance allocated for cement industry , 20% for brick factories, 10 % for paper industries and 28% for supporting fuel switching projects.

Table (11-2) Companies applying for financing their environmental projects

No.	Company name	Type of project	Cost (Million US$)
Helwan Governorate			
(Helwan – Torah - El-Tebeen)			
1	National Cement Co.	Installation of new technologies to control dust emission.	15.5
2	Torah Cement Co.	Installation of new technologies to control dust emission.	20
3	Helwan cement Co.	Fuel switching from mazot to natural gas	3
4	Egyptian Starch & Glucose Co.	Fuel switching from mazot to natural gas	0.38
5	Town gas Company (Arab Abu Saad & El-Saaf Brick Factories	Fuel switching from mazot to natural gas	25
Total			63.88
El-Qaliobia Governorate			
(Mostorod – Shubra El-Khima)			
6	Abu Zabaal Fertilizer Company	Installation of new technologies to control dust emissions.	15
7	Egyptian Starch & Glucose Co.	Replacement of glucose production line	8
8	Delta for steel	Fuel switching from mazot to natural gas	5
9	Middle East for Paper Manufacturing (SIMO)	Fuel switching from mazot to natural gas	0.41
10	El-Nasr for Rubber Products(Narobin)	Installation of new technologies for pollution control.	0.495
11	Swailem for Pottery	Installation of new filters to control dust emission.	0.2
Total			29.1
Total for Greater Cairo(Helwan, Qalubia, Giza, 6th October)			92.98
Alexandria governorate			
(Baqoss – Borg El-Arab – El-Max – Abu-Qir – El-Ameria - Kafr El-Dwar)			
12	Amreria for Cement	Installation of new filters to control dust emission.	9
13	Misr for Chemicals Industry/ Alex	Fuel switching from mazot to natural gas	0.44
14	General Company for Paper Industry (RAKTA)	Fuel switching from mazot to natural gas	4.5
15	Ameria Petroleum Refining Co.	Rehabilitation of production units to decrease pollutant loads in waste water discharged into Mariout Lake.	10
16	National Paper Co.	Installation of waste water treatment plant.	8
17	Wood Equipment Co.	Rehabilitation of production lines to decrease pollutant loads in discharged waste water.	0.4
Total			32.34
Gross total (Greater Cairo and Alexandria)			125.32

Source: EEAA (Central Department for Industry – December 2008)

Examples of financed projects:

A. National Cement Company:

The project consists of upgrading old electrostatic filters to reduce dust emissions generated from production lines figure (1, 2) , supplying it with vacuum cleaning vehicles to reduce environmental pollution load caused by dust emissions, reduce carbon dioxide emissions , improve ambient environment around the plant and protect workers' health , to achieve company's compliance with Environment Law (4 / 94). Total cost of the project is 15. 5 million US $ funded by Egyptian Pollution Abatement Project - phase II (EPAP-II).

Fig (11-1) Rotary Kiln Line No. (1)

B. Torah Cement Company:

The project includes upgrading old Electrostatic filters to reduce dust emissions generated from the eighth production line. The project aims at reducing environmental pollution load caused by dust emissions and reducing it, improve ambient environment around the plant and protect workers' health to achieve company's compliance with Environment Law (4 / 94.

Fig (11-2): Upgrading the old eighth line of electrostatic precipitator.

C. Helwan Cement Company:

The project consists of switching fuel from mazot to natural gas, through financing external and internal network of natural gas. Total cost of the project is about 3 million US $.

D. Amrya Petroleum Refining Company:

It includes development of the extraction unit by substituting Phenol because of its serious impact on environment and workers' health with NMP solvent as it is an environment-friendly substance , to protect Mariout Lake from direct discharge of industrial polluted water ,achieve company's compliance with Environment Law (4 / 94) concerning discharge to the sea. Total cost of the project is about 10 US $ million funded by Egyptian Pollution Abatement Project – phase II (EPAP-II).

Fig (11-3): Old Extraction unit in Amrya Petroleum Refining Company

11-2-2 Private and Public Sector Industry project PPSI 2008 – 2012

Background:

Private and Public Sector Industry Project (PPSI) aims at supporting Egyptian industry (small, medium and large industries) to comply with environmental laws and regulations as well as improve their environmental performance, it is a joint project between German Federal Republic (represented by KFW) and Egyptian Government (represented by Central Bank of Egypt) and implemented by Egyptian Environmental Affairs Agency (EEAA).

PPSI's Objectives:

- Supporting industrial pollution abatement projects in industrial establishments for both small and medium-sized enterprises from both public & private sectors and specific business services.
- Developing sustainable, financial, technical and institutional mechanism for pollution abatement and reduce pollution loads in Egypt's hot-spots areas particularly in Delta and Upper Egypt governorates and improve their local environmental conditions.
- Activate legislative procedures, improve inspection efficiency, develop technical and environmental capacities for EEAA cadres and competent banks, and raise environmental awareness and general knowledge related to industrial environmental affairs in Egypt particularly in Delta and Upper Egypt Governorates.

Projects' Support (Equipment & studies):

This component provides technical support such as equipment and technical industrial consultation; strengthen capacities of competent authorities responsible for application of environmental laws, in addition to supporting environmental awareness' activities.

Large Enterprises: Provided with 20 % grant for environmental equipment in addition to 20 % grant for project's technical industrial consultations (include studies of technical feasibility , Environmental Compliance Action Plan(CAP) and environmental impact assessment if needed (EIA) with 5 % maximally from the project investment value) .

Small, Medium Enterprises 'SMEs": Provided with 30 % grant for environmental equipment in addition to 50 % grant for project's technical industrial consultations (include studies of technical feasibility, Environmental Compliance Action Plan(CAP) and environmental impact assessment if needed (EIA) with 5 % maximally from the project investment value) .

Funding requirements:

The project provides finance for the following projects in all industrial sectors for:

- Pollution Abatement Projects, such as air emission, work environment, industrial wastewater and water management.
- Improvement of production process and production lines or End-of pipe treatment.
- Cleaner production projects.
- Increase efficiency usage of energy, raw materials and Fuel Switching.
- Industrial solid wastes treatment (within the context of industrial establishments).

Current Status (during 2008):

- Total grant 7.26 million € " with total investment about 31 million €", among which 6.55 million € directed as grant for industrial enterprises and the remaining directed for technical support component.
- Total investment of approved industrial projects that undergo implementation procedures are about 28. 6 million € including 5,116 million € grant, "4.551 million € for Large enterprises and 0.565 million € for SMEs".
- The remaining grants 2.071 million € are directed for new SME's projects.
- 80% of the grant allocated for Upper Egypt and Delta governorates.
- The project includes 21 industrial enterprises (16 Large enterprises and 5 SMEs), in addition to 14 public sector and 7 private sector enterprises.

Table (11-3), shows list of project's recorded companies and their geographical distribution and fund.

Table (11-3) Companies applying for financing their environmental projects

No.	Company name	Project Type	Cost (million€)	Grant (million €)
Qena and Sohag Governorates				
(Qena – Nagaa Hemady – Qous – Gerga - Armant)				
1	Sugar and Integrated Industries Company – Gerga Factory	Rehabilitation of the industrial wastewater treatment plant. (Preparation of its environmental studies is undergoing)	1.01	0.2
2	Sugar and Integrated Industries Company – Qous Factory	Rehabilitation of the industrial wastewater treatment plant. (Preparation of its environmental studies is undergoing)	1.01	0.2
3	Sugar and Integrated Industries Company – Armant Factory	Installation of 2 cooling towers and water recycling. (Preparation of its environmental studies is undergoing)	0.48	0.1
4	Qena for Paper	Preventing direct discharge of waste water into River Nile, making sanitary system (Preparation of its environmental studies is undergoing)	4.23	0.8
5	Aluminum Company of Egypt	Rehabilitation of the old tar melting unit with new one to eliminate tar/VOCs emission (under installation and will start operation on April 2009)	2.28	0.457
Total			9.01	1.757
Aswan Governorate				
(Edfu)				
6	Sugar and Integrated Industries Company – Edfu Factory	Rehabilitation of the industrial wastewater treatment plant and discharge to the timber forest(Preparation of its environmental studies is undergoing)	0.63	0.12
7	El-Nasr for Mining Co.	Installation of Filters for raw material mining	1	0.2
8	Misr-Edfu for Pulp and Paper	Bagase filtration and pulp recycling systems	6.33	0.8

Total			7.96	1.12
El-Mania Governorate				
(Abu Qurqas)				
9	Sugar and Integrated Industries Company – Abu-Qurqas factory	Switching used fuel to Natural Gas.	4.74	0.8
Total			4.74	0.8
Total for all Upper Egypt			21.71	3.677
El-Dakahlia Governorate				
(Mansora – Talkha - Sandop)				
10	Delta Fertilizer	Installation of Nitrogen emission reduction (Nox) unit (evaluation of technical offers is currently undergoing)	2.02	0.4
11	Mansoura Resins	Switching used fuel to Natural Gas, (contract had been signed)	0.1	0.027
12	Dakhlia Textile	Switching used fuel to Natural Gas,(contract had been signed)	0.15	0.056
13	Misr oil and soap (Sandop Factory)	Switching used fuel to Natural Gas,(contract had been signed)	0.63	0.126
14	Ashmawy Brick Factory	Switching used fuel to Natural Gas, (operating)	0.091	0.0275
15	Abd El Hay Brick Factory	Switching used fuel to Natural Gas, (operating)	0.091	0.0275
Total			3.082	0.664
El-Sharqia Governorate				
(Zaqaziq – 10th Ramadan)				
16	Misr oil and Soap (Zaqaziq Factory)	Switching used fuel to Natural Gas,(contract had been signed)	0.63	0.126
17	CAN for Manufacturing and Filling Cans	Installing units to minimize liquid wastes ,(operating)	0.442	0.089
Total			1.072	0.215
El-Behaira Governorate				
(Kafr El-Dawar)				
18	Misr Fine Spinning &Textile (Spinning Factory)	Switching used fuel to Natural Gas,(contract is under signing)	1.265	0.25

19	Misr Fine Spinning &Textile (Bida Factory)	Switching used fuel to Natural Gas.	1.265	0.25
Total			2.53	0.5
El-Gharbia Governorate				
(El-Mahla)				
20	Othman for dyeing	Installation of waste water treatment plant	0.1	0.03
21	SMC Electronics - Mahalla	Installation of waste water treatment plant	0.1	0.03
Total			0.2	0.06
Total for all Delta governorates			6.884	1.439

Source: EEAA (Central Department for Industry – December 2008)

11-3 Future vision:

1. During the coming 5 years all cement companies in Greater Cairo and Alexandria will achieve compliance with local and some of them with international permissible indicators.
2. Transferring all occupational polluted industries located inside residential areas to authorized industrial area such as (Badr and El-Akrasha).
3. Convert discharge of waste water from Nile River to public networks in some industrial companies which are considered the main source of Nile pollution particularly after Ministry's implementation of projects for recycling or treating wastewater.
4. Reducing pollution loads inside hot-spots areas in Greater Cairo (air quality) and Alexandria (discharge on sea), after implementing proposed projects in industrial companies through Ministry's financing programs.

Chapter 12
Solid Wastes

12-1 Introduction

National Strategy for Integrated Waste Management includes several stages starting from proper handling of solid wastes that must be realized within the framework of an integrated system for waste generation, collection, transport, recycling, reuse and the final disposal of refuses through sanitary landfilling. It also includes development of policies, regulations, legislation and guidelines for different stages of waste management practices with the identification of methods to support effective implementation of waste management. National Strategy should include a comprehensive institutional structure on various levels to be capable of good planning, management, implementation, monitoring and follow-up; in addition to training & building human capacities to raise community awareness for realizing community satisfaction, by providing required cost-effective mechanisms in order to achieve sustainability and effectiveness of the system to achieve its objectives.

That respect includes two important principles:
First principle : Polluter must pay any costs of pollution caused by him."
Second principle: Fair distribution of burdens, taking into account community's social and economic conditions.

Quantities of generated solid wastes in Egypt:

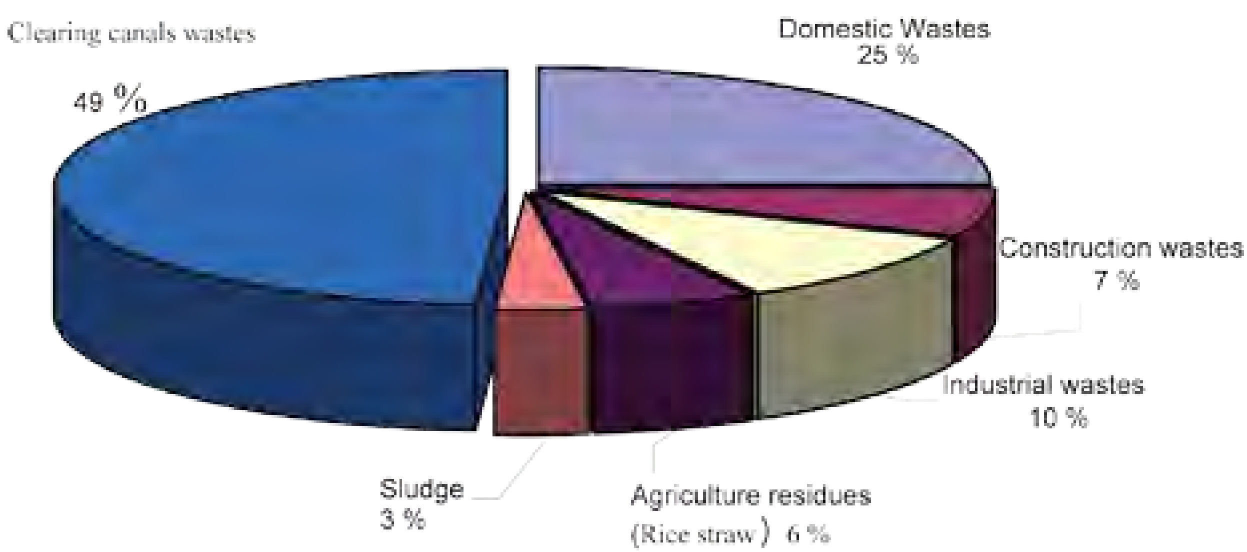


Fig (12.1): Distribution of generated solid wastes in Egypt.

12-2 Current status of solid wastes in Egypt

Total quantity of generated municipal solid wastes (household only) in Egypt is estimated with 20 million tons annually (more than 700 gm per capita), that is daily generation estimated with 55000 tons. As collection and transport efficiency do not exceed 65%, this leads to daily accumulations of these wastes within residential areas and vacant lands. Furthermore recycling is not undertaken safely and soundly which exposes citizens and workers to several health risks. It is noteworthy that most landfills, where final disposal of such wastes takes place are exposed to intentionally or self burn, which exposes ambient environment to risks and worsen their conditions , in addition that necessary equipment are not available in these sites for wastes' coverage to prevent such burning.

The most important reasons leading to municipal solid waste problems are low environmental awareness, bad behaviors while dealing with municipal solid wastes, severe deficiency in enforcing legislations related to solid wastes, and absence of integrated sustainable system for municipal solid wastes management.

12-3 Exerted efforts during 2008:

MSEA exerted efforts to reduce adverse impacts of solid wastes:

12-3-1 Controlling public landfills during Severe Air Pollution Episodes

The Ministry coordinated with Armed Forces to launch work in Al-Wafaa & Al-Amal dumpsite at Cairo governorate and Shubrament dumpsite at Giza governorate and Al-Rubiky dumpsite at 10^{th} Ramadan City; MSEA provided them with necessary equipment, 5 Loaders and 4 Trucks with $15m^3$ capacity to insure their continuous availability in these sites (24 hours/daily); to control these landfills and conduct work through two shifts per day in the morning and evening.

1. Al-Wafaa & Al-Amal landfill:

This site has been provided with two Loaders and one Truck with 10 m^3 capacities, for leveling and covering $36.000m^2$ which required more than 1300 carriage for transporting sand trucks.

Fig (12-1), (12-2): leveling and covering Al-Wafaa & Al-Amal landfill

2. Shubramant landfill:

This site has been provided with one Loader and one Truck with 10 m^3 capacities for leveling and covering 32.000m^2 which required more than 1600 carriage for transporting sand trucks.


Fig (12-3), (12-4): Controlling fire in Shubramant landfill

3. Al-Rubiky landfill:

This site has been provided with two Loaders and two Trucks with 10 m^3 capacity to cover 200 intentional burning pits and leveling 5.000 m^2 area.


Fig (12-5), (12-6): Controlling fire in Rubiky landfill

12-3-2 Participate in transferring pigs' farms outside residential areas of Greater Cairo governorates

Selection of appropriate new site for pigs' raising in coordination with concerned ministries and authorities (MHUUC-MOHP-MLD-MALR-GOPP- NCPSLU – GAVS) ; this proposed site has been approved by Cabinet of Ministers in their meeting No. 69, held on 13th May 2009, to which a presidential decree is currently undergoing .

12-3-3 Participate in preparing an Integrated Management System for Solid Wastes

Special programs had been prepared for Al-Khusos and Al-Marg districts and the neediest villages to develop their solid waste management system through supporting them with necessary equipment to contribute in removing wastes' accumulations , raising efficiency of collection and transportation , providing them with garbage containers to support collection of wastes in addition to establishing controlled landfill for the safe and sound disposal of residues in all the neediest areas .

Table (12-1): Costs of equipments required to support the neediest villages.

Governorate / Equipmenty	Sohag	Assiut	Menia	Sharkia	Beheira	Qena	Total required no.	Cost (1000 L.E)
Tractor equipped with Loader	26 Hand over	22	40	12	18	17	135	16200
Trailer trucks	44 16 hand over	44	62	20	36	26	232	4640
Trucks with 5 tons capacity	10 Hand over	---	10	24	2	15	61	8540
Normal tractor	4	3	5	5	3	5	25	2500
Trucks with water tanks	4	3	5	5	3	5	25	625
Loader	1	2	1	2	3	2	11	16500
Garbage container	260	220	300	310	190	230	1510	1510
Total								50515

12-4 Future vision

To raise efficiency of collection, transport, recycling and rehabilitation of final disposal site and the establishment of new sites, a study about Integrated Management of Municipal Solid Wastes was conducted to implement the following proposed programs along different stages with estimated costs reach about 2 milliard L.E. : removing accumulations, raising efficiency of collection &

transport, establishing intermediate stations and recycling centers in addition to increasing work efficiency in dumpsites and establishing sanitary landfills, table No. (12-2).

Table (12-2) Financial cost of the planned solid waste management system in Egypt.

Governorate	The cost of the program / million Egyptian pound						Total with million Egyptian pound
	Remove accumulations	Improve process of collections & transportation	Establish intermediate stations	Establish recycle centers	Improve work in controlled Dump-sites	Establish sanitary landfill	
Cairo	---	13	13	30	40	30	126
Alexandria	15	17	5	5	---	---	42
Giza	---	30	30	10	10	30	110
Kalyobiya	---	19.5	19.5	10	10	30	89
Dakahilya	60	56.5	16	10	---	30	172.5
Gharbeya	52	31.5	16	10	---	30	139.5
Monofiya	6	33	10	10	---	30	89
Beheira	8	47	13	10	---	40	118
Kafr El -Shiekh	6	27	10	1010	---	30	83
Sharkia	10	48.5	10	10	---	30	108.5
Damietta	3	26	10	10	---	---	64
Fayoum	3	20.5	4	5	---	15	62.5
Bani Souwaif	3	22	5	5	---	30	65
Menia	10	28.5	6	10	---	30	84.5
Assiut	3	28.5	6	10	---	30	72.5
Sohag	4.5	35	7	5	---	30	86.5
Qena	4.5	30.5	7	5	---	30	82
Luxor	2	2	3	5	---	15	27
Aswan	6	17	3.5	5	---	15	46.5
Ismailia	7	17.5	3	5	---	30	62.5
Port Said	6	7	2.5	5	5	---	25.5
Suez	10	7.5	2.5	5	5	---	30
Red Sea	7.5	14	2	5	---	30	58.5
Matrouh	---	26	5	5	---	15	51
North Sinai	---	31	4	5	---	30	70
South Sinai	7.5	15	3	5	---	30	60.5
New Valley	---	15	2	5	---	10	37
total	234	666	218	220	70	655	2063

Chapter 13
Hazardous Substances & Wastes

13-1 Hazardous Substances

13-2 Introduction:

Hazardous substances are those with hazardous effect on health and environment, including infectious, toxic, explosive, flammable substances as well as ionizing radiation substances. The seriousness of theses substances doesn't depend on a certain stage, but it continues during its lifecycle from production, transport, use, collection as waste, recycle, treatment and final disposal. Such substances can be classified according to the criterion that may cause harmful effect when used. These substances would have adverse impacts in case of unsafe handling.

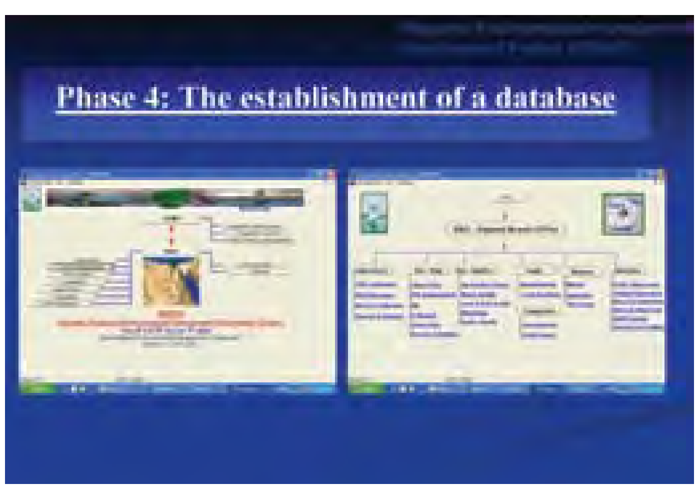
Adverse impacts on environment:

1. Polluting water surfaces, underground water and marine environment.
2. Biota accumulation.
3. Pollution resulting from explosion and fire.
4. Ozone depletion.

13-3 Exerted Efforts by MSEA to reduce adverse impacts resulting from handling hazardous substances

13-3-1 Control of Hazardous Substances (chemicals –pesticides)

A- Developing an integrated regional database for «Environmental Pollutants» in coordination with Hazardous Substances Department. This database is used to record all data collected via inventory to identify types and amounts of pollutants, its physical and chemical properties, health & environmental impacts, previous associated studies, and methods of safe disposal.



pic (13-1) Data Base screen of Environmental Pollutants

B- Issuing Egyptian Standard Specifications, in cooperation with Egyptian General Authority for Standards and Quality and concerned authorities (Ministry of Manpower, Industrial Development Authority, Center for Nuclear Safety, Atomic Energy Authority, Bavaria company as a representative from private sector company , Chemistry Agency, National Research Center, and representatives from Military Factories, concerning the following :

- Hazardous substances control, composed of three parts: Guidelines, General Requirements for Mechanical Ventilation System, and Safety Precautions for some Industrial Processes.
- Symbols' Chart composed of safety's symbols and colors, which includes design of safety signs and symbols in workplace and public areas.

C- Forming a high-level national committee from (Ministry of Industry –Egyptian Federation of Industries, Ministry of State for Environmental Affairs) in addition to concerned research centers. This committee shall be responsible with rehabilitation of Egyptian industrial companies which export its chemical products to the European Union according to REACH system. (Registration, Evaluation, Authorization and Restriction of Chemical substances) which is applied on all chemical products which enter European markets . All exporting Egyptian factories for European Union have been provided with REACH system to promote the Egyptian exports for European Union.

D- In the field of national implementation of the strategic approach for the internationally chemical management SAICM , a national implementation plan has been prepared and launched with important activities including "inventory of PCBs" in Shubra al-Khaimah region and implementing environmental awareness programs for all categories of society. On the national and regional level, a proposal was prepared reflecting Egyptian & Arab point of view towards urgent issues to reach safe management of chemicals in addition to providing technical and financial support required to implement the Arab Action Plan needed for the execution of SAICM approach ,which was presented on behalf of the Arab Countries during the second International Conference for Chemicals Management (Geneva / 11-15 May, 2009).

E- All customs releases of imported chemicals to be used as raw materials in industrial , commercial or agricultural sectors with total amount of 9957.563 tons in 2008 have been reviewed ;as well as an inventory for custom releases and quantities of hazardous substances was made from 2004 until 2008.Figure(13-1)clarifies monthly customs releases during 2008 and figure (13-2) clarifies customs releases from(2007-2008)

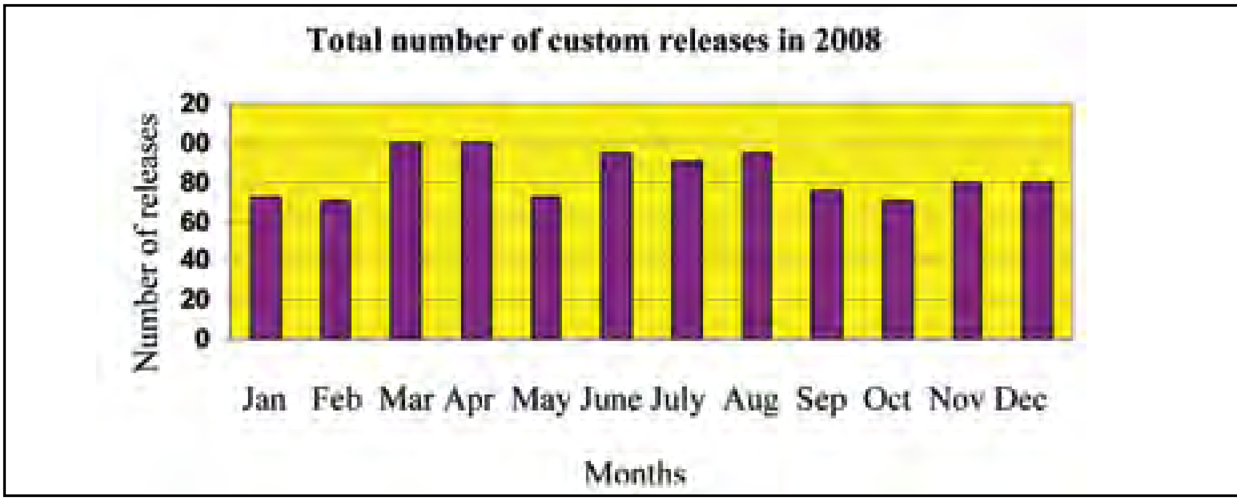


Fig (13-1) Total amounts of chemical substances released during (2007 - 2008)

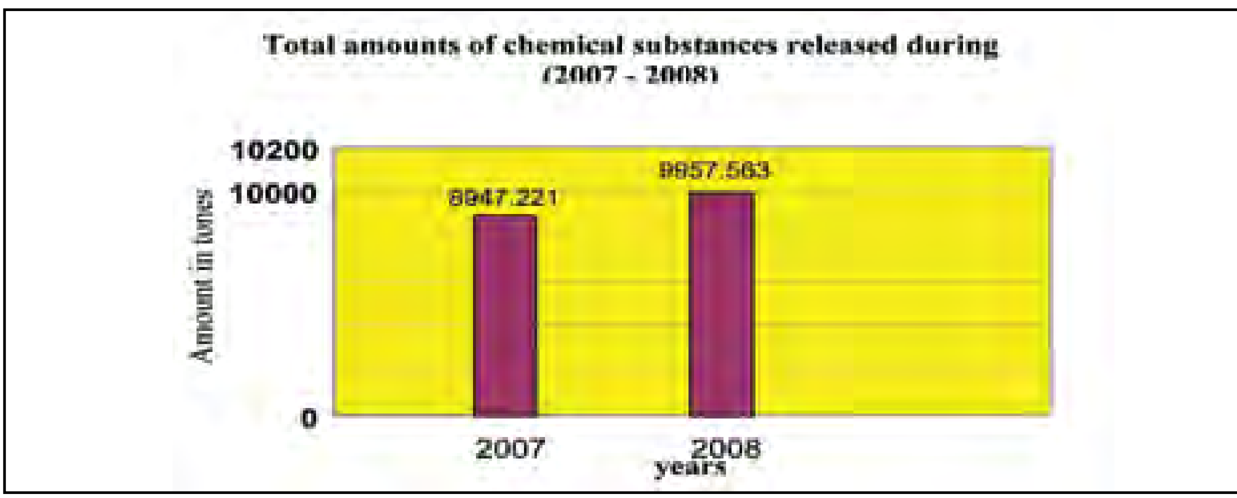


Fig (13-2) Total amounts of chemical substances released during (2007 - 2008)

F- Inventories for hazardous substances (chemicals - pesticides) that entered Egypt have been conducted through:-

- Conducting inventory of hazardous substances entering Egypt through customs releases via Hazardous Substances Department in EEAA.
- Annual inventory for chemicals via Ministry of Industry.

In addition to following up and monitoring pesticides' types & quantities in River Nile water through the annual measurements taken by National Water Research Center (Nile Research Institute) affiliated to Ministry of Water Resources and Irrigation.

13-3-2"Integrated Management of Hazardous Chemical Substances" component affiliated to "Environmental Management Improvement Project" funded by JICA

- **A Final report was prepared for Shoubra El-Khima Comprehensive Inventory with concentration on priority chemical pollutants such as PCBs- PAHs- Cr- Cd) through:-**

1. Conducting an inventory of (PCBs) substances in (Transformers and Capacitors) during (1950-1986) in the storage areas, some big Factories and transformers stations.
2. Conducting analyses for PAHs in Suspended and dust full particles in different areas.
3. Conducting analyses for heavy components' concentrations (Cr- Cd) discharged from Textile Factories.

- **Holding training and awareness courses during 2008 including:**

1. Training the Central Laboratory Staff in EEAA on monitoring and analysis of Collected Samples of PCBs in different media (contaminated oil- water-sediments-soil) in Japan.
2. Preparing guidelines for handling, storing and transporting Carcinogenic PCBs.
3. Issuing two brochures to increase environmental awareness about Poly Chlorinated Biphenyl PCBs and Polycyclic Aromatic Hydrocarbon PAHs.
4. Holding international workshop for African and Arab countries to exchange experiences in POPs Management.


pics(13-2) (13-3) Training for specialists in Central Laboratory CCC in EEAA

13-3-3 Training and Environmental Awareness

- Conducting 5 training courses in the field of " Persistent Organic Pollutants POPs and its Environmental and Health Impacts " , "Monitoring , Analyzing and Measurement," "Environmental Laws ,Legislations and International Conventions", " Heavy Metal and Polycyclic Aromatic Hydrocarbon " for the formed task force from EEAA and RBOs.
- Conducting 5 Seminars to increase environmental awareness about contaminated oil and its effects on health and environment "for NGOs and community.
- Conducting 3 workshops about" Sound Management of Hazardous Substances", "Sound Storing" ,"Integrated Management of Hazardous Wastes for Factories, Companies and Concerned Ministries.
- Conducting 7 workshops and seminars in different fields of "Environmental Inspection, Legislations and Laws, Dangerous Hazardous Substances, Types of Hazardous Wastes and Safe Disposal; for building capacities of EMUs in different districts and Shoubra City Council.

pic (13-4) Environmental awareness for Hazardous substances

13-4 Hazardous wastes

Within the framework of MSEA's exerted efforts to adopt an integrated system for the sound-environmental management of hazardous wastes and following their handling to reduce their risks and generated pollutants during their life cycle. MSEA in coordination with concerned ministries drafted a future vision & plan for the sound and safety management of hazardous wastes in accordance with procedures highlighted by Environment Law 4/1994 and its Executive Regulation.

13-5 Exerted efforts to mitigate hazardous wastes' adverse impacts

13-5-1 Hazardous wastes generated by agriculture sector

In that field, MSEA in coordination with Ministry of Agriculture surveyed all obsolete pesticides generated from agriculture activities, which resulted in about 14.137 tones that safely backed and stored at a special store located in El-Saf city, Giza governorate. Their distribution clarified in table (13-1) and figure(13-5)

Table 13-1: Quantities of obsolete pesticides generated from agriculture activities

No.	Obsolete pesticides locations	quantity/ton
1	Directorates of Agriculture (seizures)	2.714
2	Agricultural Research Centres	7.094
3	Credit Bank Development and Agricultural	2.252
4	Cooperative Societies sector	1.827
5	Agrarian Reform sector	0.25
	total	14.137

pic (13-5): Transport and storage of pesticides in El-Saf store.

While quantities of obsolete pesticides found in other ministers and authorities (Ministries of Health, Irrigation, Interior, Supply, and Petroleum Research Institute) were about 337.977 tones (according to estimations of the Central Laboratory for Pesticides, Ministry of Agriculture).

13-5-2 Medical hazardous wastes

- In cooperation with Ministry of Health to implement the Integrated Management Program for Hazardous Wastes generated from activities of health-care facilities, which amounted to 42.000 tones annually. Ministry of Health supports Health Directorates in each governorate with 128 well-equipped vehicles to transport medical infectious wastes form the point source to the disposal facility; accordingly governorates are obliged to provide special parking areas for these vehicles provided with cleaning equipment and necessary disinfectants.
- MSEA supports Ministry of Health with 28 incinerators distributed to cover demands of some governorates and contribute in safe disposal of hazardous wastes resulting from activities of health-care facilities; as well as MSEA issued the Operational Manual Guide of medical wastes incinerators, which covers the following topics:
    a. Current status of medical wastes management.
    b. Concept of medical wastes integrated management and methods of treatment.
    c. Terms and conditions of incinerators, permitted emissions limits, installation requirements of incinerators and methods of their testing and operation.
    d. Gas treatment systems and measuring methods of exhausts resulting from medical wastes incinerators and approved labs for measurement.
    e. Health and environmental risks resulting from mal-use of incinerators, legislations and laws related to medical wastes management as well as incinerators' environmental records.
    f. Recommendations with the importance of incinerators' maintenance contracts to ensure their periodical maintenance, encourage the establishment of central and sub-central facilities to avoid trouble shootings and ensure efficient monitoring and control.

13-5-3 Management of industrial hazardous wastes

MSEA with a financial & technical support from Basel Convention launched a pilot program to survey the industrial hazardous wastes generated in 10th Ramadan city. The program was implemented within Basel Convention Regional Center's activities during 2008,

Main outcomes of this program are as follows:

a. Establishing a task-force from MSEA staff to practice inventorying process for industrial hazardous wastes.
b. Development of a full detailed database for the industrial firms in 10th Ramadan city.

c. Raising environmental awareness within surveyed firms.
d. Adopting inventory program for more than 200 industrial firms.
e. Updating data of 106 industrial firms with a total number of 306 surveyed firms as clarified in table (13-2) and figure (13-6).

Table 13-2: Total results of the Industrial Hazardous Wastes Survey Program at 10th Ramadan City.

No.	Record	Quantity / No.	Unit
1	Number of firms	306	firm
2	Number of sectors	13	sector
3	Total quantity of solid hazardous wastes	12017	Ton/Year
4	Total quantity of liquid industrial hazardous wastes	4269307	M^3/year
5	Total hazardous wastes empty containers.	10527	Ton/Year
6	Total quantity of obsolete hazardous wastes	278	Ton
7	Total quantity of non hazardous solid wastes	34790	Ton/Year

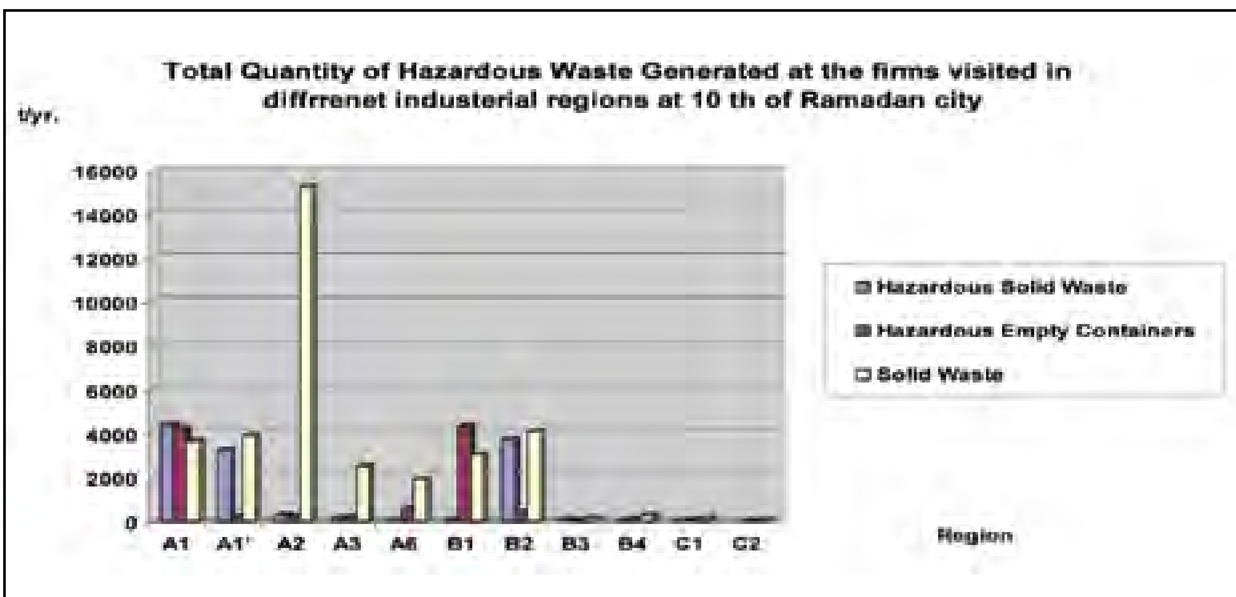


Fig (13-3): Total quantity of surveyed industrial hazardous wastes at 10th Ramadan City.

13-5-4 Sound disposal of hazardous wastes

MSEA provides technical support for the sound disposal of certain types of hazardous wastes accumulated in different entities with total 112 tons, table (13-3)

Table (13-3): Sound disposal of certain types of hazardous wastes

No.	Source of wastes	Quantity (Ton)	Type of waste	Disposal site
1	Giza General Contracting Company	18	Asbestos	Alexandria hazardous wastes landfill
2	Port Said Attorney	18	obsolete Pesticide	Alexandria hazardous wastes landfill or Cement Rotary Kiln
3	Alexandria Port	40	obsolete Pesticide	Re-export
4	3M company	35	Imported waste paper	Re-export
Total		112		

13-5-5 Following transboundry movement of hazardous wastes under Basel convention

MSEA as the acting national focal point under Basel Convention is responsible about controlling and monitoring transboundry movement of hazardous wastes through the Egyptian territories in cooperation with Suez Canal Authority and other related authorities. Hazardous Wastes Department at MSEA receives notifications related to transboundry movement from competent authorities of the exporting countries to permit hazardous wastes shipments passing from Far East to Europe through Suez Canal for the purpose of their recycling or final disposal under Basel Convention provisions.

During 2008, records registered 562.348 tones of hazardous wastes passed Suez Canal through 26 exporting and 13 importing countries, table (13-4), without recording any deviation of transit conditions stipulated in national legislations or Basel Convention.

Table (13-4) Exporting and importing countries of Hazardous waste passing through Suez Canal in 2008

Exporting countries				Importing countries			
No	Country	Quantity Ton	% from Total	No	Country	Quantity Ton	% from Total
1	Afghanistan	215	0.038%	1	Belgium	700	0.124%
2	Australia	19300	3.432%	2	Canada	130	0.023%
3	Belgium	5200	0.925%	3	China	500 000	88.913%
4	Brunei	50	0.009%	4	Denmark	5905	1.050%
5	China	3000	0.533%	5	England	44	0.008%
6	Djibouti	530	0.094%	6	Finland	1110	0.197%
7	England	340	0.060%	7	Germany	22335.5	3.972%
8	Ethiopia	2300	0.409%	8	India	12400	2.205%
9	Finland	501300	89.144%	9	Italy	18200	3.236%
10	Germany	5900	1.049%	10	Netherlands	1000	0.178%
11	Hong Kong	200	0.036%	11	Sweden	3.5	0.001%
12	India	12	0.002%	12	Switzerland	180	0.032%
13	Indonesia	180	0.032%	13	UAE	340	0.060%
14	Iran	340	0.060%				
15	Israel	900	0.160%				
16	Kenya	14	0.002%				
17	Bahrain	275	0.049%				
18	Kuwait	1900	0.338%				
19	Malaysia	3545	0.630%				
20	Oman	2030	0.361%				
21	Philippines	2500	0.445%				
22	Qatar	800	0.142%				
23	Singapore	1580	0.281%				
24	Sudan	300	0.053%				
25	Thailand	8503.5	1.512%				
26	UAE	1133.5	0.202%				

13-5-6 Integrated management of hazardous substances and wastes

A - Institutional Twinning Project:

Institutional Twinning Project under the European Union aims at exchanging and transferring technical & institutional experiences in the field of hazardous substances and wastes management between Egyptian Environmental Affairs Agency and its counterpart's authority in Germany in the following fields:

a. Developing policies, systems and strategies of hazardous substances and wastes' management.
b. Developing institutional and technical management capacities through providing local and international training.
c. Providing technical support for management of hazardous substances and wastes.

A contract has been signed with a German Authority to exchange experiences, build capacities, develop infrastructure and amend legislations in the field of integrated management of hazardous substances & wastes to fulfill requirements of international commitments and global demands.

B – Mercury Wastes Integrated Management and Recycling of Fluorescent Bulbs Project:

A project under the title of "Mercury Wastes Integrated Management" has been implemented in collaboration with the Korean International Cooperation Agency KOICA, with total investments of $ 3 million, including the following activities:

a. Survey of mercury wastes in general and fluorescent bulbs wastes containing mercury in particular.
b. Capacity building through local and international training of EEAA's staff working in the field of hazardous wastes.
c. Establishing a unit for recycling fluorescent bulbs.

A task-force had been formed from EEAA's staff and its Regional Branches to identify program's beneficiaries. The program was developed to raise environmental awareness with mercury dangers in coordination with NGOs, universities and competent ministries to participate and identified with sound methods of mercury wastes' safe disposal and recycling of fluorescent bulbs.

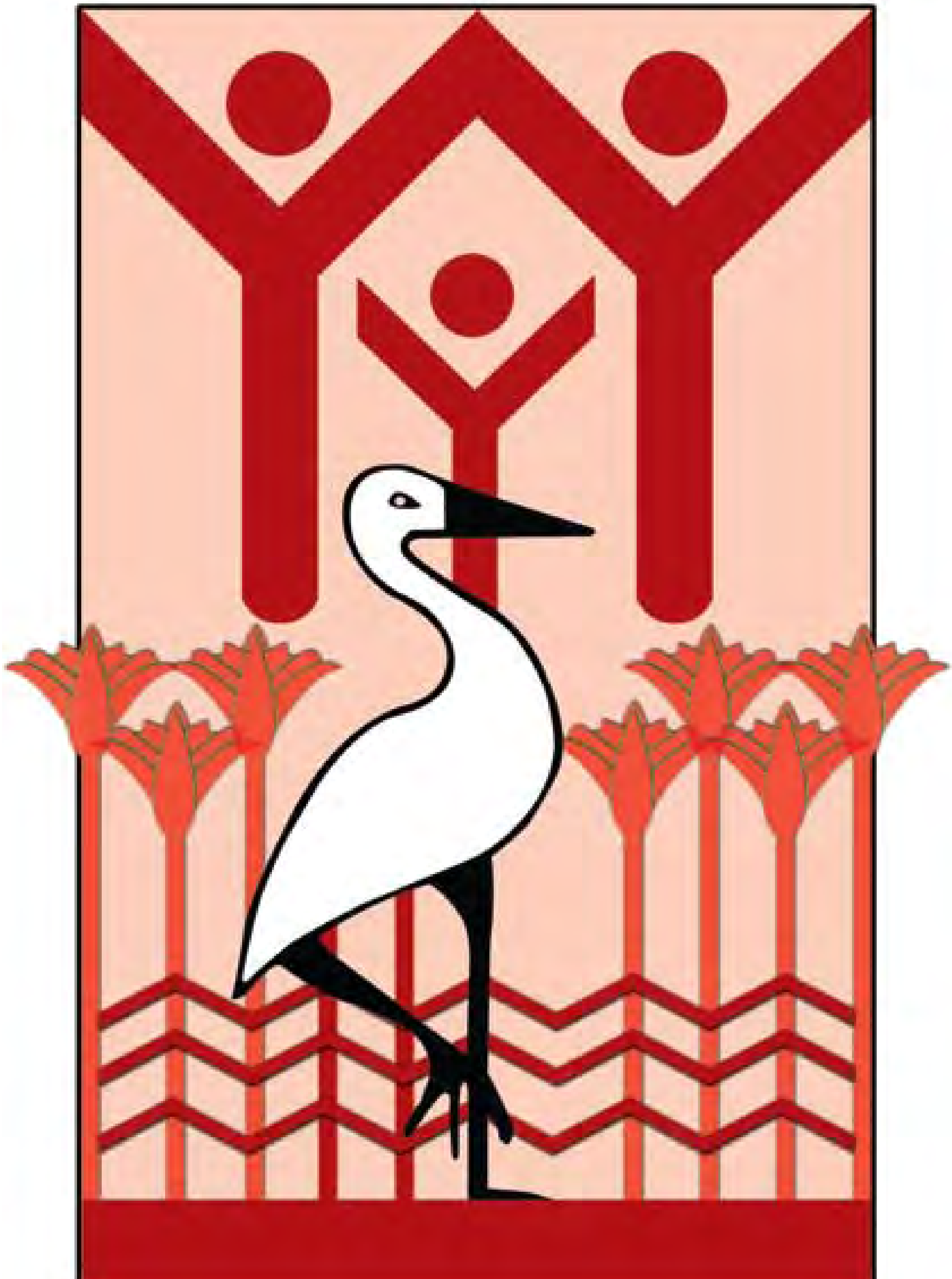
A questionnaire was prepared to make an inventory for all quantities of fluorescent bulbs "produced and imported" and spoilage amount in factories, ministries, homes, universities and schools; as well as an action plan has been prepared to execute operational activities of the inventory and coordinating with EEAA's Regional Branches to carry out an inventory for all governorates.

13-6 Future Vision

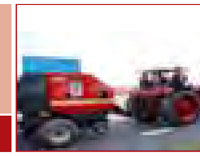
1. Applying principle of polluter must pay.
2. Applying principle of cleaner production in all industrial sectors and obligate factories to prepare an annual report with all types and quantities of hazardous wastes and substances and their methods of safe disposal.
3. Update laws and legislations to cope with international conventions and requirements of global market.
4. Carrying out a comprehensive inventory of environmental pollutants all over Egypt to identify their concentrations and priorities to launch their safe disposal.
5. Encourage recycling of hazardous wastes.
6. Encourage private sector to engage in hazardous wastes management system.
7. Raise environmental awareness in field of hazardous wastes management at all levels.
8. Increase coordination between MSEA and competent ministries handling hazardous waste.
9. Carrying out a database of hazardous wastes.

References

1. Environmental Law No. 4 of 1994 and its Executive Regulation.
2. Report of Pesticides Central Laboratory, Ministry of Agriculture.
3. Report of Central Department for Environmental Affaires, Ministry of Health.
4. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.



Chapter 14
Environment Protection Fund



14-1 Introduction

Environment Protection Fund has been established according to law No. 4 / 1994 and its Executive Regulation, Article "14" Stipulates that, a special Fund shall be established affiliated to Egyptian Environmental Affairs Agency "EEAA" entitled "Environment Protection Fund" to which all resources ,resulting from different financing resources shall devolve, represented in amounts allocated in state›s budget to subsidize the Fund, grants and donations presented by national and foreign organizations, fines levied and damages awarded or agreed upon for any harm caused to the environment. Article «15» included that resources of the Fund shall be allocated to the fulfillment of its objects set out detailed in Article «8» of the Executive Regulation, in particular to confront environmental disasters, finance experimental and pioneering projects in the field of protecting environment from pollution with all its forms.

EPF presents support for all governmental agencies, civil institutions, NGOs, private sector working in the field of environment and its protection.

To achieve transparency and credibility, web pages had been developed in EEAA's web site (www.eeaa.gov.eg) to provide information for those who are interested ,specialized and working in the environmental field about the Fund and how to contact it, explain methods EPF conducts its activities, examples form financed projects, application forms to obtain finance, Fund's action plan and its priorities to provide support.

14-2 Projects financed by EPF during 2008

The following tables from (14-1) to (14-4) show the most important environmental projects financed by EPF during 2008. These tables demonstrate that 4 projects had been entirely financed by EFP with total 523.000 L.E. in forms of (grants and loans), 6 projects had been partially financed estimated with 14.12 million LE from the original sum of 21.113 million LE in forms of grants and loans.

EPF is managing ten foreign financed projects with total 25.2 million LE, in addition to supervising twenty environmental projects implemented in cooperation with Environmental Compliance Office affiliated to Egyptian Industrial Federation with total 29.8 LE.

Quality of projects implemented under the umbrella of EPF reflect MSEA and EEAA trends which are focused upon air and water quality protection , rationalize energy use and safe disposal of solid , medical and hazardous wastes .

Table (14-1) Environmental projects co-financed by EPF with other entities

Current situation	Grants (Thousand pound)	Loan (Thousand pound)	EPF contribution (with thousand pound)	funding structure(total with thousand pound)	Project name
So far 775 taxis had been accomplished, with co-finance from Ministry of Finance	7750		5000	10000	Replacement of 1000 old taxis
Contracts had been concluded and currently under implementation	1000		1000	3000	Rehabilitation of Aswan sanitary landfill
under implementation	350		350	2000	A system for medical waste disposal in Hospital 57357
378 pistons had been distributed	3750		3750	3750	Providing 500 manual rice straw pistons for youth
Allocated fund for the association had been disbursed to start implementation	50		50	102	Development of Gamlia district (Fida Association)
7 incinerators had been installed in Beni Suef, Qena, Aswan, Giza, Cairo and North Sinai	1217		2.261	2.261	Providing 13 incinerators for governorates
	14117		12411	21113	Total

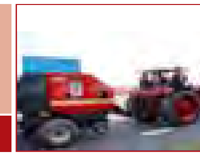


Table (14-2) Projects entirely financed by EPF

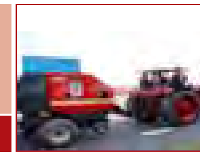
Project name	funding structure(total with thousand pound)	EPF contribution (with thousand pound)	Loan	Grants (thousand pound)	current situation
Special needs Park - Beni Suef governorate	144	59		59	Implemented
Developing two automated slaughterhouse –Dakhlia governorate	1162	760		380	Dekerness› slaughterhouse had been finalized , and the second is under implementation
Second phase of sanitary sewage for Soflak village- Sohag governorate	125	84		84	The second phase had been finalized.
Total	1431	903		523	

Table (14-3) Projects financed with foreign grants and managed by EPF, Projects implemented with DANIDA (ESP).

Project name	Total finance LE	Total Donor›s finance LE
Integrated Management of Medical Wastes - Ismailia governorate	6.255.061	3.531.248
Integrated Management of Solid Wastes , Fayoum governorate	5.443.200	2.737.350
Integrated Management of Solid Wastes - Minya governorate	7.407.000	3.942.000
Integrated Management for Collection and Recycling of Palm Wastes , El-Kharga Center El-Wadi El-Gadead governorate	9.416.000	4.764.000
Two Stations for sewage treatment at two villages ,Beheira governorate	2.882.110	1.441.055
Controlled Landfill at Lablana village , Aswan governorate	4.031.777	2.870.277
Controlled Landfill , Aswan governorate	2.938.900	1.046.500
Water reservoir for Wadi Al-Alaqi village , Aswan governorate	1.070.300	746.900
Rehabilitation of the Controlled Landfill ,Edfou ,Aswan governorate	2.147.099	1.539.199
Integrated Management of Solid Wastes at Samsta city , Beni Suef governorate	4.491.800	2.523.100
Total	46.083.248	25.141.629

Table (14-4) Projects implemented in cooperation with Environmental Compliance Office affiliated to Egyptian Industries Federation.

Company name	**Total investments (LE)**	**Revolving loan contribution (LE)**
Gehraa El-Negma Company	1,625,000	1,100,000
National Gas Company	3,145,000	2,200,000
Modern Company for Modern Industries	2,650,000	1,855,000
Doddi PLAST for Plastic Industries	1,625,000	1,300,000
Egyptian Company for Chemical industries	2,450,000	1,720,000
Modern Egyptian Company for Sulfur	2,000,000	1,600,000
Al-Ahram Company for Metal Manufacturing	3,200,000	1,700,000



Star Cool Company for Manufacturing Refrigeration & Air-Conditioning Equipments	610.000	550.000
Taki Vaita Company	3,740,000	2,620,000
N .I. D Medical Company	1,562,500	1,250,000
Marina for Scaffolding and Cranes	2,714,000	1,900,000
El-Shehab Company for Dyeing and Ready-made Clothes	2,425,150	1,697,605
El-Shorbagi Company for Clothes and Ttextiles (Charmaine)	1,274,240	1,019,392
Abo-Alela Company for Spinning, Weaving, and Dyeing.	1,945,550	1,500,000
City Textiles Company for Spinning, weaving and Tricot	1,527,700	1,222,200
El-Shehab Factory for Dairy and Food Industries	1,643,900	1,300,000
Al-Nda Company for Dairy Products	560.000	500.000
Al-Noor Company for Food Industries	3,600,000	2,500,000
El-Raai Company for Halwa Tahinia	2,500,000	1,750,000
Factory for Processing, Packaging and Refrigerating Foodstuff (Mehrez)	680.000	500.000
Total	41,478,040	29,784,197

14-3 Future Vision

Near future shall witness EPF continuous efforts to support projects implementation that enhance environment protection and achieve sustainable development.

On the medium run Ministry of State for Environmental Affairs “MSEA” and Egyptian Environmental Affairs Agency “EEAA” are aspiring to develop EPF to be able to achieve its objectives for which it had been established for, through the following:

Has its public juridical personality.

Developing its resources.

Optimum investment of its financial resources.

In addition to enhancing and building capacities of cadres working in EPF to be able to achieve their commissioned tasks and overcome obstacles facing projects’ implementation according to its targeted plan.

Chapter 15
Culture & Environmental Awareness

15-1 Introduction

Ministry of State for Environmental Affairs pays great interest to environmental public awareness among all categories of Egyptian society, due to the fact that " better environment for all " will not be realized except when a minimum limit of culture and environmental awareness will be provided to all categories of the society "from children to old aged ", "from public people to leaders", " from government sector to businessmen", which is achieved by MSEA, through the following two main pivots:

Firstly: During 2008, MSEA exerted great efforts at all levels and through using all awareness tools such as seminars, continuous environmental convoys and campaigns as well as cooperation with other ministries and associations , particularly Ministry of Education to raise environmental awareness among schools' students, supporting many radio and television environmental programs and environmental articles in newspapers.

Secondly: Supporting all governmental and non-governmental institutions such as Culture Palaces, Nile Centers, Youth Centers, Social and Sporting Clubs, Public Libraries in addition to environmental NGOs in order to include environmental issues in their awareness programs. All these efforts led to achieve positive outcomes in environmental awareness among all categories of the society.

15-2- Exerted efforts in Cultural and Environmental Awareness field

Table (15 -1) conducts a comparison between activities of environmental awareness during 2007 and 2008 which reflects increasing interest with environmental issues among public. It clarifies that EEAA organizes 5 seminars every 4 days, a workshop every 3 days, and a conference or an environmental exhibition every 3 days.

Table (15-1): Environmental awareness activities during 2007 and 2008

No.	Activity	2007	2008	percentage
1	Environmental seminars	319	460	144%
2	Environmental workshops	111	120	108 %
3	Environmental weeks	35	54	154 %
4	Environmental convoys	84	125	148 %
5	Environmental publications	31	52	167 %
6	Environmental camps	18	9	- 50 %
7	Environmental Educational Trips	32	51	159 %
8	Environmental conferences &exhibition	42	112	266 %
9	Radio programs	36	36	100 %
10	TV programs	13	17	130 %
11	Environmental articles in newspapers	40	82	205 %

A decline in activities of environmental camps during 2008 is clarified due to focusing efforts on holding seminars and environmental convoys at Youth Centers, Clubs, Culture Palaces and other institutions during summer of 2008.

Pic (15-1): Samples from public awareness activities

To determine improvement in environmental awareness level, Ministry of State for Environmental Affairs charged Center of Environmental Researches and Studies affiliated to Cairo University to conduct two studies during 2006 and 2008 to measure environmental awareness level among some categories in five governorates (Cairo, Giza, Qalubia, Gharbia and Assuit). These surveys included 2508 samples from youth, women, farmers and children as it is clarified in table (15-2) and figure (15-1). Results of these surveys reflected a great improvement in environmental awareness level among mentioned categories.

Table (15-2): Samples of Environmental Awareness Survey

Governorate	Sample
Cairo	792
Giza	576
Qalubia	396
Gharbia	396
Assuit	348
TOTAL	2508

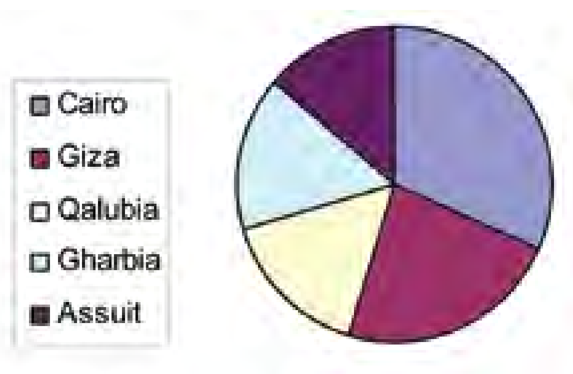


Fig (15-1): Samples' size in the 5 governorates

The conducted study during 2008 included the following facts:

- "Good" is the level of environmental awareness among majority of samples.
- Environmental awareness among surveyed samples had been obviously improved than before as a result of implementing environmental awareness programs.
- Environmental issues discussed during environmental awareness programs did not satisfy participants, so it is necessary to organize training programs suitable for each category and their interests to ensure their benefit from environmental awareness' activities.

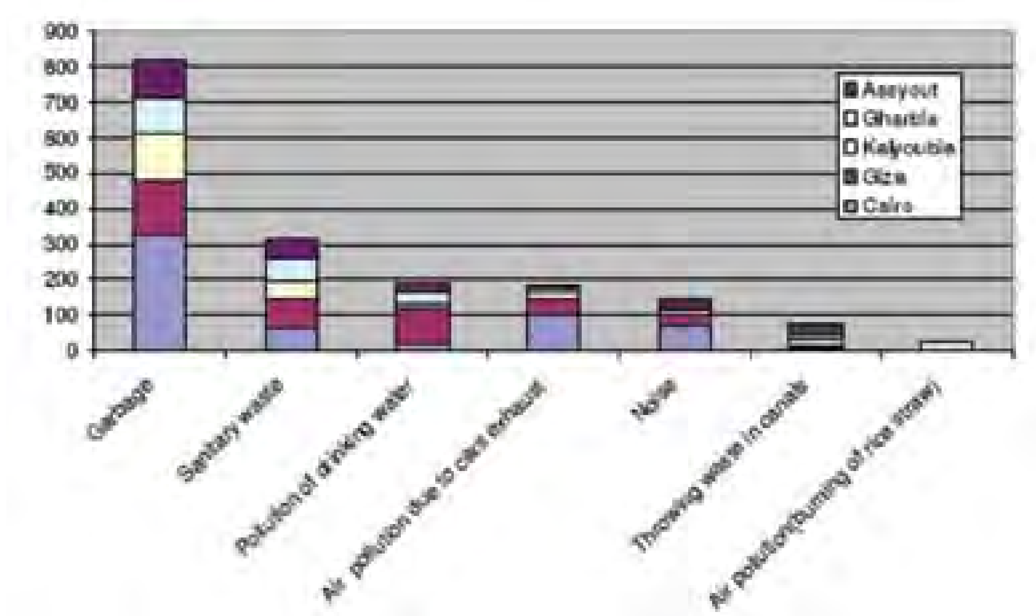


Fig (15-2): Most important problems deduced from the survey and their distribution among Governorates

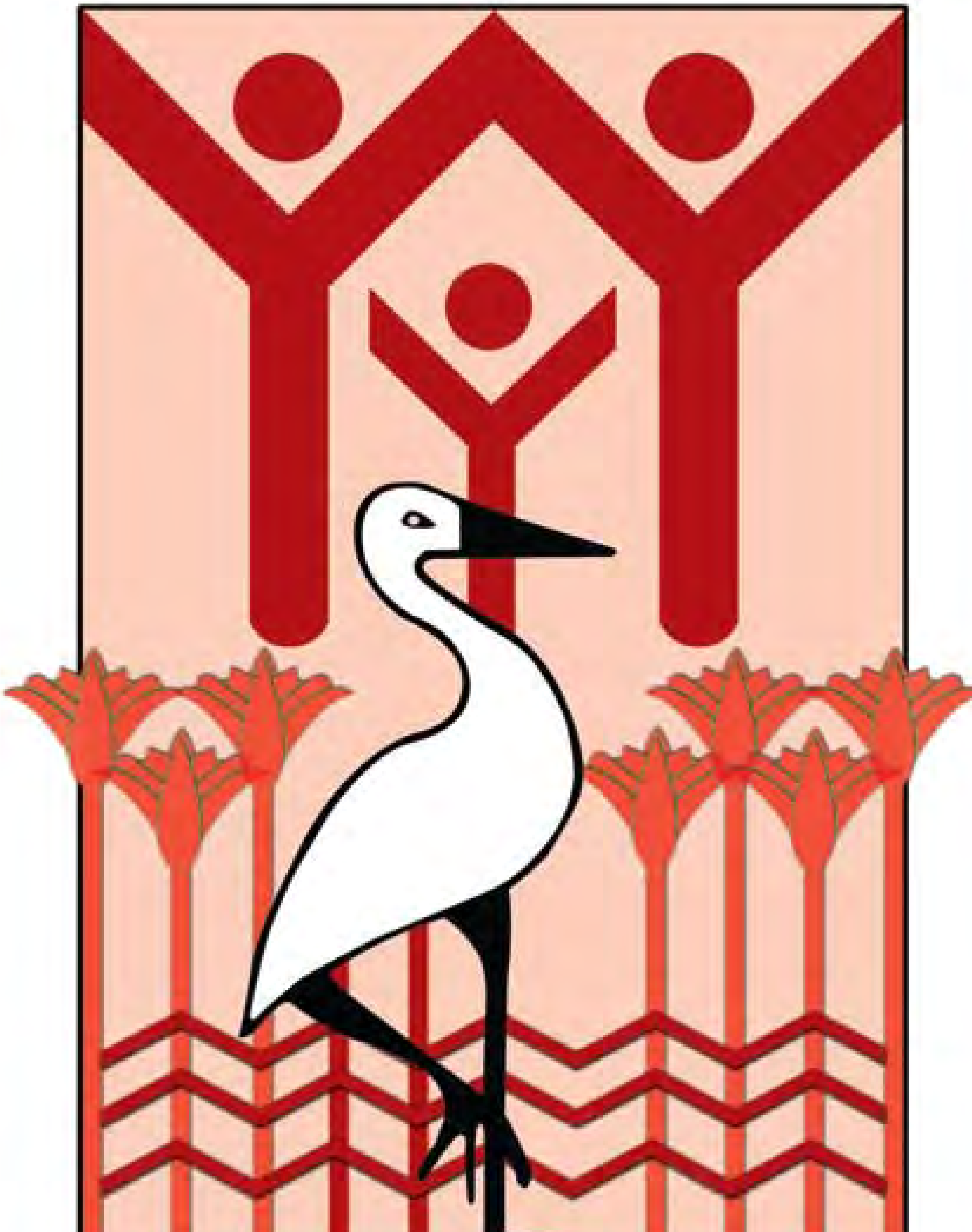
- Surveys' results clarify that EEAA's role in governorates is still limited and must be activated through providing more training programs to raise environmtal public awareness.

- The necessity to benefit from public awareness groups and their activities in several governorates to raise environmental awareness and exchange experiences.

- During the past three years until 2008, a great improvement has been achieved in Egypt's environmental awareness with 82%; however women did not enjoy an advanced rank in her interest with environmental issues. Therefore, new programs and activities should be innovated and prepared to involve women and increase her interest with environmental issues.

15-3 Future vision

Near future shall witness the continuity of exerted efforts by Ministry of State for Environmental Affairs and Egyptian Environmental Affairs Agency to improve environmental awareness through integrating environmental dimension in all programs and plans of all society categories; paying great inertest with capacity building and supporting Ministry's staff for better performance of raising environmental awareness.



Part 5

Global Environmental Trends

Chapter 16
Green Cities, Green Building & Green Chemistry

Green Cities and Green Building

16-1 Introduction

The concept of Green Building can be defined as « the process of designing buildings and urban planning in a manner that preserves natural resources of the surrounding environment , while designing, implementing, and usage .This significantly contribute to rationalize energy consumption ,efficient use of natural resources , optimal use of building materials and construction as well as good urban planning; leading to meet needs of present generation without wasting rights of future generations in having a prosperous life».

It has become obvious to decision makers, scientists and specialists in various fields and sectors in Egypt, that we are facing disturbing climate changes require profound study to determine the current situation and impacts of climate change on various aspects of life, and what can be taken to prevent its risks. Recent estimations indicate that humanity effect on environment is 23% greater than the planet›s ability to renew its resources – meaning that the land needs more than 14 months to renew what have been consumed by people in one year.

From this point of view, it was necessary to comprehend effect of climate change phenomenon on buildings in cities and villages; while most of the Egyptian cities are locating in arid areas, the current architecture scene in Egypt has started to apply green environmental standards through following modern techniques in order to reduce adverse environmental effect of buildings and modern cities.

16-2 Sustainable Building and Green Building Revolution

- The concept of Green Building apply important criteria to ensure access of quality and efficiency required for buildings; it takes into account direction , preparation and well study of sites; prepare studies about natural lighting and ventilation , available energy paths and its use ,such as solar and wind energies, with the necessity to benefit from them on the long term by establishing plants to generate electricity for cities and villages; and on the short term by using photovoltaic cells and solar heaters to generate electricity , heat water , heat residential units, and methods of heating and cooling by selecting high efficient devices and the optimal selection of local building materials (brick - stone - concrete - agricultural waste - building remnants) ;as well as supporting materials such as thermal and moisture insulation .
- Green Building develop many standards and plans to insure integration between human being and his surrounding environment within the overall circumstances of the era; due to the fact that Green Building include many branches of knowledge «engineering - agriculture

- biodiversity - geology – climate» ,among which it tries to create coherence and integration through studying and analyzing sites , land settlement , developing rainwater disposing systems through open ditches , covered canals or pipes, dealing with water components and exploiting its physical and aesthetic properties, studying locations› climatic and spatial conditions and selecting appropriate plants for local conditions to achieve their functional harmony with their surrounding elements.

16-3 Principles of Green Building

- Prevention is the most important guidelines for implementing objectives of sustainable development and Green Building, as prevention from pollution is more effective than treatment of pollution after its occurrence. On this basis it is important to avoid any activities that represent a threat to the environment and human health to be implemented and planed for the sake of achieving the following :
  - Make less possible change in the environment .
  - Less risk to the environment and human health.
  - Rational use of raw materials and energy in construction and use.
  - This principle is applied through the implementation of environmental impact assessment and the use of best available technologies and good monitoring of all types of pollution.
- Green Design Techniques reduce costs of construction and maintenance, create a comfortable working environment, improve health of its users and reduce legal liability that may arise due to diseases of buildings.

16-4 Exerted efforts

Establishing the National Council for Green Building headed by Ministry of Housing, Utilities and Urban Development through the National Council for Housing, and Building Researches and membership of relevant ministries, experts and scientists specialized in that field, is considered a strong launch to activate concepts and applications of Green Building in Egypt.

16-5 Future objectives

Ministry of State for Environmental Affairs› interest with Green Building as a new method in various fields of architecture is considered one of the selected national strategic political instruments for sustainable development; as achievement of these objectives require assessment of the current instruments› effectiveness and the introduction of new tools, particularly those based upon incentives to encourage market and expand their application.

Issuing a special code focusing on the following main aspects is one of the future objectives:

Sustainability of site selection:

- Reduce pollution from construction works by providing a comprehensive plan prior launching excavation work identifying how to deal with soil erosion and its impact on groundwater sediments, as well as dealing with produced dust from drilling and its impact on the surrounding areas.
- Commit with selecting appropriate location, which is not contrary to precautions and environmental conditions «agricultural lands - natural protectorates - coastal areas etc.»
- Give priority to exploit and redevelop Brownfield lands, for their rehabilitation and reduce pressure on the use of virgin lands.
- In coordination with all competent authorities with infrastructure in new urban cities, expand in using public transportation operated with natural gas where new projects are planed to be established.
- Commit with providing environmental impact assessment study before launching any project.

Efficiency of water consumption:

- Rationalize water consumption used in landscaping irrigation by selecting species of plants less- water requirement as well as appropriate types of irrigation «sprinkler-drip»; with the fact that drip irrigation is water-saving.
- Reduce consumption of water in buildings by using sound designs depend upon recycling of water gray, as well as use of water-saving sanitary devices.

Efficient use of energy:

- Verifying designs in terms of thermal loads; by obligating designers to provide a study about energy consumption and commitment with its Code.
- Commit with carrying out maintenance contracts for various devices, use of energy-saving devices, substituting old devices with new ones to ensure efficient operation and energy consumption.
- Encourage use of renewable and clean energy.

Selection of used materials and identification of its sources:

- Promote use of recycled materials.
- Promote re-functioning of established buildings while maintaining their external structure, which reduces the environmental burden resulting from demolition and reconstruction.
- Expansion in using organic rapidly renewable materials such as rice straw.
- Giving priority to local manufactured materials.

Improve efficiency of internal environment:

- Commit with smoking-prohibition in public buildings.
- Use of environment-friendly and low emission materials in insulation and painting.
- Increase natural ventilation inside the building and possibility of outdoor air delivery monitoring.
- Mechanical control of thermal comfort and lighting within building spaces.
- Encourage innovative designs.

Green Chemistry

16-6 Introduction

Chemicals industry is one of the most successful industries in the world, with sales estimated with approximately 2377 US billion $ in 2007 and its products are essential components to many vital industries, particularly food, medicine, building materials and others .Despite its substantive importance, however many chemicals, processes and chemical treatments resulting in damages and negative effects to the surrounding environment and health.

During 1990s Green Chemistry concept began to emerge by the US Environmental Protection Agency US EPA, to amend many chemical processes associated with different manufacturing lines in order to ensure safe and clean environment during 21st century.

Green Chemistry concept based upon «preventing pollution», and not «controlling pollution». Pollution prevention aims to prevent or reduce harmful emissions and toxic substances released during chemical operation and before emitting to the surrounding environment, while pollution control includes process, reuse or safe disposal of these materials and harmful emissions.

Green Chemistry can be defined as «promotion of innovative chemical processes technologies that seek to prevent or reduce output, input or emissions containing hazardous materials .This includes all phases of design, manufacture and use».

16-7 Principles of Green Chemistry

Green Chemistry concept focuses on some principles , the following are the most important of them:

16-7-1 Use of renewable and non-hazardous manufacturing inputs

Under this principle, substituting non-renewable inputs such as fossil fuel with inputs derived from plants .For example Adipic Acid used widely in industry producing more than 2.3 million tons annually by using benzene and nitric acid as an essential inputs in the presence of a metal catalyst « copper , vanadium» . It is known that these inputs are cancerous materials in addition to its production of nitrogen oxides; Green Chemistry concept calls to use alternative process depends upon glucose as an alternative to benzene and some types of bacteria as a bio-catalyst.

But the question is about the expected effect on the per capita quota from the annually decreasing plant- food that will result from expanding this principle application; for that reason we recommend to use agricultural residues as possible.

16-7-2 Safe use of solvents

That means substituting use of harmful solvents to environment and health such as carbon tetrachloride CCL4 and chloroform with based water-solvents or dissolved carbon dioxide for safer dry cleaning.

16-7-3 Maximize atoms› efficiency

That means reducing interacting atoms rate, which end up in producing unwanted by- product wastes. An example of this is substituting ,the old process to manufacture the pain reliever Ibuprofen where only 40% of the reactant atoms ended up in the desired product « Ibuprofen «and 60 % ended up in unwanted by-products or wastes , with the new efficient chemical process that used 77% of the reactant atoms end up in the Ibuprofen.

16-7-4 Lower energy input

That means use technologies achieving the required reactant with lower –energy consumption; such as using catalysts or microwave radiation to speed up chemical reactions.

16-7-5 Safe output

That means chemical process› output must be safer or rabidly biodegradable materials at the end of its use when disposed of, to reduce problems of solid waste. This includes replacement of polystyrene plastic packing materials made from fossil fuel with the packing pellets made from corn starch, which perform the same function and biodegradable when disposed of.

16-8 Exerted Efforts

Although the concept of «Green Chemistry» has not previously been included within EEAA›s strategies, however, some of its previous activities were supporting this concept, particularly Egyptian Pollution Abatement Project EPAP, which aims to clean up the environment from

toxic chemicals associated with industrial processes. This project provided support to more than 75 industrial establishments such as project of reducing hexane concentrations associated with rubber manufacturing through transforming to use water-based solvents and as a result of its success the establishment has acquired ISO 14001 certificate .

16-9 Future Vision

Future vision includes the following:

- Implement incentives package to encourage use of Green Chemistry technologies.
- Announcement of an annual prize to stimulate researches in pollution prevention field.
- Cooperation with agencies and networks working in that field.
- Initiate a study to promote and include Green Chemistry among future activities of pollution combating program .

Green Chemistry References

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- The American Chemical Society.
- Green Chemistry، journal of the Royal Society of Chemistry
- EPA Green Chemistry program Website (WWW.epa.gov-green Chemistry)
- The Egyptian Chemical Management Project (www.eeaa.gov.eg/egpops)

List of abbreviations used in the report

BOD	Biochemical Oxygen Demand
CBD	Central Business District
CFCs	Chlorofluorocarbons
CO_2	Carbon Dioxide
COD	Chemical Oxygen Depletion
CH_4	Methane
DO	Dissolved Oxygen
DRI	Direct-Reduction-Iron
EPAP	Environment Pollution Abatement Program
GPS	Global Positioning System
GWP	Global Warming Potential
IUCN	International Union for Conservation of Nature
ISO	International Standard Organization
JICA	Japanese International Cooperation Agency
KFW	(Kreditanstalt für Wiederaufbau (Reconstruction Credit Institute
LoA	Letter of Approval & Letter of Authorization
LoN	Letters of No-Objection
LNb	Low-NOx burners
MEDISCO	Mediterranean food and agro Industry of Cooling technologies

MDI	Meter Dose Inhalers
NMP	Normal Methyl 2– Pyrrolidone
N_2O	Nitrous Oxide
NPP	National Phase out Plan
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PH	Poten “Power” Hydrogen
PIC	Prior Informed Consent
PM_{10}	Particulate Matter
PPSI	Public Private Sector Industry Project
PVC	Poly Vinyl Chloride
SAICM	Strategic Approach to International Chemicals Management

List of some environmental abbreviations

CPM	Critical Path Method
AHED	Association for Health and Environmental Development
ALECSO	Arab League Educational, Cultural and Scientific Organization
AMCEN	African Ministerial Conference On The Environment
ANC	Authority of New Communities
AOYE	Arab Office for Youth and Environment
APE	Association for the Protection of the Environment
AR4	Fourth Assessment Report
ARFI	Arab Regional Financial Institution
ATM	Air Traffic Management
AU	African Union
BASEL	Convention of BASEL (control of transboundary movements of hazardous wastes and their disposal)
BCM	Billion Cubic Meter
BOD	Biochemical Oxygen Demand
BOT	Build, Operate, and Transfer
C&D	Construction and Demolition
CAIP	Cairo Air Improvement Project
CAMP	Coastal Areas Management Program
CAPMAS	Central Agency for Public Mobilization and Statistics
CBD	Central Business District
CBO	Central Business Organization
CDA	Community Development Association
CDM	Clean Development Mechanism
CEDARE	Center for Environment and Development for the Arab Region and Europe
CEO	Chief Executive Officer
CEOSS	Coptic Evangelical Organization for Social Services
CFCs	Chlorofluorocarbons
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Spacies
CMS	Convention on Migratory Species
CNG	Compressed Natural Gas

CNS	Communication & Navigation Systems
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
CPM	Critical Path Method
DANIDA	The Danish International Development Agency
DEM	Digital Elevation Models
DFID	UK Department for International Development
DO	Dissolved Oxygen
DRC	Desert Research Center
DRI	Drainage Research Institute
ECEP	Energy Conservation and Environment Project
ECES	Egyptian Center for Economic Studies
EEAA	Egyptian Environmental Affairs Agency
EEC	Energy Efficiency Council
EEHC	Egyptian Electricity Holding Company
EEI	Emerging Environmental Issues
EEIF	Egyptian Environmental Initiatives Fund
EEPP	Earth Education Partnership Program
EESA	Egyptian Energy Service Association
EHMIMS	Egyptian Hazardous Materials Information and Management System
EIA	Environmental Impact Assessment
EIMP	Environmental Information and Monitoring Project
EMG	Environmental Management in the Governorates
EMU	Environmental Management Unit
EPAP	Environment Pollution Abatement Project
EPF	Environmental Protection Fund
EPM	Environmental Planning and Management
EQI	Environmental Quality International
ERF	Environmental Revolving Funds
ERSAP	Economic Reform and Structural Adjustment Program
ESP	Environmental Sector Program
EU	European Union

Eutrophication	Eutrophication is a condition in an aquatic ecosystem where high nutrient concentrations stimulate blooms of algae
Faecal Streptococci	Kind of harmful bacteria
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investments
FEA	Friends of the Environment in Alexandria
FEDA	Friends of the Environment and Development Association
FEI	Federation of Egyptian Industry
GCR	Greater Cairo Region
GDP	Gross Domestic Products
GEF	Global Environment Facilities
GHG	Green House Gases
GHGRP	Green House Gases Reduction Project
GIS	Geographic Information System
GMA	Global Mercury Assessment
GMO	Genetically Modified Organisms
GOE	Government of Egypt
GOFI	General Organization for Industry
GOPP	General Organization for Physical Planning
GPA/LBA&	
MEDPOL	Global Program of Action for the Protection of the Marine Environmental from Land Bared Activities
GTZ	German Technical Cooperation Agency
GWS	Ground Water Sector
HACCAP	Hazardous Analysis & Critical Control Points System
HCRW	Health Care Risk Wastes
HCW	Health Care Wastes
ICA	Institute of Cultural Affairs
ICARDA	International Center for Agricultural Research in Dry Areas
ICCON	International Consortium for Cooperation on the Nile
ICED	International Center for Environment and Development
ICZM	Integrated Coastal Zone Management
IDB	Islamic Development Bank

IDSC	Information and Decision Support Center
IFCS	International Forum on Chemical Safety
IPCS	The International Program on Chemical Safety
ISI	Import Substitution Industry
ISO	International Standard Organization
IT	Information Technology
JICA	Japanese International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau (Reconstruction Credit Institute)
LDC	Least Developed Countries
LIFE	LIFE program USAID/Egypt for Lead Pollution Clean-Up in Qalyoubia
LMO	Living Modified Organisms
LoA	Letter of Approval & Letter of Authorization
LoN	Letters of No-Objection
LPG	Liquefied Petroleum Gases
M&E	Monitoring and evaluation
MALR	Ministry of Agriculture and Land Reclamation
MAP	Mediterranean Action Plan
MDI	Meter Dose Inhalers
MEAs	Multilateral Environmental Agreements
MENA	Middle East and North Africa
METAP	Mediterranean Environmental Technical Assistance Program
MHUUC	Ministry of Housing, Utilities, and Urban Communities
MLD	Ministry of Local Development
MLF	Multilateral Fund
MOEE	Ministry of Electricity and Energy
MOFA	Ministry of Foreign Affairs
MOHP	Ministry of Health and Population
MSDS	Material Safety Data Sheet
MSEA	Ministry of State for Environmental Affairs
MSWs	Municipal Solid Wastes
MSY	Maximum Sustainable Yield
MTBE	Methyl Terially Butyl Either
MWRI	Ministry of Water Resources and Irrigation

NAFTA	North America Free Trade Agreement
NAP	National Action Plan
NAPOE	National Association for Protection of Environment
NARSSS	National Authority for Remote Sensing and Space Sciences
NAWQAM	National Water Quality and Availability Management Project
NBI	Nile Basin Initiative
NC	National Communication
NEAP	National Environmental Action Plan
NEES	National Energy Efficiency Strategy
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
NIOF	National Institute of Oceanography and Fisheries
NOPWASD	National Organization for Potable Water Sanitation and Drainage
NOU	National Ozone Unit
NPP	National Phase out plan
NRI	Nile Research Institute
NSS	National Spatial Strategy
NWC	National Women Council
NWRC	National Water Research Center
NWRP	National Water Resources Plan
OAU	Organization of African Unity
ODS	Ozone Depleting Substances
OEP	Organization for Energy Planning
OPEC	Oil Producing and Exporting Countries
ORDEV	Organization for Reconstruction and Development of Egyptian Villages
P&I	Protection and Indemnity
PAH	Poly Aromatic Hydrocarbons
PAP	Priority Action Program
PCB	Polychlorinated Biphenyl
PERSGA	Program for the Environment of the Red Sea and Gulf of Aden
PFTC	Department of Planning, Follow-up and Technical Cooperation
PIC	Prior Informed Consent
PM10	Particulate Matter

POPs	Persistent Organic Pollutants
PPC	Policy Planning Committee
PPM	Part Per Million
PPP	Pollution Prevention Pays
PVC	Poly Vinyl Chloride
R&D	Research and Development
RAC	Regional Activity Centers
RBO	Regional Branch Offices
RFP	Request for Proposals
RIGW	Research Institute for Groundwater
RMP	Refrigeration Management Plan
SAICM	Strategic Approach to International Chemicals Management
SAP	Strategic Action Program
SCA	Supreme Council for Antiquities
SDU	Sustainable Development Unit
SEAM	Support for Environmental Assessment and Management
SEDO	Small Enterprise Development Organization
SFD	Social Fund for Development
SGP	Small Grants Program
SHW	Solar Hot Water
SMART	Scientific, Measurable, Attainable, Relevant and Trackable
SME	Small and Micro-Enterprises
SPAMI	Specially Protected Areas of Mediterranean Importance
TDA	Tourism Development Authority
TDS	Total Dissolved Solids
TLV	Threshold Limit Values
TOE	Ton Oil Equivalent
TSM	Total Suspended Matter
TSP	Total Suspended Particles
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCHS	United Nations Center for Human Settlements
UNDP	United Nations Development Program

UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention for Climate Change
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
VCM	Vinyl Chloride Monomer
VET	Vehicle Emissions Testing
VOC	Volatile Organic Compound
WB	World Bank
WHO	World Health Organization
WRI	World Resources Institute
WTO	World Trade Organization

Contributors	
Ministry of State for Environmental Affairs	**EEAA**
Dr. Mawaheb Abu El-Azm	EEAA, CEO
Gen. El-Minshawy Amer	Head, Financial and Administrative Affairs Sector
Eng. Ahmed Hegazi	Head, Environmental Quality Sector.
Prof. Dr. Mostafa Fouda.	Head, Nature Conservation Sector
Dr. Ali Abu Sedira	Head, Branch Affairs Sector and EEAA Secretary General
Dr.Fatma Abu Shok	Supervisor, Environmental Management Sector
Eng .Ahmand Abou Al -Soud	Head, Central Department of Air Quality and Protection against Noise
Dr. Hisham El- Agamawi	General Director, General Directorate of Energy Projects
Eng. Moheeb Abd El-Sattar	Head, Central Department of Information and Computer Center
Fouad Megahed	General Director, General Directorate of Culture and Environmental Awareness
Eng. Amin El-Khayal	General Director, General Directorate of Wastes and Supervisors, Central Department for Wastes and Hazardous Substances.
Chem. Ikhlas Gamal El-Ddin	General Director, General Directorate of Water Quality
Dr. Mona Kamal	General Director, General Directorate of Protection against Noise
Eng. Adel El-Shafei	General Director, General Directorate of Hazardous Substances and Wastes
Chem. Mohamed Farouk Abd El-Monem	General Director, General Directorate of Integrated Management of Coastal Zone and lakes
Dr. Atwa Hussien	General Director, Greater Cairo Branch
Chem. Kawthar Hefni	General Director, General Directorate of Air Quality
Eng. Sherif Abd El- Rehim	General Director, Minister's Technical Office
Mr.Said El-Dalil	General Director, Environment Protection Fund
Mr. Ahmad Moustafa	General Director, General Directorate of Environmental Knowledge
Dr. Manal Tantawi,	General Director, General Directorate of Marine Pollution Control and Ports' Affairs

Chem. Gihan Sl-Sakka	General Director, Technical Office –Environmental Quality Sector
Dr. Mohamed Ismail	Director, Hazardous Wastes Department.
Chem. Elham Refaat	Director, Hazardous Substance Department.
Chem. Maysoun Ali	Deputy Manger, National Coordinator for Cleaner Production
MSEA and EEAA Advisors	
Dr. Mohamed Sayed Khalil	Minster's Adviser, Planning, Follow-up and Arab-African Cooperation
Dr. El-Sayed Sabri	Supervisor, Climate Change Unit
Dr. Moustafa El-Hakim	Minster's Advisor, Agriculture Affairs
Dr.Ezzat Louis	Supervisor, Ozone Unit
Prof. Dr. Mahmoud Hewehy,	Administrative Director, Minster's Technical Office
Technical Support	
Strengthen, Monitoring and Reporting systems of the MEAs (CP2 project) – GEF/UNDP:	
Prof.Dr. Fatma El-Gohary ,	Emeritus Professor, National Research Center
Prof.Dr. Ahmad Wagdi	Assistant Professor, Faculty of Engineering, Cairo University
Prof. Dr. Mohamed El-Deak	Professor, Organic Chemistry, Faculty of Science - Ain Shams University
Mrs. Yassmin Fouad	Project Director
Environmental Indicators and Reporting Unit, General Supervision and Coordination:	
Dr. Mona kamal	Head, Environmental Indicators and Reporting Unit
Eng. Ahmad Awadalla	Advisor, Environmental Indicators and Reporting Unit
Ms. Ghada karem	Coordinator, Report preparation

Translation Department	
Mrs. Amany Abd El-Fattah	Director, Translation Department
Mrs. Noura Latif Fawzy	Translation Specialist

Covering Design: Eng. Sherif Abd El-Rehim

Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency

Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency

30 Misr Helwan El-Zyrae Road, Maadi
P.O Box 11728 Cairo, Egypt
Tel:+ 202-25256452
Fax: +202-25256490
Website: WWW.eeaa.gov.eg
E.Mail: eeaa@eeaa.gov.eg

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