Arab Republic of Egypt

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

Ministry of State for Environmental Affairs

Egypt State of The Environment Report 2009

Issued in 2010

Egypt State of Environment Report
2009

Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency

Foreword

It gives me great pleasure to foreword this Egypt state of the Environment Report 2009, which has been issued successively for the sixth year. This report comes within the framework of Law No. 4/1994 on environment protection, as amended by Law No. 9 /2009 that stipulates developing an annual state of the environment report to be submitted to the President of the Republic and the cabinet of ministers with a copy forwarded to the People's Assembly.

within the framework of implementing the political environmental commitment demanding taking the necessary procedures to protect the environment, and to provide healthy and safe environment for the Egyptian people; the government has issued the document - Vision, Targets, Strategy and Policies of the government in December 2009. The government environmental policies have encompassed the development towards green economy, supporting the integrated environmental systems, enhancing sustainable development policy and preparing to meet climate change issues; it also included integrating the environmental work at the national level as well to increasing women's participation in environmental work.

Furthermore, this report evaluates the state of the air, aquatic (fresh – marine), as well as the urban and industrial environments; in addition to evaluating biological diversity and the changes that have been taking place in those fields, using a scientific approach and related environmental indicators to describe and analyze the status in Egypt Precisely.

The report is divided into five parts consisting of sixteen chapters; the first part addresses air quality, the second addressees water quality (fresh and marine), the third focuses on Earth, the fourth discusses the urban and industrial environment, and finally the report is concluded by discussing global environmental orientations in the fifth part.

The first chapter covers **air quality** and the major air pollutants namely particulate matters ($PM_{2.5}$, PM_{10}) , Carbon Monoxide(CO), and Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2) , Lead and Ozone(O_3); in addition to the national network for monitoring pollutants to define its sources and the adequate mitigating measures. Besides the efforts exerted to update and upscale the national network to cover all the governorates.

This chapter also includes indicators of air quality, data analysis and air concentrations monitored during the year compared to previous years.

The second chapter discusses **climate change**; green house gases and its expected threats and impacts on Egypt concerning the rise of sea level, shortage of water resources, lack of agriculture productivity, and the difficulty in cultivating some types of crops. This is in addition to possible adverse impacts on tourism, industry and health, as well as impacts on energy, industry, food safety and the national economy as a whole.

This chapter also describes the CO_2 equivalent indicators in 2009 compared to 2000 (baseline year), in addition to the significant efforts made to mitigate its adverse impacts and the clean development mechanism (CDM) projects, which include 55 projects that reduce greenhouse gases' emissions by up to 8 million equivalent tons of CO_2. Also, this chapter includes the pilot and executive projects in the field of mitigation and adaptation to climate change.

The third chapter overviews **Ozone layer protection** and the harmful impacts that may result from the erosion of this layer; this is in addition to the exerted efforts for gradual reduction of Ozone depleting substances (ODS) to achieve the final disposal according to the Montreal Protocol. Also, this chapter includes the indicators of the gradual reduction of imported Halon, Chlorofluorocarbons (CFCs) and Methyl Bromide and Hydro-Chlorofluorocarbons (HCFC's) consumption reduction.

The fourth chapter focuses on **Noise**, its indicators include noise monitoring plan for the greater Cairo governorates in 2009 in comparison with 2008; also includes the different activities to define sources, and to develop programs to reduce noise in major squares, industrial, commercial, administrative and residential areas. This chapter also includes measured noise levels in the air traffic landing and taking - off and the residential areas around Cairo international airport. This is in addition to monitoring noise levels inside industrial , commercial , tourism work environments in all governorates as well as noise from ground vehicles .

The fifth chapter pointed out the participation of concerned ministries and authorities in the national plan for integrated **water** resources management to achieve sustainability and to develop these resources, in addition to developing unconventional and new water resources in the light of the current limited water resources and increasing population growth. This chapter also includes indicators of water quality and the status of industrial and sanitation drainage.

The sixth chapter describes the national program for **coastal water quality** and protecting it from pollution, in addition to monitoring the changes in coastal water quality and the corrective measures taken. This chapter describes water quality indicators for the Mediterranean Sea, Red Sea, Gulf of Suez and Gulf of Aqaba.

The seventh chapter overviews **biodiversity** conservation and the supportive measures used through institutional as well as capacities development, awareness, participation and projects sustainability. This chapter also discusses the issuance of the fourth national report on biodiversity convention in 2009, in addition to determining the indicators used for measuring progress achieved in the areas of biodiversity and nature conservation.

With reference to the importance of **afforestation and green landscapes** in maintaining the environmental balance and reducing the CO2 emissions, the eighth chapter discusses the Ministry of State for Environmental Affairs (MSEA) efforts to increase the green spaces by implementing the Greater Cairo green belt project, and planting of timber forests using treated waste water. This is in addition to the other activities such as afforestation of schools, governorates and gardens.

This report discusses the ministry's efforts in **urban and industrial environmental development** in the ninth chapter, in addition to exerted efforts to reduce the adverse environmental impacts resulting from industrial and construction development. These efforts include the measures & procedures that were taken to reduce environmental deterioration, and pollution level, and to increase economic and industrial development rates while protecting the environment.

In the **energy** field the tenth chapter points out the major and important role of energy rationalizing plans and improving its efficiency in the different fields to reduce the consumption rates, and to achieve economical balance between demands for oil products and to develop the revenue from exports. Also, it includes the Egyptian Environmental Affairs Agency (EEAA) reviews the Environmental Impact Assessment (EIA) studies for energy projects; and the issuance of environmental approvals.

The eleventh chapter includes the important initiatives for industrial pollution abatement projects, industrial modernization and **industry** new clean technologies integration to achieve the environmental balance without prejudice to the environmental status: Also, it points out the implementation of Environmental Pollution Abatement Project II (EPAP II), and environmental protection project for both the private and public industrial sectors, to support industrial companies to comply with environmental regulations.

The twelfth chapter represents the current levels of municipal **solid waste** in Egypt which is estimated at about 20 million tons annually; and the daily generation is estimated at 57,000 tons, that requires the application of integrated environmental management systems. This chapter also discusses the exerted efforts to reduce the negative impacts of waste that include control of public dumpsites, special programs for solid waste in the neediest villages, private sector participation in the collection, transportation and recycling processes and the final disposal of wastes.

The thirteenth chapter addresses the proper management of **hazardous waste and substances** to avoid the health and environmental problems that can result during the production, handling, storage, and disposal. The waste should be monitored during the different stages till the final disposal. MSEA has prepared a number of indicators relevant to inventory of the chemicals and pesticides imported and used by the industrial sector. The chapter includes also the projects implemented in cooperation with the concerned authorities.

In the fourteenth chapter the focus was on projects and activities implemented by the **Environment Protection Fund** (EPF) that is being designated as an independent public entity in the amended environment law no. 9 of 2009, to give it more authority to achieve its role in environment protection . The EPF is currently financing different projects such as the medical waste incinerators, waste recycling, and old taxies replacements, in addition to the projects implemented for the disposal of healthcare waste, recycling of agricultural waste and projects to achieve compliance by companies in cooperation with the office of environmental compliance in the Egyptian industrial federation.

In the framework of future environmental orientations, the fifteenth chapter discusses the **green economy**, which reflects the powerful and close relationship between the economy and the environment including the natural resources. The green economy depends on the green development through the optimal use of resources and energies without harmful impacts on the environment.

The sixteenth chapter addresses the topic of **applications and usage of radiation in protecting the environment** such as the sterilization of medical products, treatment of polymeric chemical compounds and food processing, in addition to treatment of liquid and gaseous waste that depends on using electronic accelerators without the need for the use of chemical polluting substances, and by using the radiation techniques as alternative for protecting the environment.

Finally, I would like to extend my thanks and appreciation to all who have contributed to produce this report from the Ministry's Staff, other ministries, institutions, as well as agencies , NGOs and the private sector for their distinguished efforts to conserve sustainable natural resources and control pollution in order to maintain a clean environment for the current and upcoming generations .

Methodology

Report Objectives:

Firstly: Implementation of an important article of Environmental Law No. 4/1994, and its Executive Regulation as amended by Law No. 9/2009.

Secondly: Delineating a clear and accurate picture of an important element of the environment – air & water (fresh and coastal), the urban and industrial environment in 2009 while identifying their negative and positive changes, with a brief presentation of changes that took place through the environmental indicators and comparing it to the previous years.

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

Principle I:

Transparency: In this context, the real image of environmental status in the Arab Republic of Egypt has been displayed using updated data made available by The Egyptian Environmental Affairs Agency (EEAA), in cooperation with other ministries, organizations and think–tankers. It is believed that the transparency principle would allow people to know the nature and magnitude of impacts on the environment as well as the government efforts to mitigate them.

Principle II:

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

Principle III:

Adoption of internationally recognized standards in developing State of the Environment Reports as well as utilizing scientific approach in writing this report in all its aspects (sources- harmful impacts- environmental indicators- the efforts to reduce negative impacts and future vision and plans).

Principle IV:

Commitment to Egypt's international agreements: Egypt continues to meet its international commitments including international environmental agreements that affect the global environment in conjunction with the national efforts regarding national environmental issues.

INDEX

INDEX

Index

Chapter Three
Ozone Layer Protection

Chapter Four
Noise

Part Two: Water

Chapter Five:
Fresh Water

Chapter Six: Coastal and Marine Zones

Part Three: Land

Chapter Seven: Biodiversity

Chapter Eight: Afforestation, Forests, Green Belts and Landscapes

Part Four: Urban Environment

Chapter Nine:
Urban and Industrial Environmental Development

Chapter Ten:
Energy

Chapter Eleven:
Industry

Chapter Twelve: Solid Waste

Chapter Thirteen: Hazardous Substances and Wastes

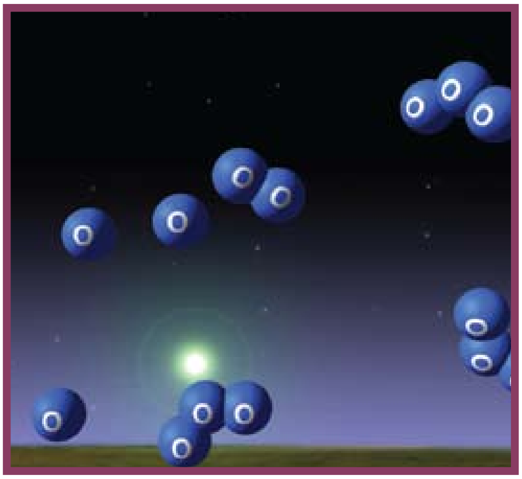
Chapter Fourteen:
Environment Protection Fund (EPF)

Part Five: Global Environmental Orientations
Chapter Fifteen:
Green Economy

Chapter Sixteen:
Role of Radiation Technology for Environmental Protection

PART ONE

AIR



Chapter One

AIR QUALITY

1-1 Introduction:

Air pollution abatement is one of the main challenges and obstacles facing many countries in the world including Egypt. Air pollution in Egypt is considered one of the greatest challenges because of its multiple sources resulting from the remarkable industrial development. Air pollution has various sources such as different kinds of industrial waste, burning of agricultural residues, vehicle emissions and pollutants resulting from open burning of municipal solid waste which exhaust toxic gases that cause many diseases and negative impacts to human body, such as poisoning, infertility, decrease of mental ability and human body's length, hearing impairment, anemia, neurological disorders and other diseases related to ambient environment.

It is worth mentioning that US Environmental Protection Agency (US EPA) and World Health Organization (WHO) have focused on six air pollutants that negatively affect air quality ,cause harmful impacts to human health and the ambient environment. This is based on results of their scientific research and health studies conducted along previous years. Studies have shown that these pollutants are characterized by their large and remarkable impacts on both human health and the ambient environment which necessitates exerting great efforts to reduce and minimize their concentrations by all possible means. These pollutants include particulate matters ($PM_{2.5}$, PM_{10}, Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide, Lead and Ozone.

1-2 Main pollutants of ambient air:

Ambient air pollutants in Egypt are divided into two types; the suspended inhaled particles and gases. The following will descript these pollutants, sources and health impacts resulting from exceeding their permissible limits stipulated in Law No. 4/1994 amended by Law No. 9/2009.

1-2-1 Particulate Matters PM_{10} &$PM_{2.5}$:

Particulate Matters are the most common pollutants in dry, semi arid zones, industrial and heavy traffic areas. These suspended particles consist of a mixture of primary particles resulting from incomplete combustion of fuels and secondary particles resulting from incomplete combustion of fuels and secondary particles resulting from particles which are mostly produced from chemicals reactions of some pollutants in the atmosphere. These are produced from fossil fuels combustion, especially diesel fuel. Their emission increased in diesel powered transport than gasoline powered transport with 40%- 50%. These particles are also emitted from industrial facilities such as cement plants and electrical power stations…etc.

It is worth mentioning that these particles have negative impacts on human health as they cause dangerous diseases to respiratory system. Their impact depends on the size of these particles, if they are less than 10 micron (PM10) they will be more harmful because they can be inhaled easily, in addition, particles less than (PM2.5) are considered the most dangerous because breathing defense organs cannot prevent them from reaching to deep lungs and interact with blood stream reaching different organs of the body.

US EPA published report in 2009 which clarified that the particulate matters; especially PM_{10} and $PM_{2.5}$ are the most dangerous pollutants to public health. The researchers and academicians estimated that high concentrations of fine particles are directly responsible for the increased rates of early deaths in most world countries annually.

1-2-2 Gaseous Pollutants:

Combustion of fossil fuel is the main source of gaseous pollutants, such as nitrogen oxides, sulfur oxides and carbon monoxide (NOX, SO_2, CO). These gases have an important role in deteriorating air quality and smog formation. Furthermore, when these gases interact with oxygen in the presence of hydrocarbons under the effect of ultraviolet rays they form very dangerous secondary pollutants such as Ozone (O_3), which causes inflammation of the mucous membranes of respiratory system as well as eye irritation, coughing, inflammation of lungs, provoking asthma and bronchitis

1-3 National Network for Monitoring Ambient Air Pollutants:

In view of the essential role of the Ministry of State for Environmental Affairs (MSEA) and its Executive Agency (EEAA) in monitoring air pollutants, identifying their negative impacts and reducing them; the Ministry has established an integrated National Network for monitoring air pollutants composed of 87 stations for monitoring and controlling main air pollutants periodically and continuously since 1998 until now. Additionally, the network monitors other pollutants such as volatile organic compounds (VOC) and non-methane hydrocarbons compounds (NMHC). Furthermore, the Ministry compiles data from metrological stations, such as wind speed, direction, temperature, and relative humidity ….etc.

Suspended dust monitored with two different methods:-

- **First Method:** using devices for instantaneous and continuous monitoring for the whole day, to measure pollutants' concentrations and calculate their average per hour.

- **Second Method:** using devices that analyze samples collected on filters every 24 hours every 6 days. Samples analyzed by specialized chemical laboratories to determine particulates concentrations on these filters. It is worth to mention that MSEA upgrades these monitoring devices and increases number of monitoring stations to cover all areas of the country. Table (1-1) shows geographical distribution of monitoring stations. Figure (1-1) shows distribution of stations in Greater Cairo and Delta governorates.

Table (1-1): Geographical distribution of EEAA's National Network Stations for Monitoring Air Pollutants - 2009

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	

Source: EEAA/ EQS
Monitoring Air Quality network includes 87 Stations, distributed as follows:
42 Instantaneous monitoring stations
45 Sampling stations include 20 stations to collect lead samples in Greater Cairo

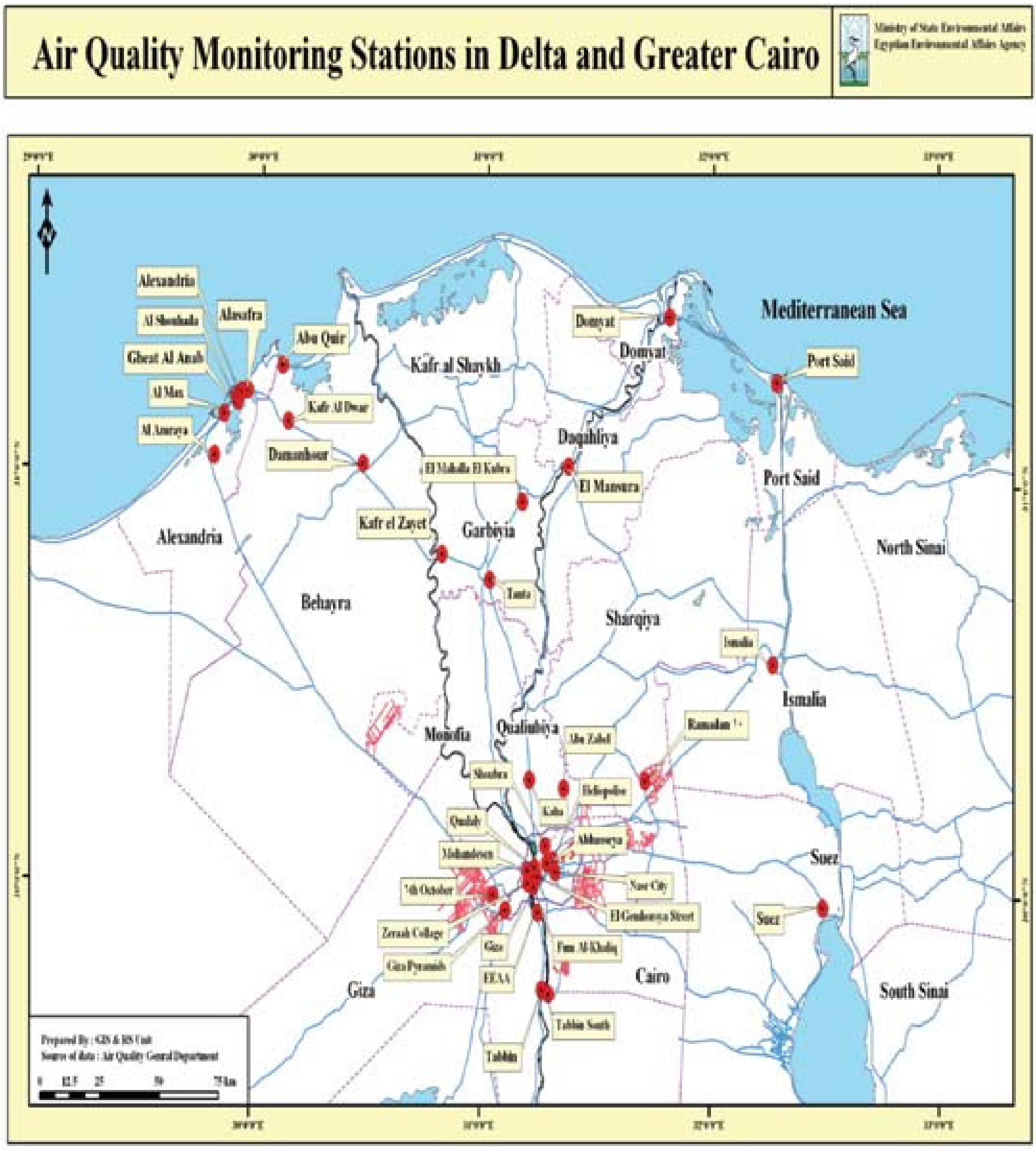


Figure (1-1): Distribution of air quality monitoring stations located in Greater Cairo and Delta Governorates

Source: EEAA/ EQS

1-4 Air Quality Indicators:

Environmental indicators and data of air quality collected along previous years by monitoring stations affiliated to both Ministry of State for Environmental Affairs and Ministry of Health are considered one of the most important mechanisms in environmental assessment field for following up realized progress in achieving sustainable development over years as follows:

1. In general, environmental indicators are an important tool in identifying, specifying, evaluating environmental problems, setting priorities, monitoring

trends and progress in achieving environmental goals according to development plans.

2. Indicators and data are used in preparing reports of integrated environmental assessment, sustainable development, state of environment and environmental indicators.
3. Indicators are considered an important tool to follow up policy performance, development and achieved progress.
4. Indicators provide simplified and clear picture for decision makers on state of environment and sustainable development.

The following are the most important indicators that have been monitored by national network stations during 2009. They clarify air pollutants and quality of ambient air over the year in comparison with previous years. Considering that during the first half of 2009, MSEA upgraded different monitoring devices and added new monitoring stations in new locations, which cause lack of regular access during that period. Nevertheless, the second half of 2009 recorded regular and continued access to data. Furthermore, it should be noted that the increase in concentration of some pollutants during 2009 was mainly due to bad weather conditions particularly, strong winds and dust storms that covered skies of Cairo during second half of 2009**.**

1-4-1 Sulfur Dioxide (SO_2):

Sulfur dioxide is primarily generated as an emission from sulfur residues oxidation in liquid oil fuel during the combustion process; whether from fixed sources, such as energy generation stations and different factories or mobile sources, such as vehicles particularly those operated with diesel fuel. The permitted annual limit in Law No. 4/1994 amended by Law No. 9/2009 is 60µg/m3.

Figure (1-2) shows the overall average concentrations of sulfur dioxide over the past six years (2004-2009) in Egypt, which clarifies significant improvement in measured concentrations since 2004 till 2009 , as average monitored concentrations during 2009 were approximately 31 $\mu g/m^3$, which is similar to concentrations of 2008; while 2006 and 2007were about 37 and 38 $\mu g/m^3$ respectively. It clarifies the remarkable improvement in the annual average concentrations along previous six years by 20-30%.This is due to tightening control over emissions from industrial facilities, efficiency of control devices, increasing traffic campaigns and emphasis on arresting vehicles violating environmental law.

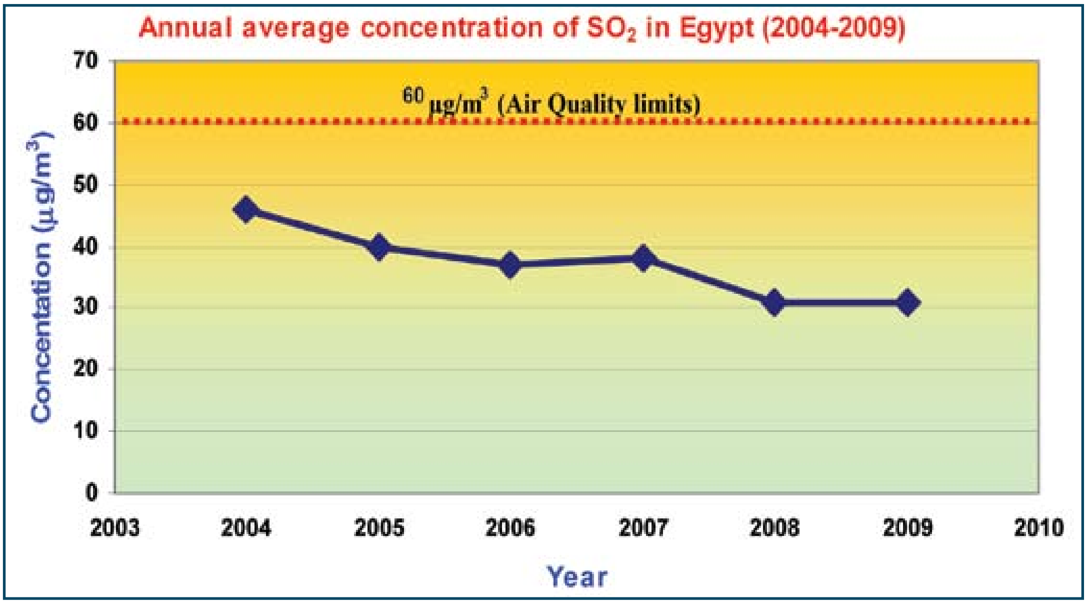


Figure (1-2): Annual average concentration of sulfur dioxide during 2004-2009

Source: EEAA/ EQS

Studying air quality indicators of sulfur dioxide measured during 2009, shows that its annual average concentrations did not exceed the permissible limits stipulated in the Executive Regulations of Environment Law No. 4 /1994 , (60µg/m^3/ year), except Beni Suef's monitoring station (located downtown Beni Suef city) which exceeded the permissible limits, it recorded 82µg/m^3 during 2009 compared to 51µg/m3 in 2008 .This relative increase is due to industrial development in this area which led to the increase in vehicles numbers, particularly diesel vehicles, which use large amounts of diesel fuel with high sulfur content.

Table (1-2) shows annual average of sulfur dioxide concentrations from 2006 – 2009 compared to baseline year 1999 in different areas (Greater Cairo – Delta – Upper Egypt). Generally, there was significant decrease in sulfur dioxide concentrations in 2009 in different areas as follows:

- Annual average concentrations in Greater Cairo were 28 µg/m^3 in 2009 while 39 µg/m^3 in 2008. This was due to the expansion in using natural gas by electric power plants and most of other industrial activities located in Greater Cairo.
- Annual average concentrations in Delta were 16 µg/m^3 in 2009 which is roughly similar to 2008 concentrations, which recorded 15 µg/m^3. This slight stability is considered an improvement compared to the annual increase in vehicles number.
- An increase was monitored in annual average concentration of Upper Egypt cities; but , it did not exceed the permissible limit of 60 µg/m^3. Moreover, annual average for 2009 was 46 compared to 16 µg/m^3 in 2008. This is due to the significant increase in industrial expansion in Upper Egypt cities, which resulted in the

increase of diesel consumption by trucks used during construction processes of new cities and factories. This requires more control over factories emissions, careful inspection of vehicles exhausts by concerned authorities and intensify inspection campaigns on roads.

Table (1-2): Annual average concentrations of sulfur dioxide (micrograms/m³) from 2006 – 2009 in comparison with baseline year 1999

Year / Region	1999	2006	2007	2008	2009
	Concentration (µg/m³)				
Greater Cairo	65	44	49	39	28
Delta Cities	19	20	18	15	16
Upper Egypt Cities	53	24	21	16	46

Source: EEAA/ EQS

Figure (1-3) shows annual average concentrations of sulfur dioxide at different monitored areas of Egypt along previous years. It shows remarkable improvement in 2009 concentrations compared to 1999 in most monitoring areas.

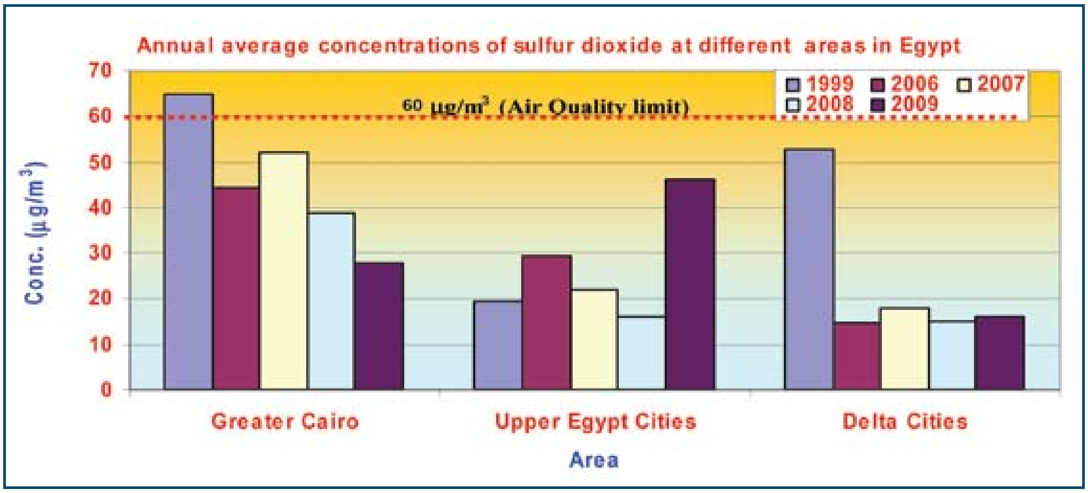


Figure (1-3): Annual average concentration of sulfur dioxide in different monitored areas

Source: EEAA/ EQS

1-4-2 Nitrogen dioxide(NO_2) :

Nitrogen dioxide is emitted as a result of fuel combustion processes that happen at high temperatures, and Executive Regulations of Environmental Law No. 4/1994 did not define annual average limit for its concentration. However, World Health Organization (WHO) specified 40µg/m^3 as the annual average for NO2 concentrations; modified Executive Regulations for Environment Law No. 9/2009 has suggested annual average concentration for nitrogen dioxide in ambient air.

Studying average concentrations of 2009 clarified that some locations have exceeded 40µg/m^3 limit. These locations are characterized with high traffic density, such as El-Kolaly, Kaha, Beni-Suief, Shebin El-kom, Fum El-Khalig and El-Gomhoriya; where their concentrations were 75, 66, 62, 57, 53 and 50µg/m^3 respectively. This is due to high traffic density particularly in Greater Cairo, in addition to the poor technical conditions of old cars used in some governorates, which require intensifying inspection campaigns on roads and emphasis on the full maintenance for those types of cars.

Comparing 2009 annual average with previous years (figure 1-4) clarified significant improvement if compared with 2008 which recorded 60 µg/m^3, while 2009 was 40 µg/m^3 . This improvement is a result of adding nine stations to the network, which resulted in increasing data accuracy and the exerted efforts by Ministry of State for Environmental Affairs (MSEA) and its Executive Agency (EEAA) in developing policies and programs to reduce concentrations of nitrogen oxides.

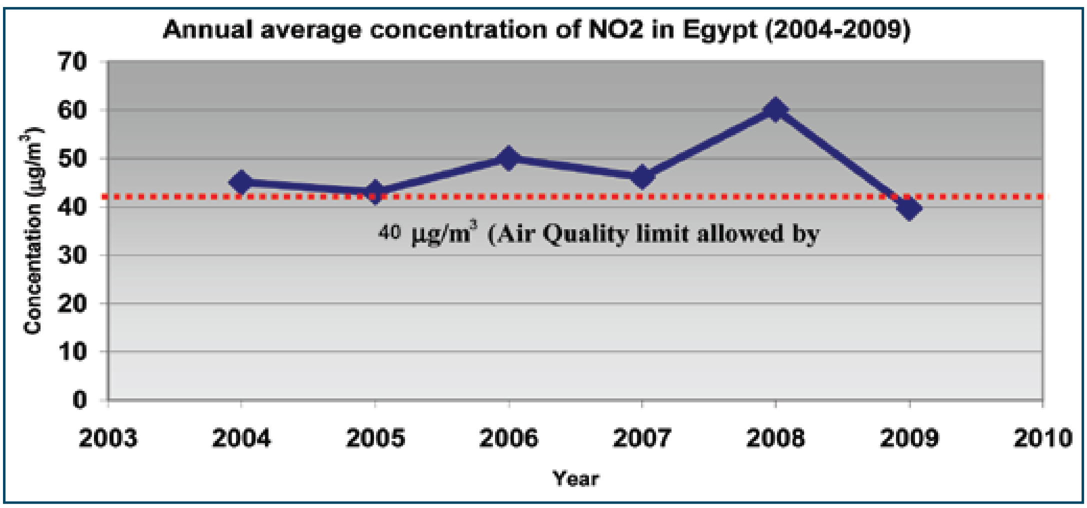


Figure (1-4): Annual average concentration of nitrogen dioxide during 2004-2009

Source: EEAA/ EQS

Table (1-3) shows nitrogen dioxide annual average concentrations from 2006- 2009 compared to baseline year 1999 in major areas of the country. Significant improvement was noticed in most locations in average concentrations recorded in 2009 as compared to 2008, as follows:

- Annual average level of 2009 in Greater Cairo was 36 μg/m^3 compared to 64 μg/m^3 in 2008. This is due to the increased number of monitoring stations that resulted in the accuracy of data which affected the evaluation of annual average of Greater Cairo, in addition to the continuous control over factories emissions, and obligating factories using natural gas as fuel to use low-NOx burners to reduce NO_X emissions.

- Annual average of Delta region in 2009 recorded 39 μg/m^3 which is so close to 2008 annual average 37μg/m^3. This slight increase could be due to the increasing number of outdated cars in these governorates (Delta). This necessitates accelerating the application of replacing old cars program.

- Slight improvement was monitored in Upper Egypt concentrations in 2009 by recording 44 μg/m^3 while they were 46 μg/m^3 in 2008. Nevertheless, these concentrations are still higher than the 40 μg/m^3 allowed by World Health Organization (WHO). This increase could be due to non compliance of some industrial facilities to apply required environmental procedures to reduce nitrogen oxides emissions (like using modern technology in industries) and the increasing rate of traffic associated with industrial development in Upper Egypt.

Table (1-3): Annual average concentrations of nitrogen oxides (micrograms/m^3) from 2006 – 2009 in comparison with baseline year 1999

Year / Region	1999	2006	2007	2008	2009
	Concentration (μg/m^3)				
Greater Cairo	58	56	51	64	36
Delta cities	31	33	--	37	39
Upper Egypt cities	--	39	39	46	44

Source: EEAA/ EQS

Figure (1-5) shows annual average levels of nitrogen dioxide at different monitoring stations in Egypt during previous years. It clarifies the occurrences of some improvements in 2009 if compared with 1999 (baseline year) in most monitoring locations.

It is noticeable that nitrogen dioxide concentrations measured as hourly average did not exceed (400µg/m^3 /hour) stipulated in the Executive Regulations of Law No. 4/1994 during 99% of the year in most stations, which is considered an excellent indicator of the good control over nitrogen oxides' emissions. Nevertheless, it must be indicated that expanding in using natural gas either in industry or transportation without use of low-NOx -burners would result in higher concentrations of nitrogen dioxide in the future. Therefore, environmental impact assessments studies conducted for new industries or already established industries which will be converted to natural gas should emphasize the necessity of using low-NOx-burners to minimize nitrogen oxides' emissions.

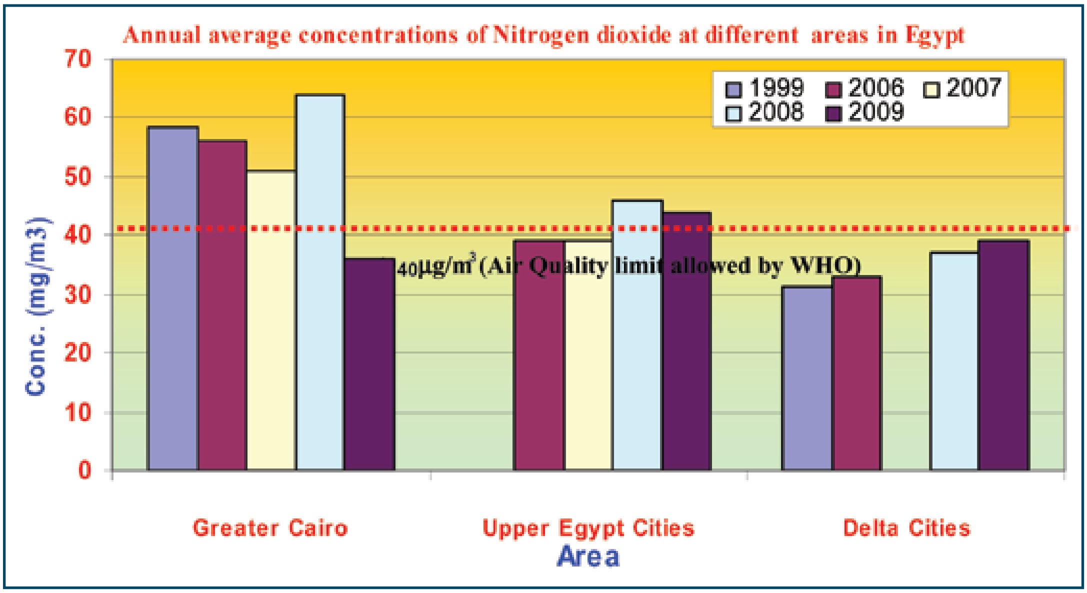


Figure (1- 5): Annual average concentration of nitrogen dioxide at different monitored areas

Source: EEAA/ EQS

1-4-3 Particulate Matters (PM_{10})

Inhaled particles are considered one of the main problems causing the increase in pollution levels in Egypt, especially in Greater Cairo and neighboring areas. This is due to Egypt's topography and its multiple sources of pollution. In recent years MSEA has concentrated on monitoring all types of dust, especially inhaled particles less than 10 micron in diameter (PM_{10}), which have negative impact on human health. The Environment law 4/1994 has stipulated that annual average permissible limit of inhaled particles less than 10 micron in diameter (PM_{10}) is (70 µg/m^3).

Figure (1-6) shows annual average concentrations of PM_{10} from 2004-2009; it clarifies relative stability in the annual average along the past six years, with exception of 2007. This is considered a relatively good indicator particularly within the steady increase of human activities during these past six years.

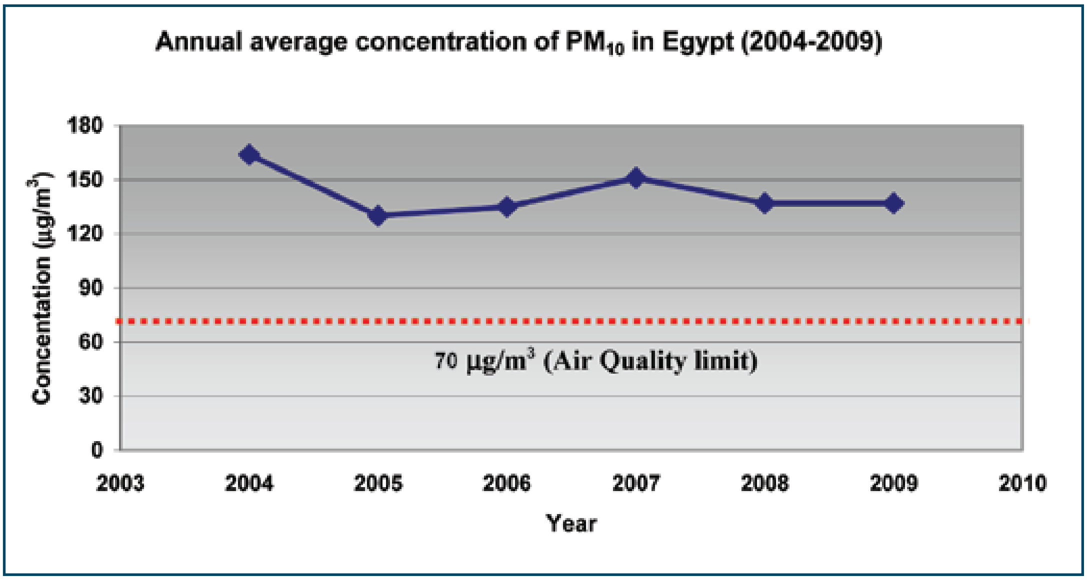


Figure (1 - 6): Annual average concentrations of PM_{10} during 2004 - 2009

Source: EEAA/ EQS

In this regard, it should be mentioned that the surrounding natural resources represented in desert areas and their released winds carried with dust, significantly affect air quality in Greater Cairo and Delta. This effect was clearly appeared during 2009 autumn where dust storms had contributed to increasing annual average of particles (less than 10 microns) as shown in table (1-4) compared to other years. This is also confirmed by the conducted study "Attributing all Pollutants to their Sources". It proved that natural sources are responsible for 30-50% of PM_{10}.
Furthermore, the noticeable negative impacts of traffic density in some areas, open burning of solid waste and industrial expansion in some areas, such as in Upper Egypt are greatly contributing in exaggerating this effect .

Table (1 - 4): Annual average concentrations of Inhaled particles (PM_{10}) (mg/m^3) from 2006-2009 in comparison with baseline year 1999

Year / Region	1999	2006	2007	2008	2009
	Concentration ($\mu g/m^3$)				
Greater Cairo	234	153	139	145	149
Delta Cities	150	135	176	164	234
Upper Egypt Cities	--	130	147	143	161

Source: EEAA/ EQS

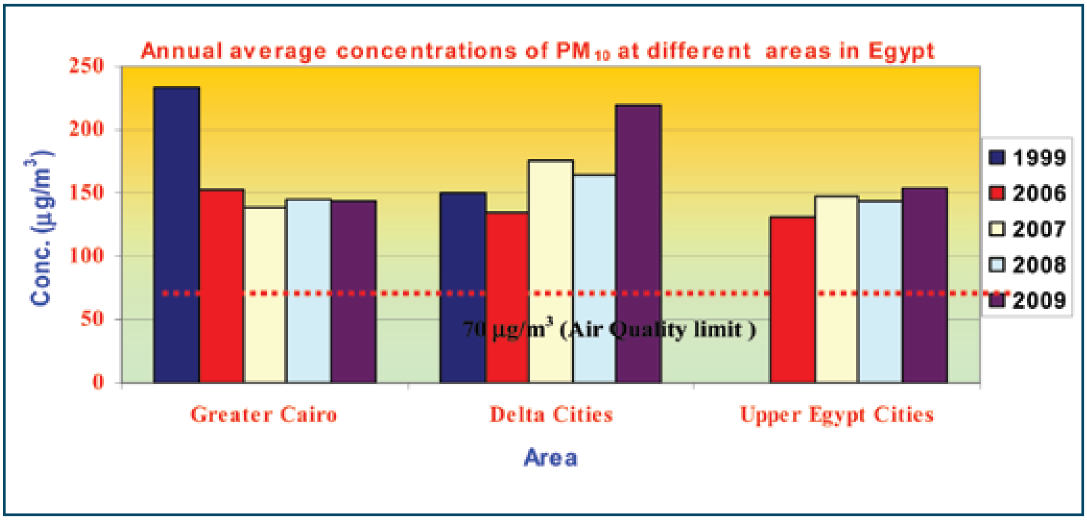


Figure (1 - 7): Annual average concentrations of particulate matters less than 10 micron (PM_{10}) in different monitoring locations

Source: EEAA/ EQS

1-4-4 Lead:

Lead pollutant impacts on human health are different; either through inhalation, or eating food contaminated with lead or its derivatives. Its most serious impacts are represented in inhaling its particles stuck to air or dust, which accumulate this toxic element in human blood through the respiratory system. Lead has negative impact on human embryos, mental abilities, blood causing anemia and may lead to reduce intelligence rate particularly among children.

Monitoring results of lead concentrations in Greater Cairo from 2008-2009 have shown significant decrease as compared to 2000. This is due to the adopted national program by MSEA which started in 1998 and ended in March 2008 to reduce lead pollution loads in Shoubra El-Khaimah area, through implementing a project to transfer foundries from Shoubra El-Khaimah and clean their sites contaminated with lead, the expansion in producing lead-free gasoline by Ministry of Petroleum and using compressed natural gas as vehicles fuel.

These efforts had been accompanied by MSEA amendments on Executive Regulation of Environment Law No. 4 /1994 with respect to permissible limits of lead concentrations in air to become 0.5µg/m3 in residential areas and 1.5 $\mu g/m^3$ in industrial areas. Significant decrease has been noticed in the overall average concentrations of lead in Greater Cairo from 1.67 $\mu g/m^3$ in 2000 to reach 0.73 $\mu g/m^3$ in 2009; this reduction represents about 60.3% decrease.

Figure (1-8) shows the annual average of lead concentrations from 2000-2009 in Greater Cairo. It shows the significant improvement in lead levels, which is clear indication of the success of exerted national efforts to reduce lead levels in Greater Cairo.

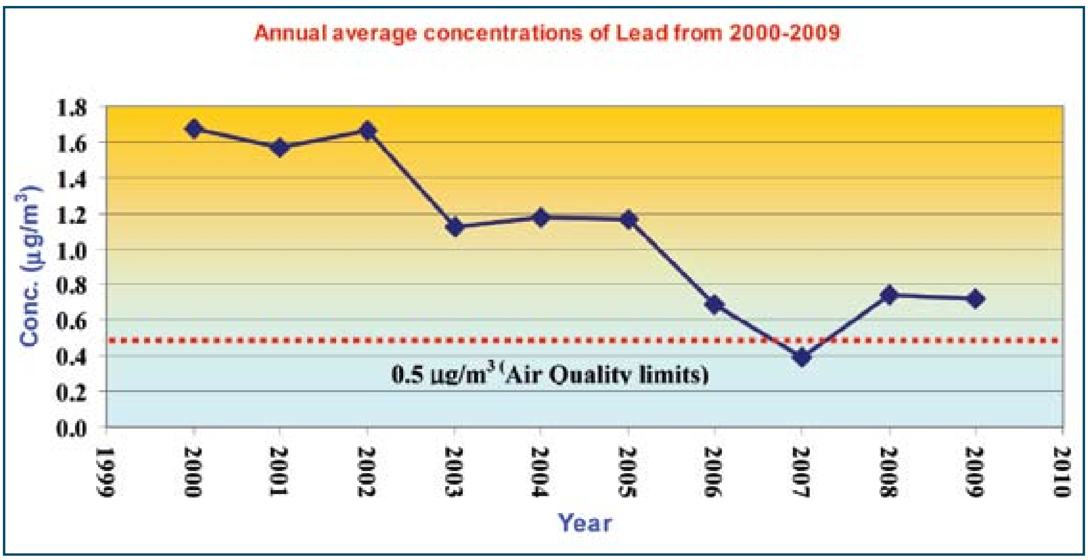


Figure (1 - 8): Annual average concentrations of lead in Greater Cairo from 2000 - 2009

Source: EEAA/ EQS

Despite this success, it is noticed that 2009 annual average concentrations were slightly higher than the permissible annual average limit stipulated in Environment Law by recording (0.73 mg / m ^{3}), which is close by large to 2008 annual average concentrations (0.74 mg / m ^{3}), this can be traced to the significant increase of consuming gasoline 80 during this period as a result of high prices of other kinds of gasoline.

Furthermore, monitoring stations in industrial areas such as Abu-Zabel showed the highest concentrations (2.51µg/m^3) of lead in 2009 as compared to (2.4 µg/m^3) in 2008. This increase was due to transfer of old foundries to Akrasha area near Abu-Zabel, without taking necessary technical procedures to prevent excessive emission of lead fumes. Currently, there is a plan to implement a study concerning lead emission inventory to determine its sources and future strategies for preventing it.

Table (1 - 5): Annual average concentrations of lead (microgram/m3) in Greater Cairo from 2000 - 2009

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Concentration (µg/m^3)	1.67	1.57	1.66	1.12	1.18	1.16	0.69	0.39	0.74	0. 73

Source: EEAA/ EQS

1-4-5 Carbon Monoxide (CO):

Carbon monoxide is emitted from vehicles exhausts and combustion of coal and wood. It is considered one of the most dangerous and toxic pollutant to human and animals because it combines with hemoglobin forming carboxyl hemoglobin; thus prevents oxygen from combining with hemoglobin and deprives body from getting oxygen which causes asphyxiation.

In this regard, Executive Regulation of Environment law stipulates that maximum allowable exposure to carbon monoxide for one hour is 30 mg/$m^3$and 10 mg/m^3 for 8 hours.

Despite the steady increase in human and industrial activities and consumption rates of energy, monitored concentrations of 2008-2009 clarified relative stability in the indicator of compatibility for an average hour as stipulated in permissible limits of environment law.

Figure (1-9), shows that 99% of 2009 recorded measurements were less than the allowable limits due to the cooperation among different concerned entities in taking actions to improve fuel combustion efficiency in industrial sector, electricity generating plants, reducing use of diesel and replacing it with natural gas in addition to the application of replacing old taxies by new one project.

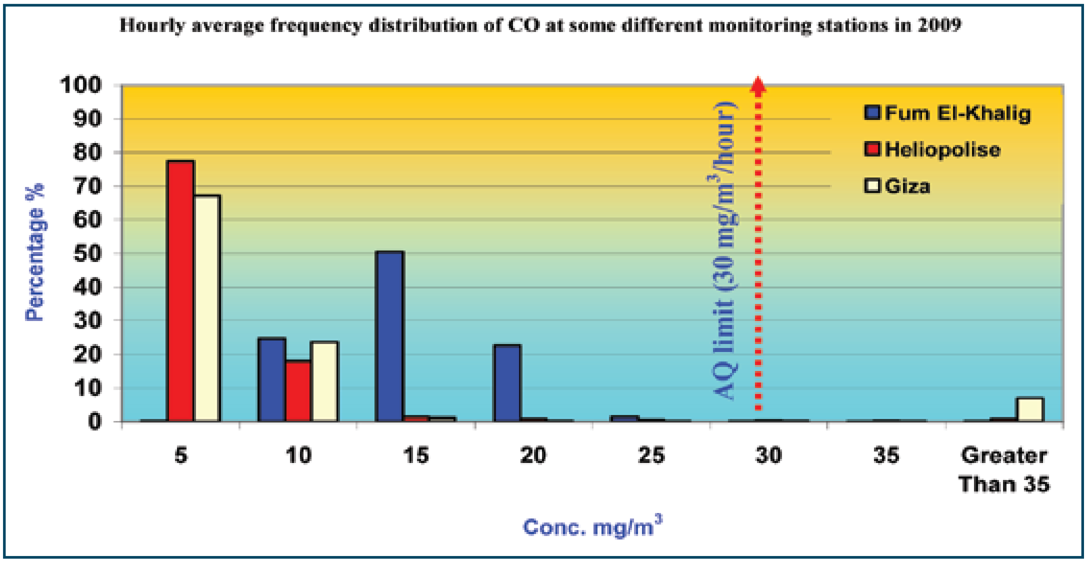


Figure (1 - 9): Hourly average frequent distribution of carbon monoxide at different monitoring stations in 2009

Source: EEAA/ EQS

1-4-6 Ozone (O_3):

Ozone is considered a secondary pollutant; it exists at lower layers of the atmosphere as a result of interaction between volatile organic pollutants emitted from 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 leads to the occurrence of smog phenomenon when its concentrations increase greatly. Therefore, Executive Regulation of Law No. 4/1994 determines that the highest environmental concentration of ozone must not exceed 200µg/m^3 in one hour, while its limit during 8 hours must not exceed 120µg/m^3.

Figure (1-10) shows annual average concentrations of ozone from 1999-2009 in Greater Cairo. It shows a reduction in ozone average concentrations near ground layers during 2009 in comparison to 2007 and 2008. The annual average during 2009 was about 68 µg/m^3 and 79, 70 µg/m^3 in 2007 and 2008 respectively.

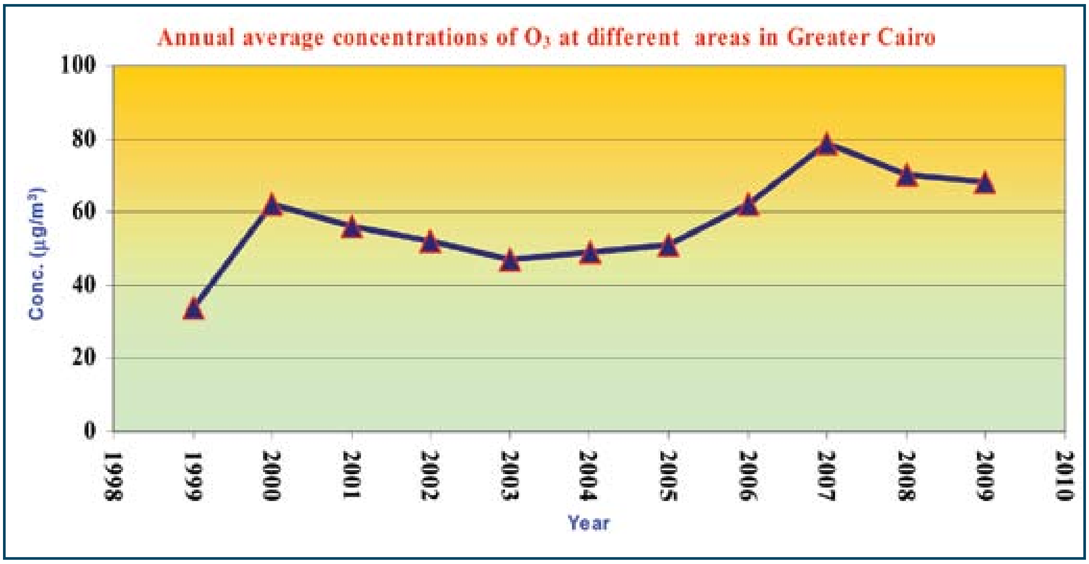


Figure (1 - 10): Annual average concentrations of ozone from 1999 - 2009 in Greater Cairo

Source: EEAA/ EQS

Considering the importance of monitoring ozone levels, EEAA is preparing an integrated monitoring plan to increase monitoring stations to scientifically analyze ozone average concentration in different areas.

1-5 Air pollution episodes (Black Cloud) during 2009

Black cloud phenomenon is one of the most important chronic environmental phenomena that occur since 1999, especially in Greater Cairo sky. Its severity increases during night after sunset and early morning and varies from year to year. After studying and analyzing this phenomenon 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 concentrations of pollutants in Cairo air.
- Occurrences of particular weather phenomenon known as the "Thermal Inversion Layer ".
- Cairo topography.
- Presence of many different sources that help in polluting 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 during acute episodes of pollution (from 15th September to 15th November) during 2009 by specialists and experts of EEAA and various research agencies, had clarified the following:

1. Starting from 17th October 2009, Egypt has been exposed to south , south east and south west winds , lasted for most of the month till 9th November 2009.
2. Southern winds that blew from 17th-29th October caused an increase in concentrations of suspended particulates; this was due to dust transported by winds from desert areas (Chad and Arabian Peninsula deserts).
3. Southern winds that blew from 29th-31st October were accompanied by an improvement in measured concentrations of suspended particles because they were not loaded with dust.
4. This confirms that measured concentrations during the second half of October 2009 were not from rice straw burning in Delta as wind directions during that period were South winds.
5. According to "Source Attributing Study"; it proved that dust storms which prevailed during this period contributed with about 30-50% of the increased concentration of particulate matters.

Table (1-6) illustrates main monitoring results from 15th September to 15th November for the previous three years 2007, 2008 and 2009.

Table (1 - 6): Main monitoring results from 15th September to 15th November during previous three years 2007, 2008 and 2009

Indicator / Year	2007	2008	2009
First: Met. factors			
Wind Speed	1-6 m/s	1-7 m/s	1-8 m/s
Average of WS during the month	3.41 m/s	3.42 m/s	3.62 m/s
Number of Stability hours	160 hours	139 hours	95 hours
Wind Direction	Approximately constant from north and north east direction	Changing between north east and north west direction	Changing between north and south especially during second half of October
Thermal inversion thickness average	20-2300 m	50-3060 m	50-2750 m
Number of Thermal inversion hours less than 100 m	61 hour	36 hour	22 hour

Second: Air Quality Indicators				
General average of PM_{10}	100-200 µg/m³	100-180 µg/m³	100-200 µg/m³	
No. of hours > 300 µg/m³			North	South
Abbassiya	73	46	40	52
Kolaly	123	38	18	39
Fum El-Khalig	65	22	36	44
Tabbin	97	58	67	31
Roxy	43	23	63	84
Mohandseen	110	40	30	40
Maximum of hours number <300 µg/m³	123	58	67	84
Average of hours number > 300 µg/m³	85	40	42	48

Source: EEAA/ EQS

6. Figure (1-11) shows that general average of total hours of monitoring PM_{10} were higher than 300 µg/m³ at monitoring stations in Greater Cairo. It is clear that although there is comparative increase in general average concentrations during 2009 compared to 2008, they were less than that of 2007, because there was significant decrease in number of hours that particulate matters exceeded the alarming limit.

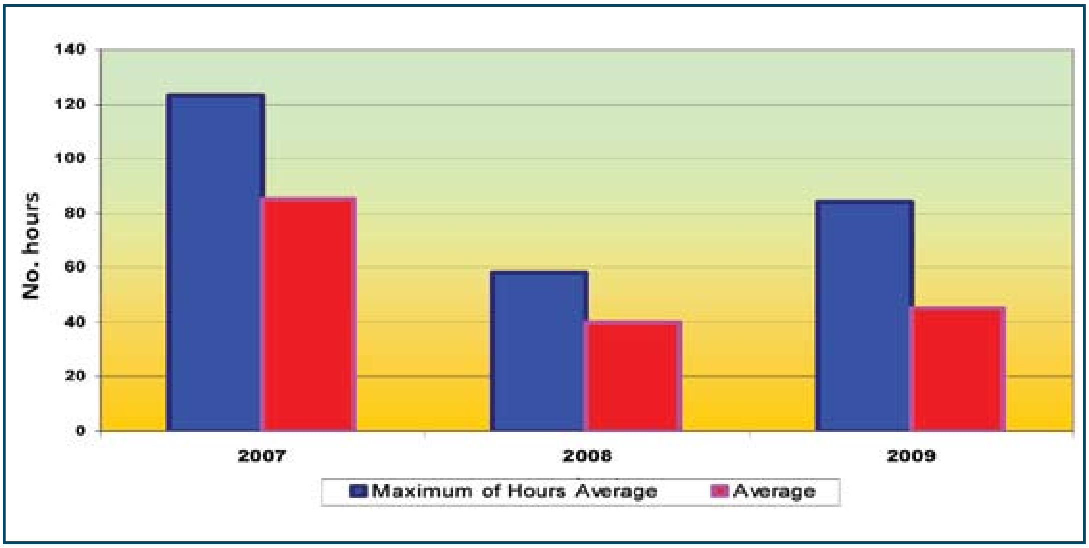


Figure (1 - 11): Number of hours where concentrations recorded higher than 300 microgram/ m³ in Greater Cairo

Source: EEAA/ EQS

7. According to metrological reports, this increase in particulates concentrations during 2009 was due to the storm extended from southern part of Chad Republic to reach boundaries of Egyptian territories. This is also due to the exposure of northern parts to warm air mass resulting from low pressure that dominated middle of the Mediterranean region then followed by high pressure (coming from Chad) which influenced southern sector of the country, accompanied by a downward air bearing dust (from height of 5 km) as shown in figure (1-12).

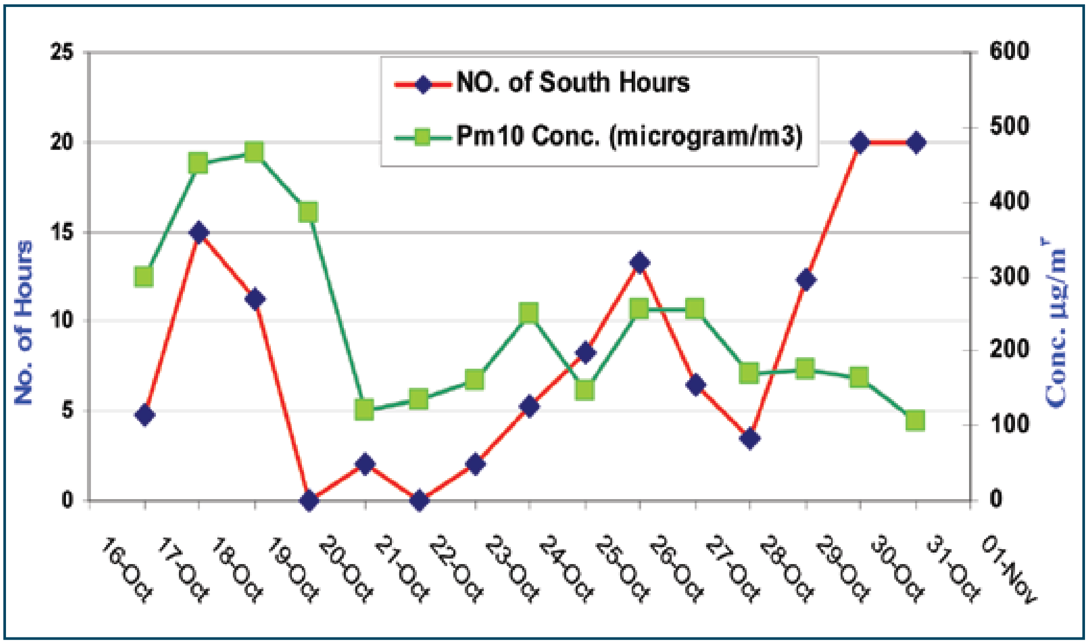


Figure (1 - 12) : Relationship between dust concentrations and southern winds over Egypt during second half of October 2009

Source: EEAA/ EQS

The above mentioned analysis clarifies that exerted efforts by MSEA in collaboration with other concerned agencies to address non- natural factors that lead to the occurrences of acute Air pollution episodes, are running in the right direction.
Nevertheless, more progress could be achieved to further mitigate the phenomenon through increasing public awareness with the effects of this phenomenon, role of individuals in reducing it by encouraging them to examine their cars' exhausts ,adjust vehicles engines and stop burning all types of waste (agricultural - solid).

1-6 The most important results of monitoring indicators of ambient air quality during 2009:

General Average Concentrations of Sulfur Dioxide:

- Remarkable improvement was monitored in concentrations of sulfur dioxide over the same period of previous years. It indicated steady improvement in concentrations since 2004 until now; as the overall average concentrations monitored during this year were about 31 micrograms / m^3, which are the same concentrations that were monitored during 2008, while they were 36.6, 38 $\mu g/m^3$ during 2006, 2007 respectively. This represents improvement ratio ranged between 20-30%. Daily average concentrations (ranged from 25-45$\mu g/m^3$) which are extremely less than stipulated limits in environment law 4/1994 (150 ug/m3 as daily average). Nevertheless, during 2006 and 2007 daily average concentrations ranged from 30-50 $\mu g/m^3$.
- The above mentioned improvement in sulfur dioxide concentration could be attributed to many factors. The most important are as follows: taken steps to improve efficiency of fuel combustion used in power stations and industrial sector, reduction of using diesel fuel in these sectors and expansion in using natural gas in all fields.
- The increased number of monitoring stations during 2009 led to increase accuracy of monitored data, becoming more representative and reflecting actual status of ambient air quality.

Average Concentrations of Nitrogen Oxides:

- **Significant decrease was monitored in Nitrogen Oxides during 2009 compared to previous years.**
- Daily average concentrations of nitrogen oxides recorded during 2009 were less than the allowed limits (150 µg/m3/day) stipulated in Executive Regulation of Environment law No. 4/1994; where they were between 55 to 85 µg/m3/day, while daily range during 2008 was 60-90 µg/m3.

Average concentrations of particulate matters (PM):

- Decrease was monitored in annual average concentrations of PM during 2008 and 2009 compared to that of 2007.
- Relative improvement was monitored in concentration levels of September and the first half of October during 2009 compared to the same period in 2007. These levels increased on 17 October 2009, due to Egypt's exposure to south, south east and south west winds that lasted for most of the rest of the month and till 9^{th} November 2009.
- Southern winds that blew from 17^{th}-29^{th} October resulted in increasing

concentration of suspended particulates loaded with dust transported from desert areas (Chad and Arabian Peninsula deserts).

- In general, relative increase in PM was mainly due to the southern winds blown during the second half of October 2009. This increase could also attribute to the increase in human activities and the increased number of vehicles from 4.3 million vehicles during 2008 to 4.8 million during 2009.

General average Concentrations of Lead:

- Remarkable decrease was monitored in Lead concentrations from 2000 - 2009 in Greater Cairo; where the general average was about 1.67 $\mu g/m^3$ in 2000 and decreased to 0.73 $\mu g/m^3$ in 2009, a decrease of about 50% which proved the success of the national program adopted by MSEA to reduce lead emissions.
- Despite this success, monitored concentrations of lead during 2009 were the same of 2008 in some monitoring places. This can be attributed to the observed increased consumption of gasoline 80 during previous period due to its competitive price compared to other types of gasoline, in addition to the spread of some unofficial lead foundries which use old conventional technology in Abu Zaabal (Akrasha), which necessitates taking legal action against these violating foundries through coordination with all stakeholders.

1-7 Cement Industry Emissions:

Application and activation of Article (20) of the Executive Regulation of Environment Law No. 4 / 1994, stipulates that (EEAA shall supervise the establishment and operation of the Environmental Monitoring Networks). So that, national network to monitor cement companies' emissions has been established. It provides the continuous and effective monitoring of environmental situation along the whole day, achieves control over cement companies' stacks and takes necessary legal procedures in case of violation.

82 monitoring sites were followed by the network through continuous self-monitoring of total suspended particulates' emissions from stacks of 17 cement companies in all parts of Egypt , with an increase of 14% over what was monitored in the previous year as a result of increasing number of monitoring sites in some companies as shown in table (1 - 7).

Table (1 - 7) shows locations of monitoring sites of total solid particles' emissions from stacks of cement factories					
Serial	**Company**	**Self- Monitoring Sites**	**Serial**	**Company**	**Self- Monitoring Sites**
1	National cement company	11	10	Alexandria Portland cement company	2
2	Portland Toura cement company	13	11	El Menia cement company	2
3	Helwan cement company	12	12	Misr Quena cement company	2
4	El katamyia cement company	3	13	Egyptian cement company	4
5	Suez cement company	4	14	Sinai Portland cement company	2
6	Beni Suef cement company	3	15	Sinai White cement company	2
7	Misr Beni Suef cement company	3	16	El-Ameriya cement company	4
8	Assuit cement company	11	17	Arabian cement company	3
9	El Ameriya sambor cement company	1			
Total					**82**

Monitoring total suspended particulates emitted from cement stacks depends on using specialized devices to calculate values of its emissions.

Figure (1-13) shows the working system of the national network for monitoring cement factories' emissions; where data was sent automatically to both EEAA and the main control room in each factory to achieve continuous monitoring over emissions of these factories.

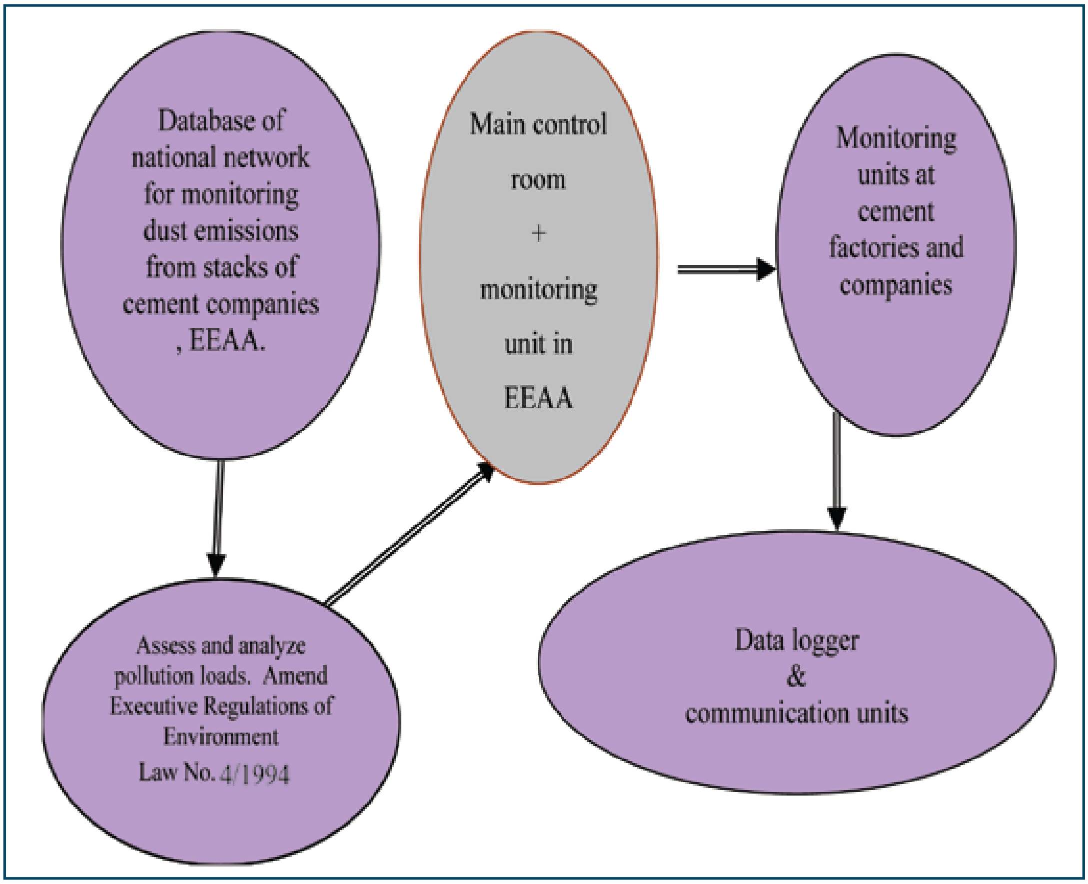


Figure (113-) Working system of national network connected to EEAA for monitoring cement factories' emissions

1-7-1 Indicators of Monitoring Results during 2009:

First: : Compatibility of total suspended particulates' emissions with stipulated criteria in the Executive Regulation of Environment law No. 4/1994:
According to the continuous monitoring of total suspended particulates' emissions from all cement factories in Egypt in 2009; the following results were reported:

1. **Emissions are compatible with the maximum limit stipulated in the law:**
   - 97, 26 % of the emissions from old cement factories (established before 1995, date of issuing Executive Regulation of Environment Law) , did not exceed 300 mg / m^3 (maximum Permissible limit for these factories) as shown in figure (1-14).
   - 98, 63 % of the emissions from new cement factories (established after 1995, date of issuing Executive Regulation of Environment Law), did not exceed 200 mg /m^3 (maximum Permissible limit for these factories) as shown in figure (1-15).
   - 99, 74% of the emissions from stacks of modern factories (established after 2005, date of amending Executive Regulation of Environment Law) ,did not exceed 100 mg /m^3 (maximum Permissible limit for these factories) as shown in figure (1-16)

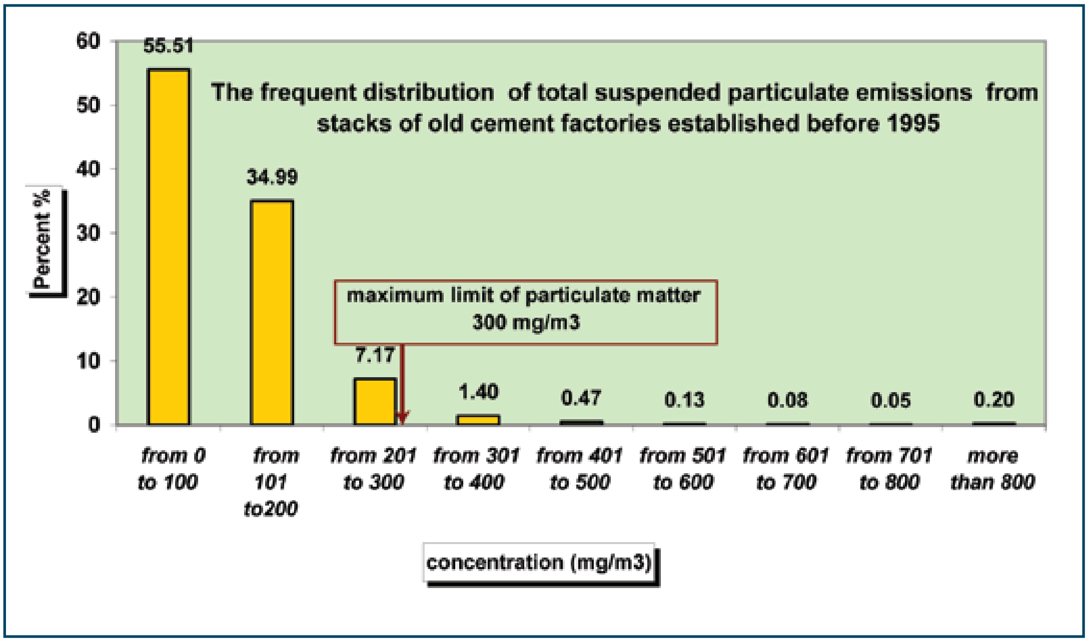


Figure (1 - 14) Frequent distribution of total suspended particulates' emissions from stacks of old cement factories established before 1995

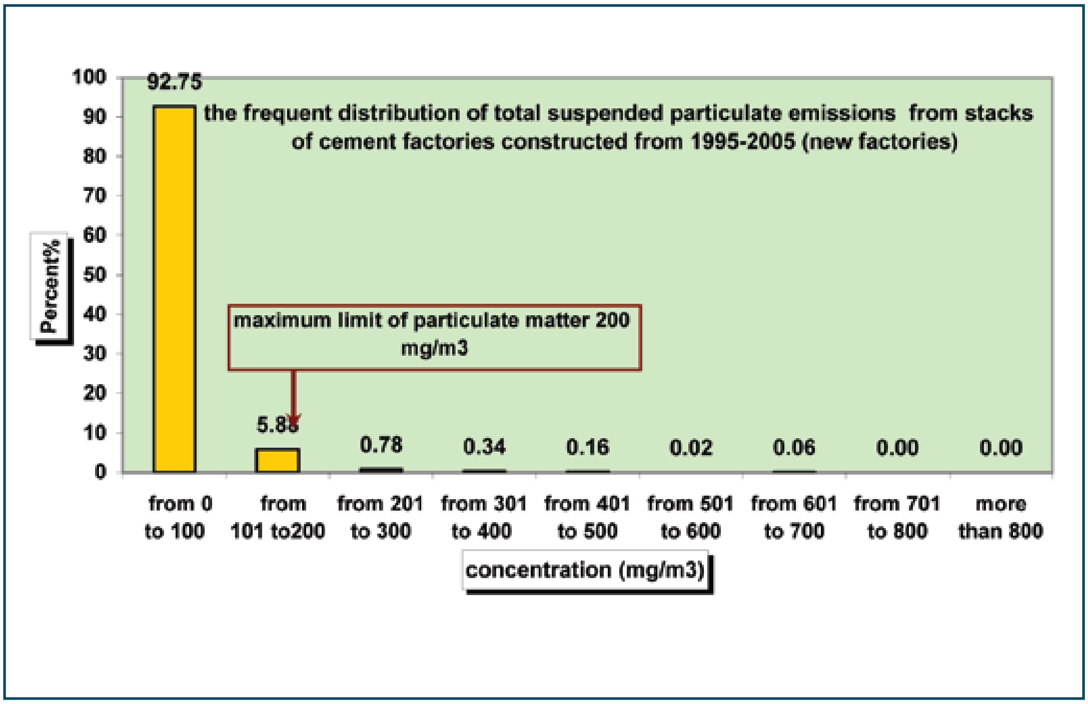


Figure (1 - 15) Frequent distribution of total suspended particulates' emissions from stacks of cement factories established from 1995 - 2005 (new factories)

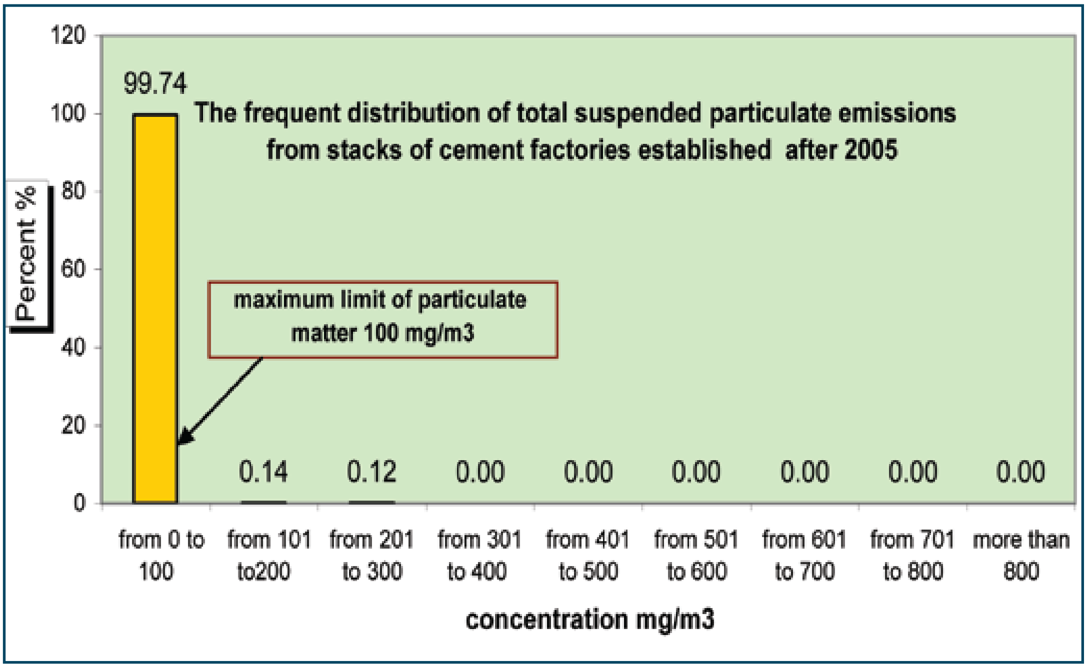


Figure (1 - 16) Frequent distribution of total suspended particulates' emissions from stacks of cement factories established after 2005 (modern factories)

2. **Emissions of cement factories are compatible with maximum limits within their geographical location :**

   a) **Cement factories located within Greater Cairo:**

   Due to the sensitive locations of cement factories within Greater Cairo and on its borders, which directly and greatly affect residential areas, statistical analysis and relative distribution of total suspended particulates' emissions were performed for (El-Kaowmia, Tora, Helwan and Katamia companies), which indicated the following results:

   - 97.7% of the emissions did not exceed 300 mg /m3 as indicated in figure (1-17)

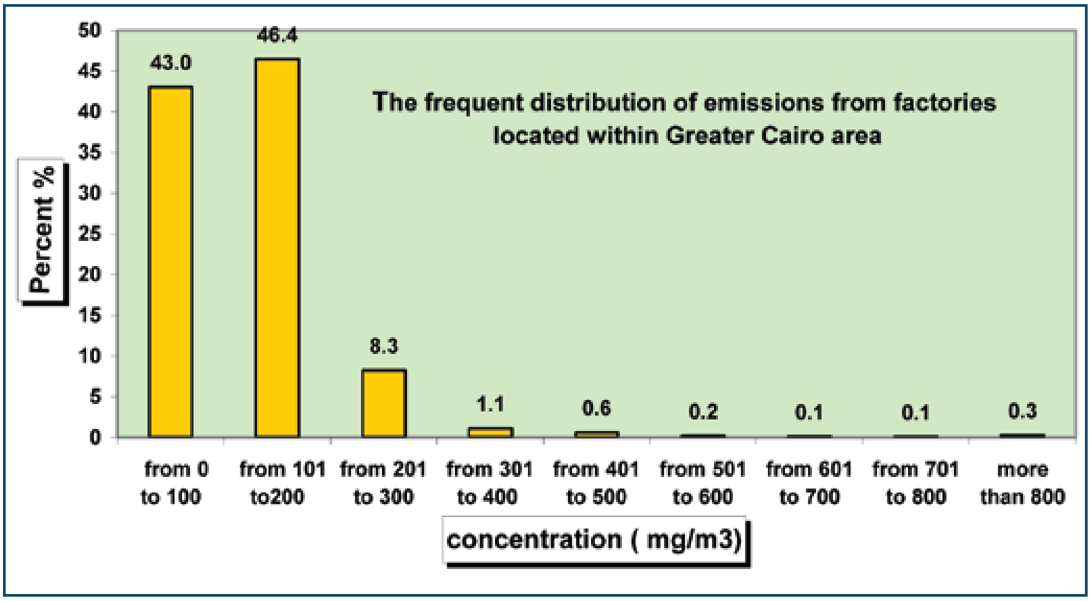


Figure (1 - 17) frequent distribution of emissions from factories located within Greater Cairo

b) Cement factories located within Alexandria governorate:

Statistical analysis and relative distribution of total suspended particles' emissions were performed for (Alexandria and Ameriya Cement Companies), which indicated the following:

- 94.4% of the emissions did not exceed 300 mg /m3 as shown in figure (1-18)

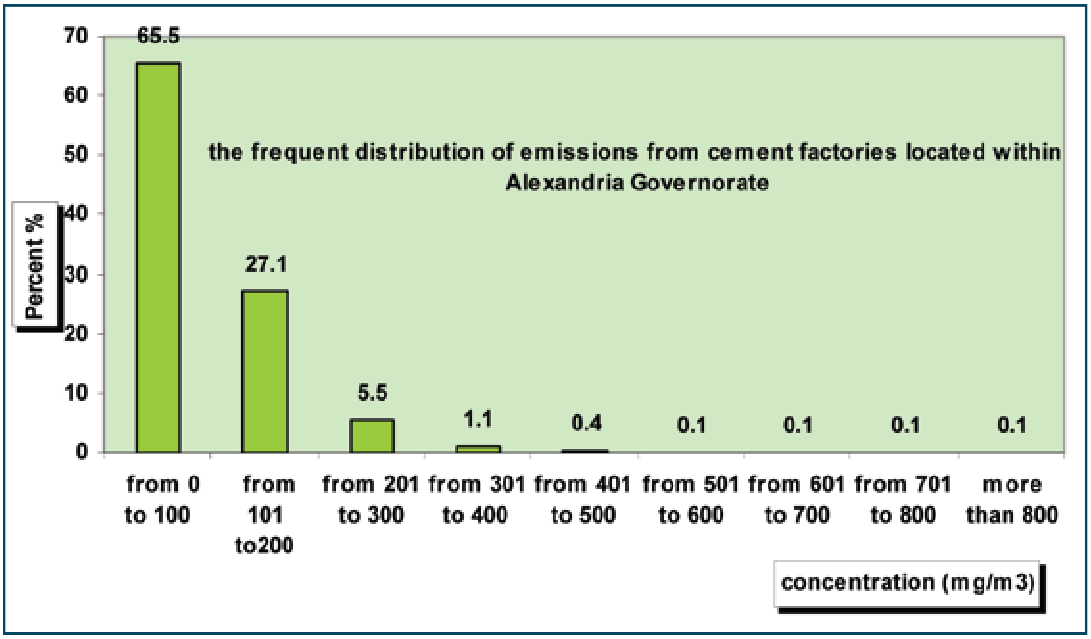


Figure (1 - 18) Relative distribution of emissions from cement factories located within Alexandria governorate

c) **Cement factories located within Upper Egypt:**
Statistical analysis and relative distribution of total suspended particulates' emissions were performed and the following results were indicated:

- 99.3% of the emissions did not exceed 300 mg /m3 as shown in figure (1-19)

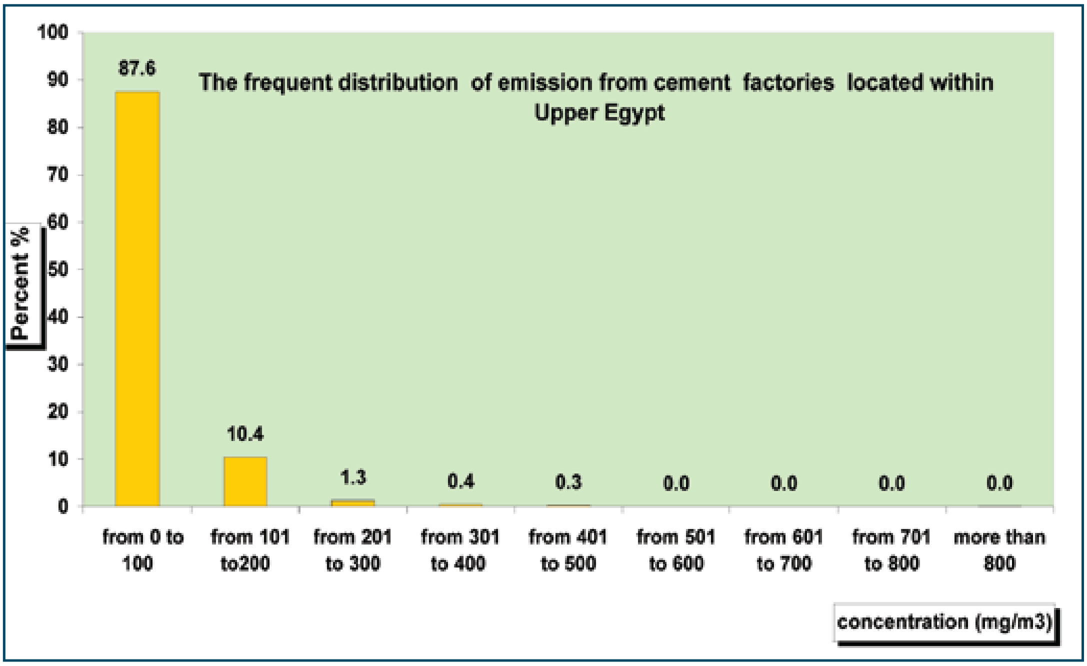


Figure (1 - 19) Relative distribution of emissions from cement factories located within Upper Egypt

d) **Cement factories located within Suez governorate:**
Statistical analysis and relative distribution of total suspended particulates' emissions were performed for (Suez, Masria and Arabia cement companies), and the following results were indicated:

- 99.8% of the emissions did not exceed 300 mg/m3 as shown in figure (1-20)

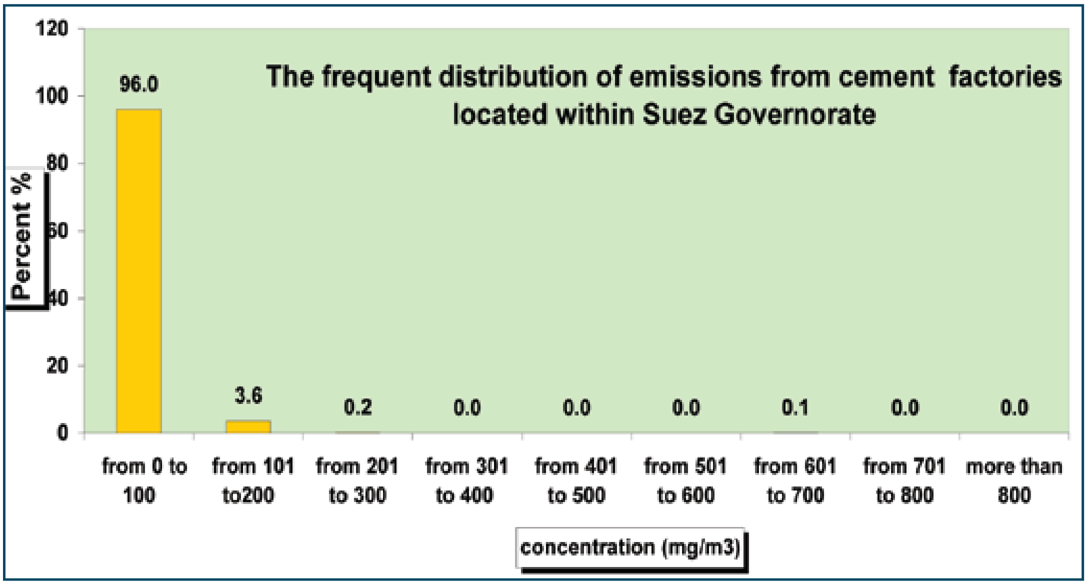


Figure (1 - 20) Relative distribution of emissions from cement factories located within Suez governorate

e) **Cement factories located within Sinai Peninsula:**

Statistical analysis and relative distribution of total suspended particulates' emissions were performed for (Sinai portland and Sinai White) and the following results were indicated:

- 100% of the emissions did not exceed 200 mg/m3 as shown in figure (1-21)

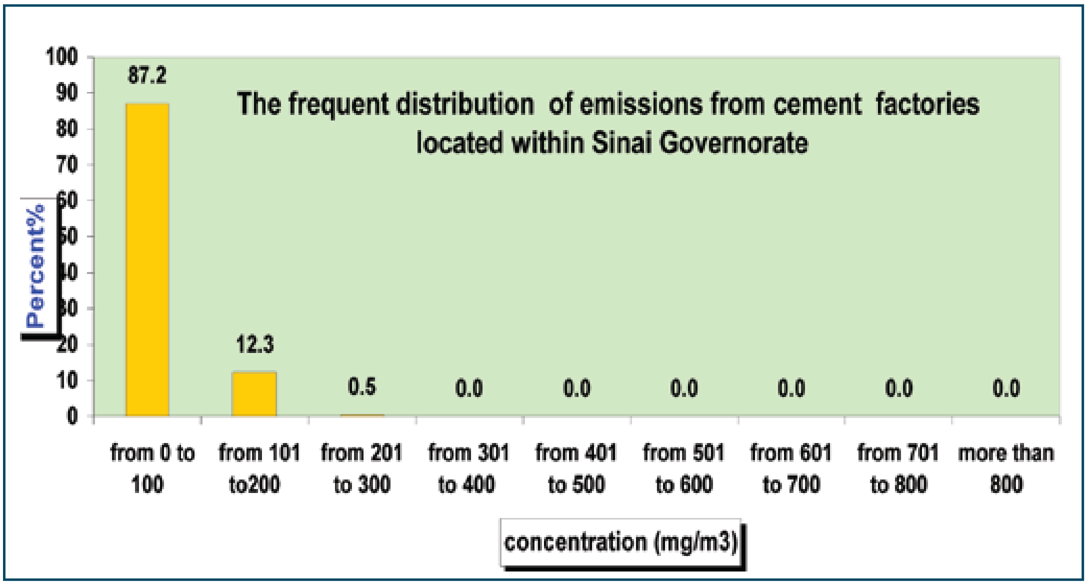


Figure (1 - 21) Relative distribution of emissions from cement factories located within North Sinai governorate

Second: Emission loads of total suspended particulates:

1. Statistical analysis of total suspended particulates' emissions conducted by cement monitoring network indicated the responsibility of five major companies (El-Kawmia, Torah, Asuit, Amiriya and Helwan) with about 75.3% of total emissions as shown in figure (1-22)..

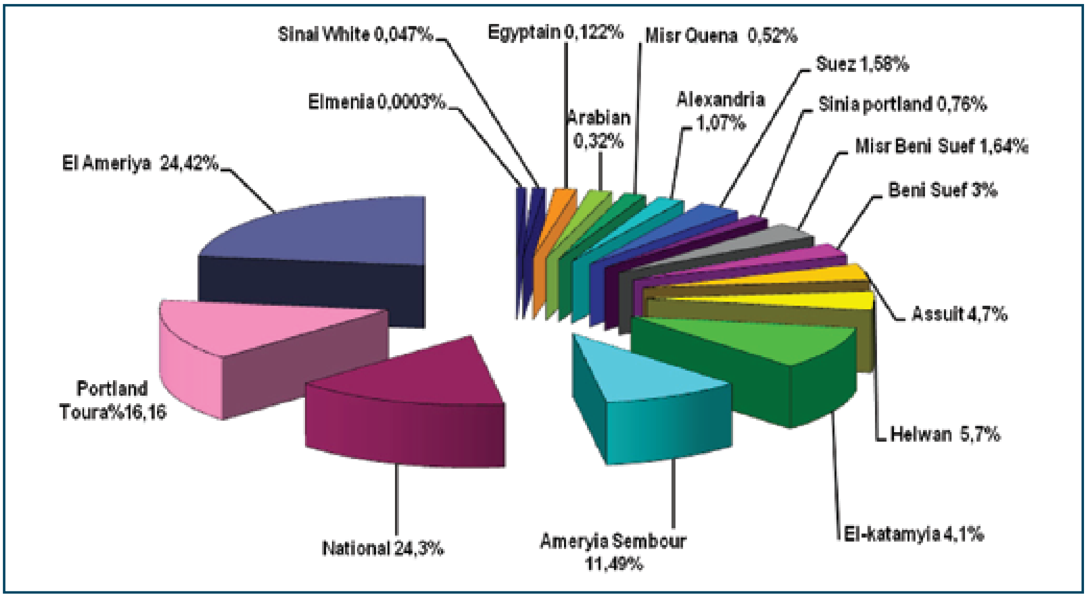


Figure (1 - 22) Percentage of each factory's contribution in total solid particles' emissions during 2009

2. Emissions from raw materials mills in factories are responsible for about 52% of pollution loads with total suspended particulates' emissions emitted from cement factories, as shown in figure (1-23).

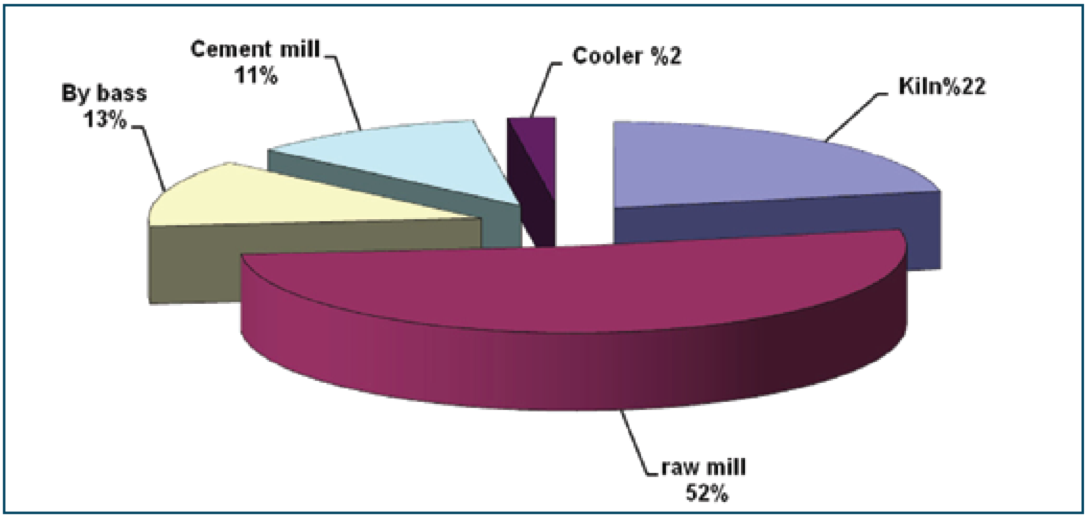


Figure (1 - 23) Contribution of different phases in cement production with total solid particles' emissions during 2009

1-7-2 General indicators of cement factories emissions during 2009:

1. **Relative distribution of total suspended particulates:**

- Comparing indicators of monitoring network issued by cement factories during 2008 and 2009, relative and positive improvement was recorded in 2009 results ranged between 2.3 to 4.9% as follows:
- Compatibility with stipulated standards in Executive Regulation of Environment Law no. 4 / 1994, were increased as compatibility of old factories were increased from 92.4% to 97.26%.
- Compatibility of new factories increased from 96.3% to 98.63%.
- Compatibility of modern factories increased from 99.4% to 99.74%.

2. **Loads of total suspended particulates:**

- Comparing total loads of total suspended particulates from cement stacks in 2008 and 2009, clarified relative and positive improvement with about 10% in 2009 in comparison with 2008.

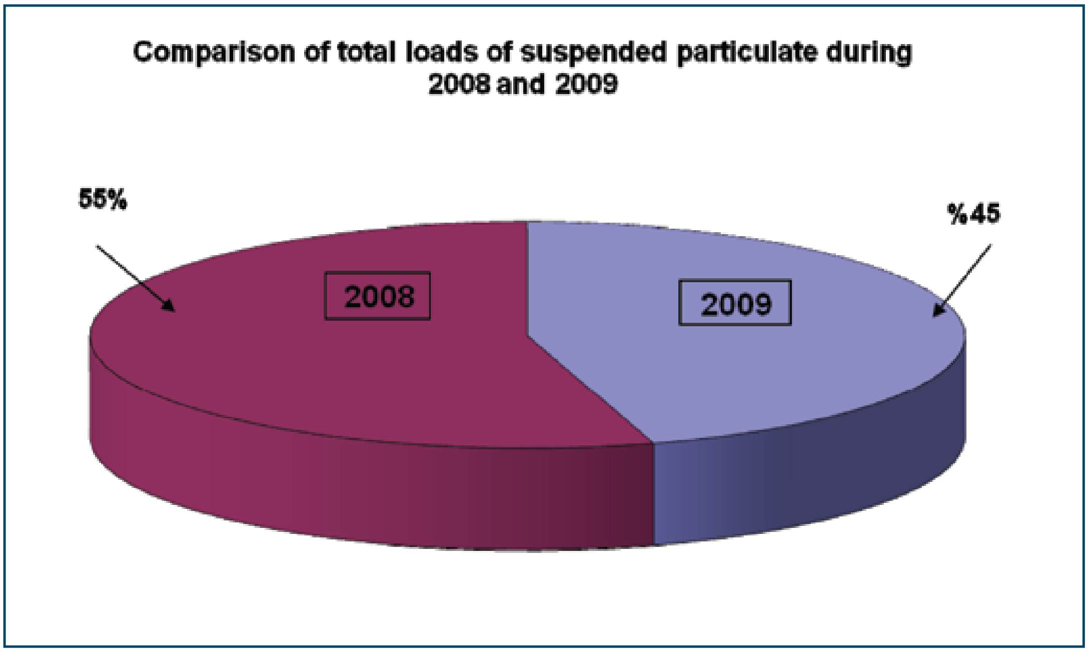


Figure (1 - 24) Comparison of total loads of total suspended particulates during 2008 and 2009

3. **Standards and maximum limits of total suspended particulates' emissions from stacks of cement factories:**

   - Monitoring results of total suspended particulates' emissions indicated an increase in compliance rate with permissible maximum limits stipulated in the Executive Regulation, due to exerted efforts by EEAA to follow-up these companies and considering their old technology; it became clear that it is important to gradually develop specific standards to achieve compliance on two phases (issuance of Regulation 1995 - amendment of the Regulation in 2005). Those results qualify to conduct another phase of amendment during 2010 , to reach international standards (100 mg/m^3) for already established facilities and (50 mg/m^3) for modern facilities, with focus in the next phase to improve efficiency of raw mills and controlling devices through environmental compliance projects.

1-8 Emissions from agricultural waste:

1-8-1 Emissions from open burning of rice straw:

With regard to MSEA's exerted efforts to address agricultural waste problem, especially rice Straw, a practical and scientific experiment has been implemented during 2008-2009 for the assessment and development of Egyptian factor for rice straw emissions in case of its burning with conventional methods for using it in estimating volume of produced emissions. Scientific efforts were conducted in cooperation with scientific Egyptian and foreign institutions resulted in the development of the first Egyptian factor for rice straw burning as shown in table (1-8).

Table (1 - 8) shows pollutant emissions factor for burning rice straw using traditional methods

Pollutant	Emission factor (Kg/ton)
Total Suspended Particulates	10
Sulfur oxides	0.0685
Nitrogen oxides	0.409

Loads' emissions resulting from rice straw burning have been successfully estimated, (nitrogen oxides, sulfur oxides and total suspended particulates), as shown in table (1-9).

Table (1 - 9) Total estimated loads of pollutants' emissions from rice straw burning

Pollutant	Loads of pollutants (ton)		
	2007	2008	2009
Total suspended Particulates	40000	40000	32000
Sulfur oxides	274	274	219
Nitrogen oxides	1636	1636	1309

Results indicated decrease of emissions loads during 2009 than 2007 and 2008; due to the following factors:

- MSEA's efforts to reduce rice straw burning through inspection campaigns and taking legal procedures against violators.
- Recycle and compress rice straw to utilize it in producing fertilizer, fuel and feed for livestock…etc.
- Reduce cultivated areas with rice crop in 2009 compared to the previous two years due to Ministry of Irrigation tightening to commit with planned space for rice cultivation and thus the amount of resulting rice straw has relatively decreased.

1-8-2 Reduction amount in environmental loads of air pollutants resulting from rice straw by recycling, compressing processes and reducing open burning as shown in table (1-10):

Table (1 - 10) Total pollutants loads reduced as a result of treating rice straw

governorates	Amount of processed rice straw /ton	Decreased amount of emitted /ton environmental load		
		Total suspended particulate TSP	Sulpher oxides (SO_2)	Nitrogen oxides (NO_x)
Qalyubia	23821	238.2	1.6	9.7
Gharbia	50064	500.6	3.4	20.5
Dakahlia	110821	1108.2	7.6	45.3
Sharkia	139523	1395.2	9.6	57.1
Different recycling processes	50000	500	3.4	20.5
Total	374229	3742.3	25.6	153.1

Figures (1-25), (1-26) and (1-27) show reduced amount of pollutants' environmental loads by ton

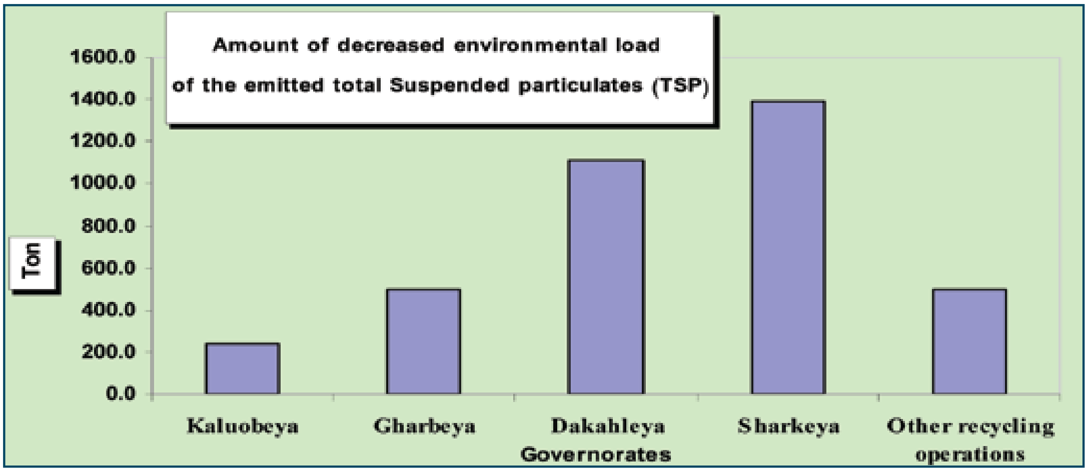


Figure (1 - 25) Reduced amount of (TSP) loads due to rice straw

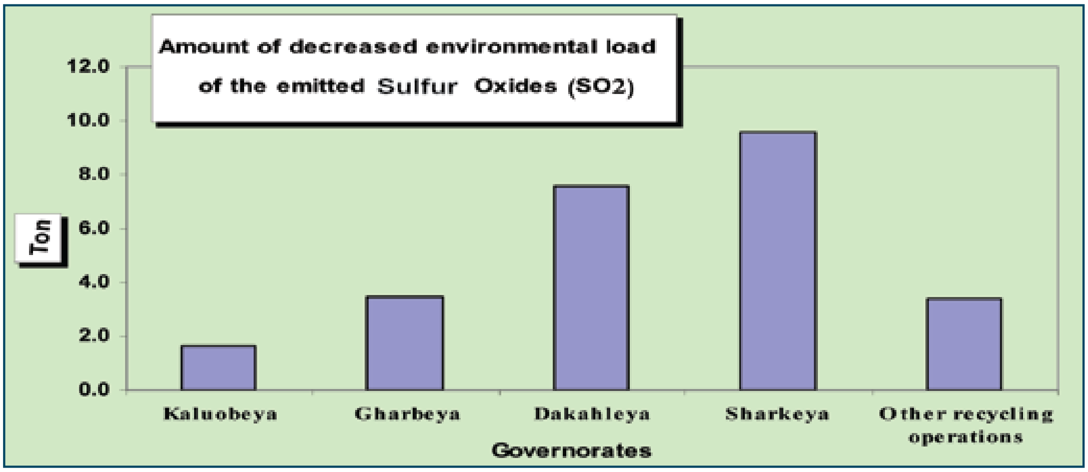


Figure (1 - 26) Reduced amount of Sulfur Dioxide (SO_2) loads due to rice straw treatment

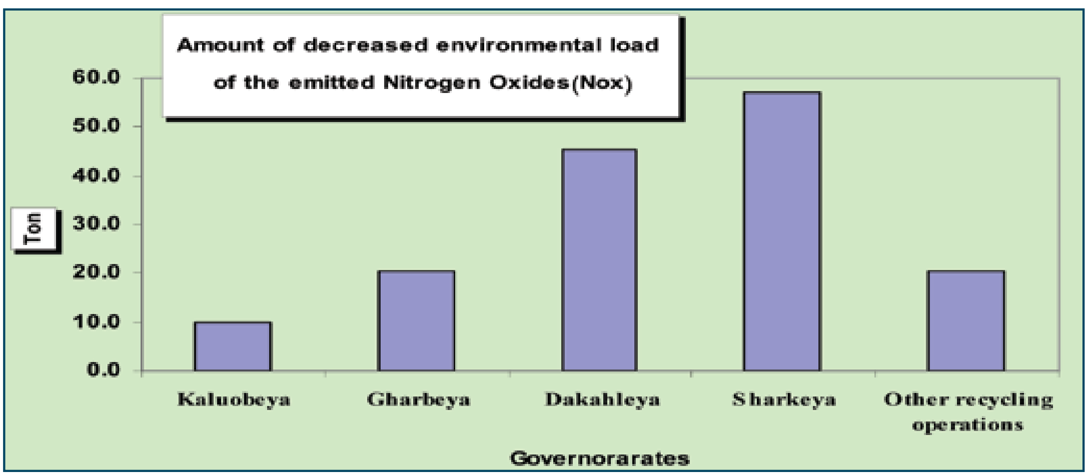


Figure (1 - 27) Reduced amount of Nitrogen Oxides (NOX) due to rice straw treatment

1-9 Vehicles Exhaust Emissions:

- Vehicles exhaust emissions are considered one of the most important factors causing air pollution in large cities with high traffic density, especially Greater Cairo due to traffic problems resulting from traffic jam, increased vehicles numbers and low vehicles speed– 11km/hour – according to the last study conducted by the National Institute of Transportation in 2008.
- Vehicles exhaust emissions represent approximately 26% from the total load of particulate matters in Greater Cairo, and more than 90% of total loads of carbon monoxide; it also contributes with 90% of total loads of hydrocarbons and 50% of total loads of nitrogen oxides. Additionally, these emissions have harmful effects on human health and ambient ecosystems.
- Number of licensed cars increased in 2009 to about 4.8 million vehicles; representing an increase of about 0.5 million vehicles compared to 2008, and more than double of 1993 (2.1million) as shown in figure (1-28).

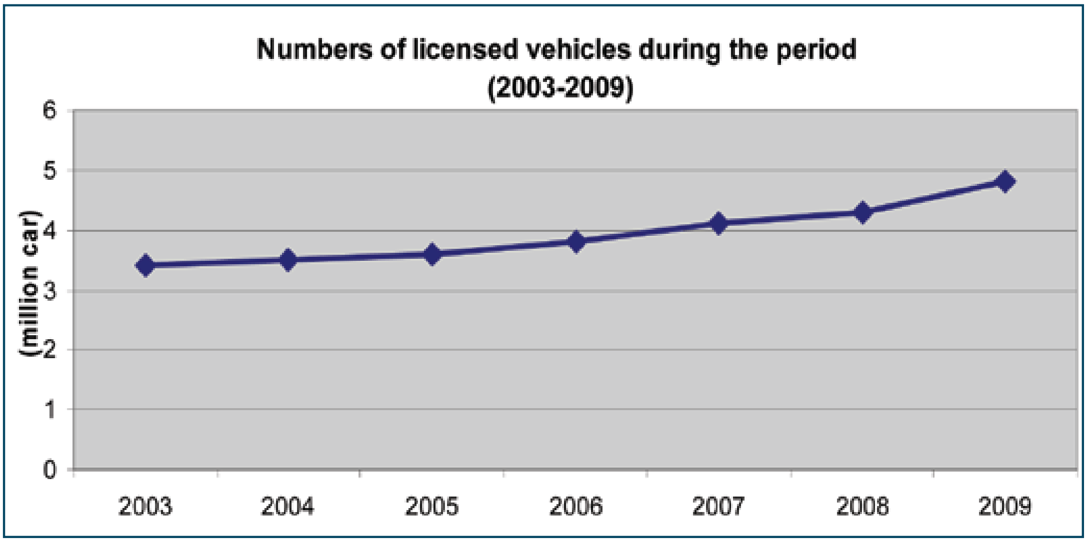


Figure (1 - 28) Total increase in licensed vehicles at the national level

Source: General Directorate of Traffic

- In 2009, the number of private vehicles amounted to 2.3 million representing 48% of the total vehicles numbers, followed by truck-trailer vehicles 19% (0.91 million), then motorcycles 17% (0.82 million) , taxies 8% (0.38 million), public transportation, governmental vehicles and others 8% as shown in figure (1-29).

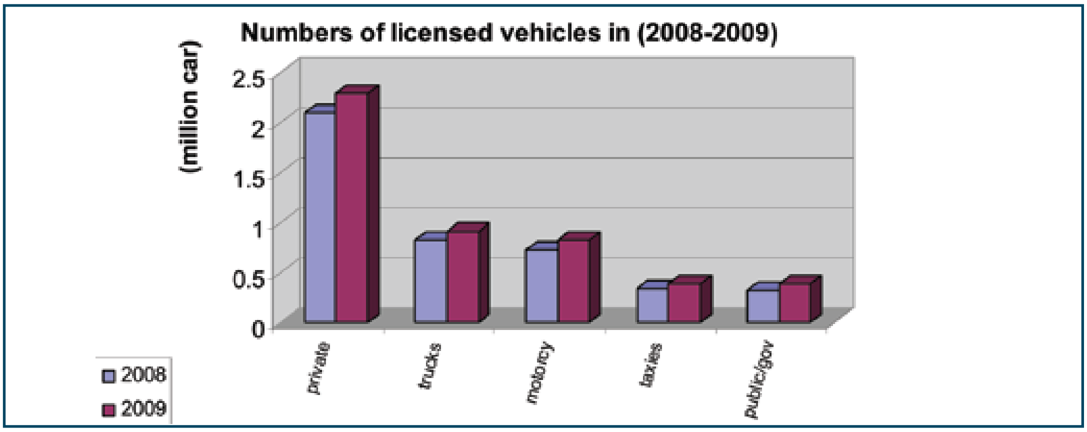


Figure (1 - 29) licensed vehicles according to type of license 2008 - 2009

Source: General Directorate of Traffic

- • A study was prepared to estimate old vehicles' contributions in causing pollution, and to find the relationship between the manufacturing year and the possibility to pass road inspection test, through inspecting 4063 gasoline vehicles and 1700 diesel vehicles, and results clarified the following:
- Numbers of new models of diesel vehicles have increased to 57% of total licensed diesel vehicles.

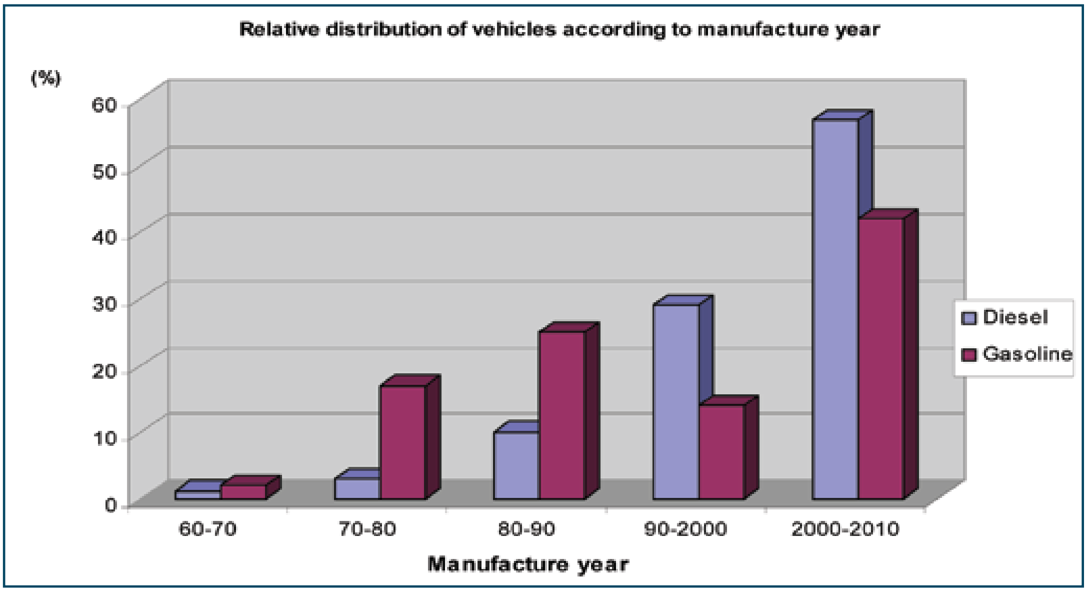


Figure (1 - 30) Relative distribution of vehicles on roads

Source: General Directorate of Traffic

Table (1- 11) Relative distribution of inspected gasoline vehicles on roads

Manufacturing year	passed	percentage	failed	percentage
60-70	29	1%	24	1%
70-80	301	7%	416	10%
80-90	470	12%	517	13%
90-2000	341	8%	266	6%
2000-2010	1444	36%	255	6%
total	**2585**	**64%**	**1478**	**36%**

- Highest percentage of vehicles passed road inspection test were new models (2000-2010) representing 36% of total inspected vehicles; however, (1980-1990 models) represents highest failure (13%), as shown in figure (1-31).

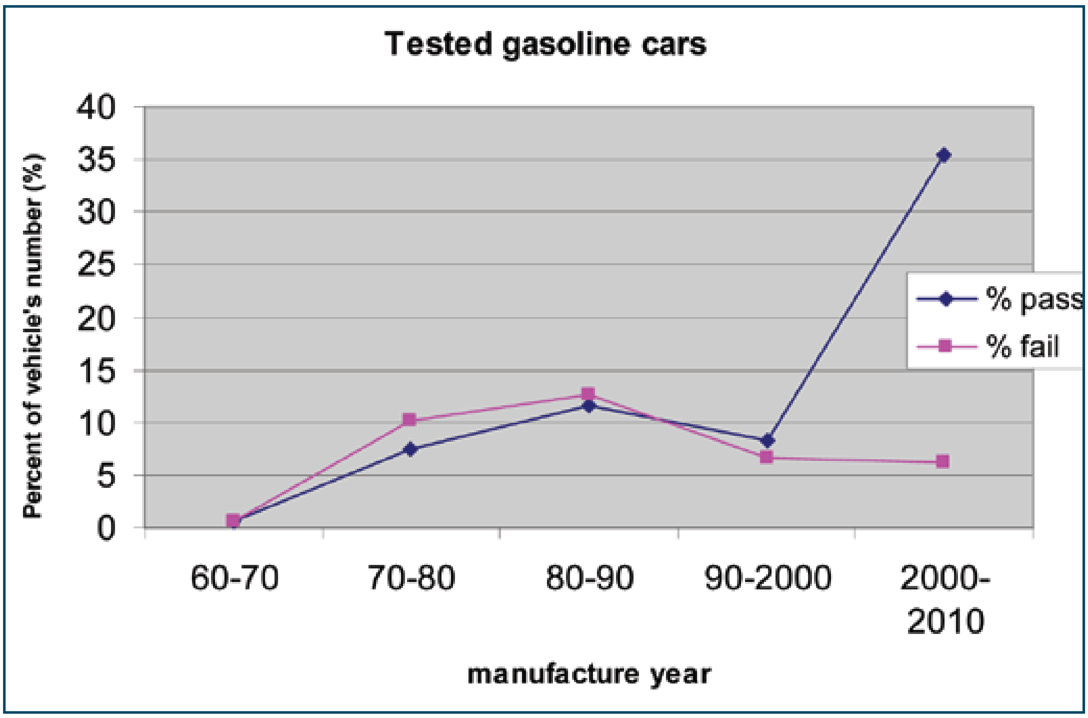


Figure (1 - 31) Gasoline vehicles tested on the roads

Table (1 -12) shows relative distribution of inspected vehicles using diesel

Manufacturing year	pass	percentage	fail	percentage
60-70	4	0.2%	12	1%
70-80	20	1%	37	2%
80-90	51	3%	125	7%
90-2000	170	10%	313	19%
2000-2010	638	37.8%	330	19%
total	**883**	**52%**	**817**	**48%**

- Highest percentage of diesel vehicles passed road inspection test were new models (2000-2010) representing 37.8% of total inspected vehicles. While (90-2000) models recorded highest failure percentage 19% as shown in figure (1-32). Nevertheless, article (37) of the Executive Regulation of Environment Law No. 4/1994 stipulated that 30% is the allowed failure rate for all types of vehicles regardless of being new or old models. Therefore, identifying standards according to the year of production has been taken into consideration while amending Executive Regulation of Environment Law.

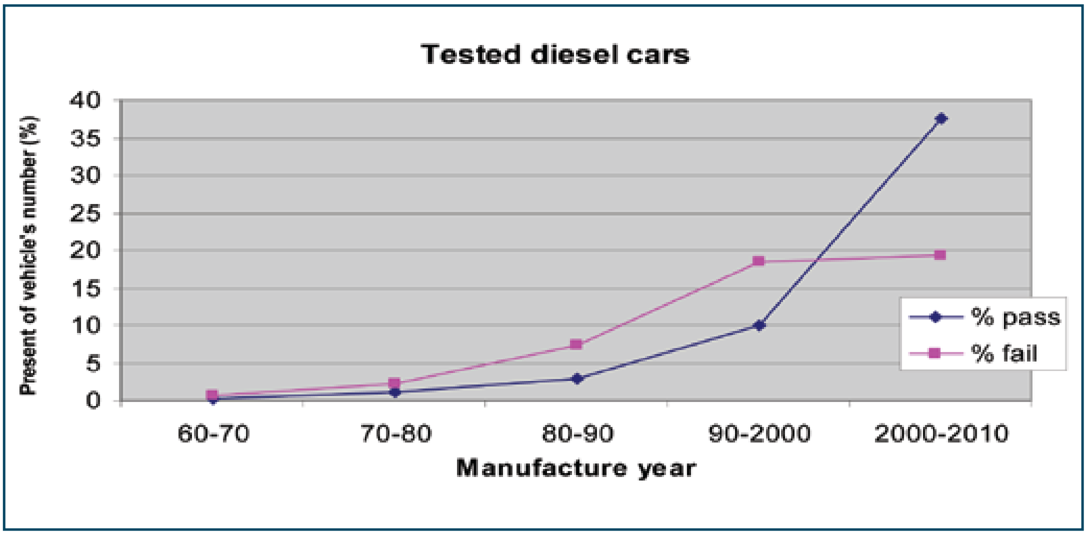


Figure (1 - 32) Tested diesel vehicles

1-9-1 Implemented programs to reduce pollution from vehicles emissions:

1. **Expanding in using natural gas in public transportation program**

   a. **Use of natural gas as fuel in public transportation.**

   Public transportation vehicles exhaust emissions; significantly contribute in causing air pollution in Greater Cairo, as a result of using diesel fuel. Accordingly, MSEA in cooperation with Public Transportation Agency has implemented a program to expand in using natural gas in public buses, the following has been implemented:

   - Increase number of natural gas public transportation buses to 209 during 2009 in addition, procedures are going on to provide more 80 buses to Public Transportation Authority.
   - Examine technical defects in locally produced natural gas buses to improve their efficiency through specialized technical committee composed of experts from different engineering faculties and "Engineering Company for Vehicles Industry."

   b. **Convert governmental vehicles to natural gas**

   Within the framework of MSEA's efforts to implement an ambitious program to convert 5000 government vehicles to natural gas, resulted in the following:

   - 2308 vehicles belonging to 112 government agencies were converted by the end of 2009.
   - 3010 vehicles belonging to 140 government agencies will be converted during next phase.
   - 1716 vehicles belonging to 108 government agencies have passed technical inspection and proved their validity for being converted to natural gas.

   c. **Smart Card Program:**

   Within the framework of MSEA's efforts to encourage use of natural gas as an environment friendly fuel, the Ministry in cooperation with Ministry of Petroleum has implemented the smart card program that helps car owners to finance their cars conversion to natural gas without paying any money so as to discount conversion value on stages from prices' difference between gasoline and natural gas, which resulted in finalizing the following:

   - 120.000 vehicles were converted through smart card program sponsored by Ministry of Petroleum represented in its gas companies.

- Natural gas stations were increased to 119 stations nationwide.
- Natural gas pipe lines were extended to Minia and Sohag Governorates and work is currently going on for the establishment of natural gas stations, in those governorates.

d. Capital Taxi Project in Greater Cairo:

MSEA in cooperation with Cairo Governorate (competent authority of capital taxi) is planning to convert 1136 vehicles to natural gas, among which 1047 have already been converted, and the remaining 89 taxis are currently under conversion.

Photo (1 - 1) Capital Taxi

2. Program of replacing old taxis in Greater Cairo:

- During 2009 MSEA in cooperation with Ministry of Finance has finalized first phase of this project by replacing 1000 old taxis (1960-1979) in Greater Cairo area.
- Through cooperation between Ministry of Finance and Ministry of Environment to finalize the project, a fund has been established at Ministry of Finance to finance economic incentives necessary for taxis' owners in activation of Article (4) item (2) stipulated in New Traffic Law No. 121/2008 that (it is not authorized to license cars which have been manufactured since ten years including manufacturing year when

it is licensed for the first time, and it is not permissible to license taxis, manufactured since twenty years). In all cases, Ministry of Finance has allocated 312 million pounds to cover replacement of 34 thousand old Taxis, manufactured since 30 years; 17 023 old taxis were replaced with modern ones and old taxis were scrapped . Waiting list includes more than 20 thousand taxi owners wishing to replace their old vehicles through this project.

Photo (1 - 2) New taxis

- In addition to environmental returns achieved by the project, it led to an economic boom for automotive industry in Egypt despite the global crisis and decrease in car sales in the world

3. Inspection program of vehicles' exhausts in Traffic units:

- MSEA in cooperation with Ministry of Interior implemented a program to link vehicles licensing with their emissions levels. Vehicles inspection program has been finalized in 23 Governorates, representing 96% of total licensed vehicles in Egypt. Purchasing cost of inspection devices was amounted to 12 million Egyptian pounds approximately covered equally by ministries of Interior and State for Environmental Affairs.
- The fifth and last phase of the exhaust inspection program has begun during 2009 at the Traffic Units of (El-Monofia, Port-Said, Aswan and Ismailia Governorates), which represent 4% of the total licensed vehicles

in Egypt. In coordination with Ministry of Interior a survey has been conducted to identify each governorates needs form inspection devices which amounted to 56 devices for inspecting gasoline exhausts and 56 for diesel exhausts. Total estimated cost was 4,256,000 Egyptian pounds covered equally by ministries of Interior and State for Environmental Affairs.

- Within the framework of EEAA's coordination with Public Traffic units a program has been implemented to follow up and review Traffic units to identify obstacles facing program implementation through a joint committee from EEAA's and Public Traffic Authority in 8 Governorates (El -DaKahlyia- Alexandria, Beni-suif, North Sinai, Demiata, El-Garbia, El-Behaira and Asyuot).

4. **Inspection program of vehicles' exhausts on Roads:**

- MSEA in coordination with Traffic Authority and Environment Police has conducted inspection campaigns on vehicles on roads to insure their compliance with Executive Regulation of Environment Law, and taking legal actions against violating vehicles.
- During 2009, 38,332 gasoline and diesel vehicles were inspected compared to 45,012 vehicles in 2008. Passed vehicles were 23,287 and failed ones were 15,045, which represent 62% passed and 38% failed as shown in figures (1-33) and (1-34) respectively . Decreased number of inspection campaigns lead to decrease number of inspected vehicles in 2009. Therefore, MSEA has coordinated with Environment Police, to increase number of roads' campaigns to 5 daily, to reach the target of inspecting 50,000 vehicles annually.
- During the last quarter of 2009; 224 passenger transport vehicles (microbus) were inspected where 104 had passed and 120 had failed. Given the seriousness of this kind of vehicles and their contributions to environmental pollution, great interest had been directed to examine large numbers of them and study how to reduce their emitted pollution in coordination with concerned authorities.

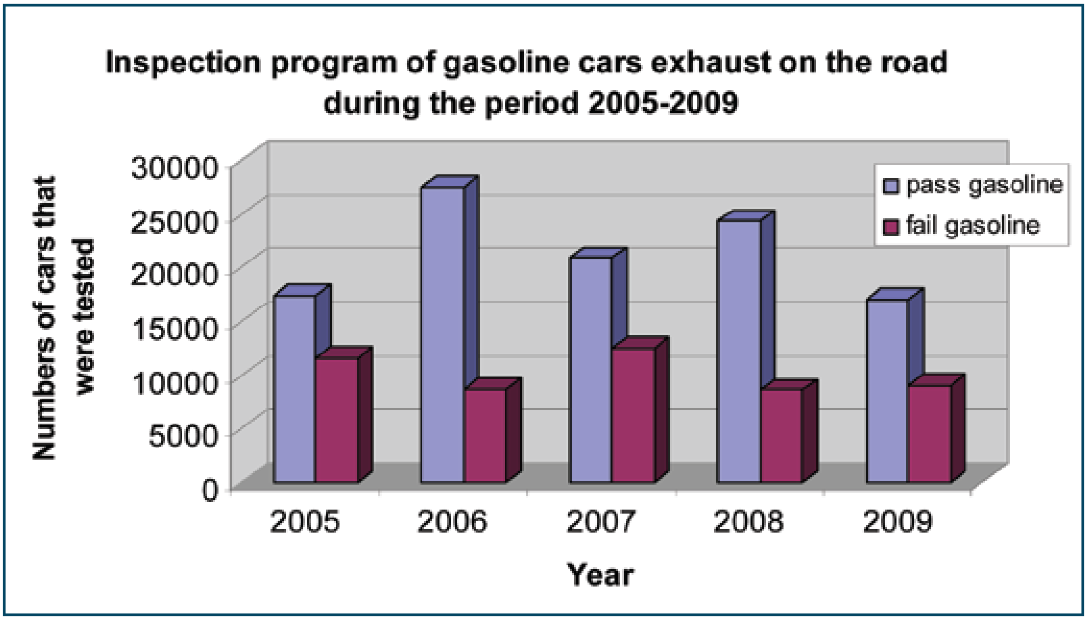


Figure (1 - 33) Results of inspection program of gasoline vehicles' exhausts on roads

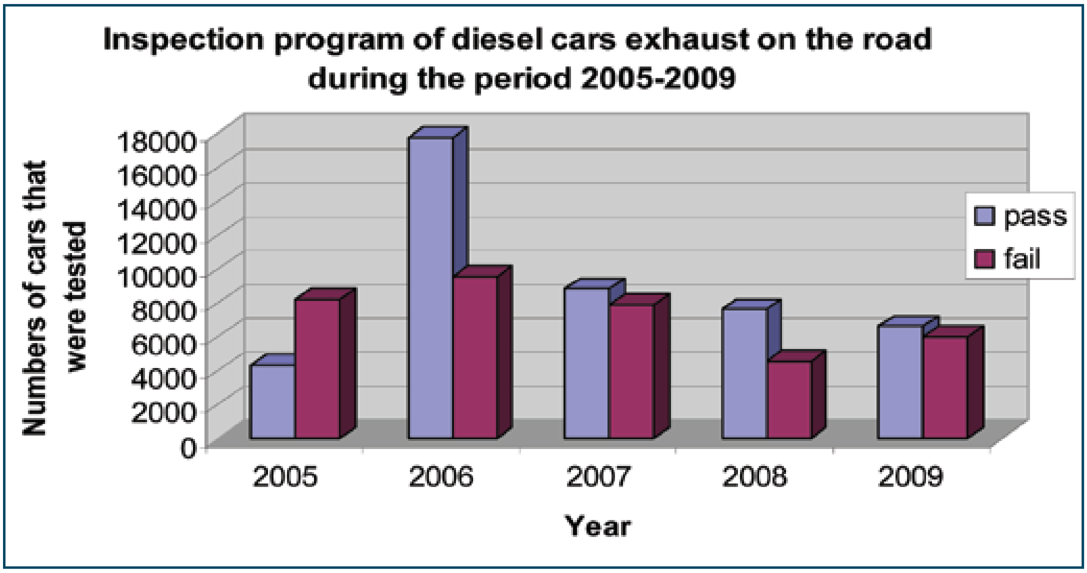


Figure (1 - 34) Results of inspection program of diesel vehicles' exhausts on roads

5. **Inspection Program of Cairo Transport Authority Buses**
   - With regard to MSEA's efforts to reduce vehicles exhaust emissions, an inspection program for buses of Cairo Transport Authority and Greater Cairo Bus Company has been implemented. In 2009, 4020 buses were inspected compared to 4436 in 2008. This recorded decrease in buses number in 2009 was due to scrapping rest of out of services buses.

- Recorded results have shown that approximately 28% of the above total buses have passed the inspection, 32% failed and 40% were out of service at time of inspection, as shown in table (1-13) and figure (1-35).
- Public Transport Authority was notified with examination results and numbers of failed buses , a program has been prepared for re-examining them as soon as the Authority provides EEAA with a statement stating the finalization of their maintenance and re-operation.

Table (1 - 13) Inspection results of Public Transport authority Buses

Buses	2008	2009
Test	3316	2421
Passed	1909	1143
Failed	1407	1278
Work fail	1120	1599
Total	**4436**	**4020**

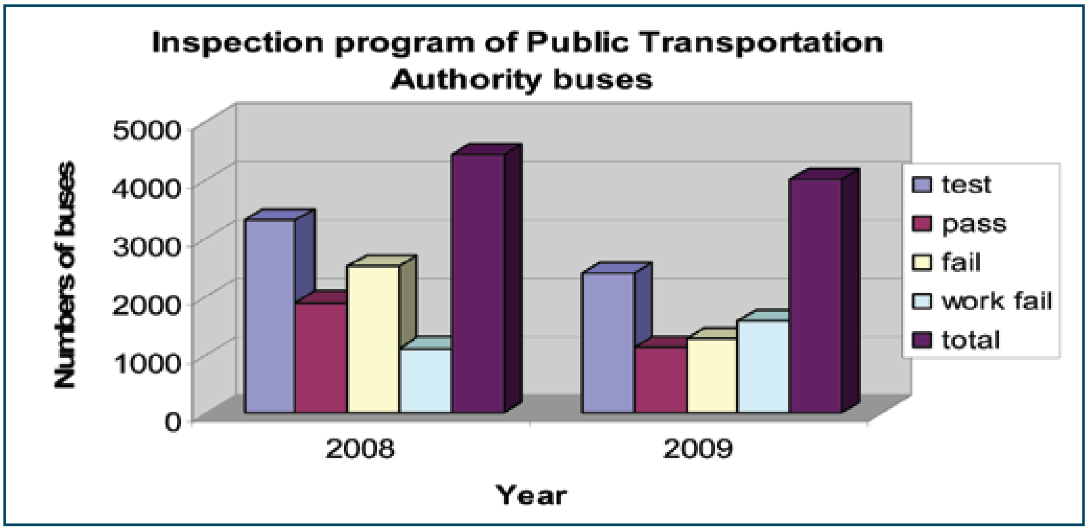


Figure (1 - 35) Inspection results of Buses' emissions

6. **Program of protecting environment from emissions caused by Motorcycles:**
   - In the framework of exerted efforts to reduce motorcycles exhausts, production of motorcycles with two-stroke engines in all its forms, types and sizes were prohibited in Egypt starting from 31/12/2007 according to Ministry of Commerce and Industry's decree No. 85 /2004.

- To support these efforts, decree No. 23/2008 was issued by Ministry of Commerce and Industry to prevent importation of two-stroke engines motorcycles with all its forms and types.
- In 2009, MSEA has coordinated with Ministry of Commerce and Industry to issue a decree to prevent importation of Tock-Tock with two-stroke engines of all its types and sizes, because of its increased polluting impact compared to Tock-Tock with four-stroke engines.

Future vision of air quality Improvement:

1. **National Network for monitoring air pollutants:**

- **Upgrade National Network for Monitoring Air Pollutants:**

Increase number of monitoring stations especially in populated and industrial zones in Delta and Upper Egypt, continue maintenance and replacement of old stations.

- **Air Quality Indicators**

Add some environmental indicators that have not been monitored in the past and monitoring these pollutants, especially those affecting citizens' health negatively, such as $PM_{2.5}$ and NH_3.

- **Pollutants' Inventory**

Inventorying all sources of pollution in all areas and preparing an environmental map for each region to specify all pollution sources, and using them in attributing pollutants of each region to their major sources and calculate environmental loads.

2. **National Network for Monitoring Industrial Pollution:**

Development of national network to monitor emissions from stacks of different kinds of factories:

- **Cement Companies:**

Due to the increased types of monitored and emitted pollutants from cement companies, companies were directed to conduct continuous self-monitoring of sulfur and nitrogen oxides emissions, flow rate, temperature and pressure of their stacks, then linked it to the national network for monitoring industrial emissions.

- **Fertilizers Companies:**

Implementing the plan to develop the network to add the 14 fertilizer companies to industrial emission monitoring network, fertilizer companies have been addressed to conduct continuous self-monitoring of their stacks and to execute connectivity to the national network for monitoring industrial emissions.

- **Electrical Power Stations:**

Add the 28 electric power plants to the national network of monitoring industrial plants emissions, power plants have been addressed to conduct continuous self-monitoring of their stacks and to execute connectivity to the national network for monitoring industrial emissions.

- **Major Industries:**

Add stacks of some major industries to the continuous self-monitoring plan, such as iron and steel, ferrosilicon, oil refiners and petrochemical companies; as well as execute connectivity to the national network for monitoring industrial emissions.

3. **Future plan to reduce vehicle emissions:**

- Complete national project for replacing old vehicles by proposing auto companies' contribution in this project by providing financial incentives for citizens to complete the financial cycle provided by the State.
- Raise efficiency of inspection programs of vehicles' exhausts in traffic units and conduct partnership with private sector participation in establishing technical examination centers in coordination with Ministry of Interior.
- Develop existing standards applicable to vehicles' exhaust in Egypt and work on improving quality of diesel fuel used in Egypt and reach its content of sulfur to 2% in cooperation with the Ministry of Petroleum.
- Issue environmental standards for emissions resulting from new vehicles produced for the first time or being imported or assembled in Egypt.
- Conduct awareness campaigns for drivers and citizens about the importance of their participation in improving environmental status through the use of public transportation (metro - buses - trains) to mitigate environmental load and traffic congestion.
- Implement a program to reduce emissions from motorcycles by replacing old two-stroke motorcycles with modern four stroke-cycle to reduce exhaust emissions.

References

- General Directorate of Traffic –Ministry of Interior
- Vehicles' Exhaust Inspection Program – EEAA
- Old taxis replacement project – EEAA
- Vehicles Exhausts' inspection program on roads– EEAA
- Government Vehicles Conversion to Natural Gas
- Annual Report of industrial emissions monitoring network
- Monitored data by Air Pollution Monitoring Stations - MSEA
- Environment Law 4/1994
- Environmental Indicators Report - 2008
- Pollution Inventory Study – Japanese International Cooperation Agency (JICA)
- US EPA and WHO internet sites
- Air quality internet sites

Chapter Two

CLIMATE CHANGE

2-1 Introduction

Climate Change phenomenon is known as a disruption in the frequent climatic conditions such as temperature, wind and precipitation patterns that characterize each region on earth. The pace and magnitude of climate change on the long-term have led to huge impacts on the natural biological systems. Also, increasing temperatures would lead to changes in types of weather patterns like wind, amount of precipitation and its types; in addition to high potential climatic events; leading to environmental, social and economic consequences which would have broad impacts and could not be predicted.

The recorded temperatures of earth's surface have increased steadily during the last hundred years, ranging from 0.5 - 0.7 Celsius degrees. Human industrial activities and technological revolution have led to increased rates and concentrations of greenhouse gases (GHGs) emissions in the atmosphere; causing increased ability of the lower layers of the atmosphere to absorb long-wavelength radiation, leading to warming and causing the onset of global climate change. It is well known that climate change is a global phenomenon but its effects would vary from place to place on earth.

In spite of severe social and economical impacts arising from climate change; many political analysts, economists and environmental experts believe that there are favorable opportunities to apply mitigation and adaptation technologies to climate change.

2-2 Sources of Greenhouse Gases (GHGs)

The six main Greenhouse Gases are:

1. Carbon Dioxide (CO_2)
2. Methane (CH_4)
3. Nitrous Oxide (N_2O)
4. Perofluorocarbons (PFCs)
5. Hydrofluorocarbons (HFCs)
6. Sulfur Hexafluoride (SF_6)

Greenhouse Gases listed above keep some of the solar energy in the atmosphere that warm up earth and preserve a mild climate. These gases are not considered sources of air pollution but it has been influential on the global warming phenomenon. Carbon Dioxide is one of the main gases which contribute to the increase of this phenomenon; it is produced during the burning of coal, oil and natural gas in power stations, cars and others, as well as it is not absorbed due to large scale of deforestation. Methane is the second important gas emitted from rice fields, cattle breeding, landfills, and mining and gas pipelines. Nitrous Oxide is emitted from fertilizers and other chemical industries and it contributes to heat trapping.

2-3 Adverse Impacts of Climate Change on Egypt

Based on the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) in 2007, it is expected that Egypt would be largely vulnerable to number of risks and threats, such as sea-level rise, high temperatures, followed by shortages in water resources, impacts on agricultural productivity and difficulty in cultivating some types of crops ; as well as impacts on tourist's areas, public health and infrastructure that would affect energy, industry, food safety and national economy sectors.

2-3-1: Sea Level Rise

Studies have shown that a sea-level rise from 18 to 59 cm will lead to negative impacts on the low level coastal zones by submerging some of the north parts of the Nile Delta, Affecting the aquifer near the coast; also would affect quality of agricultural and reclaimed lands; in addition to impacts on tourism, trade and ports in the coastal areas. It would also lead to a decline in productivity of some food crops such as rice and wheat; difficulty in cultivating some crops, loss of agricultural land and change in Egypt's crop structure.

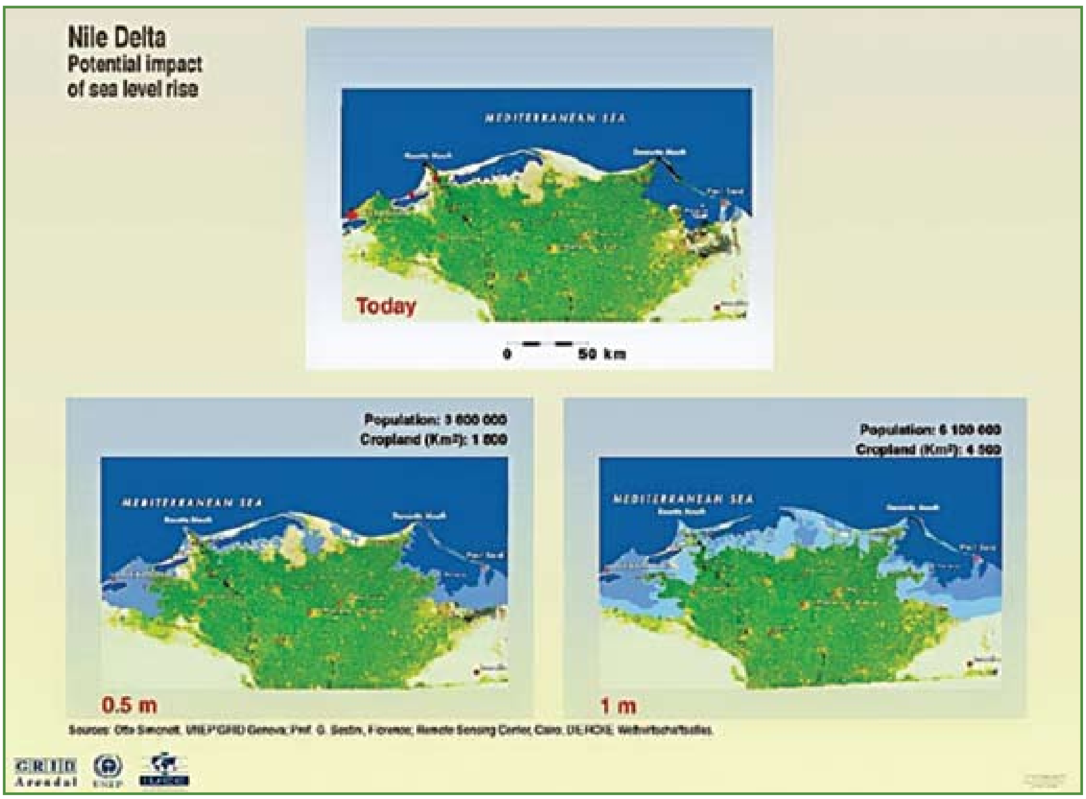


Figure (2-1): Expected scenarios of Sea Level Rise on the Egyptian Delta

Source: Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2007

Sea Level Rise would destroy weaker parts of the sand belt along the coastline which is important and necessary to protect shallow and low level lakes and reclaimed lands. It would also change water quality affecting most of freshwater fish, threatening low buildings in Alexandria and Port Said. Recreational tourism may be affected by degradation of beach facilities and salinity of groundwater.

2-3-2 Temperature Rise

Increasing rates of temperature, severity of heat and cold waves will result in fluctuation of rainfall quantitatively and spatially leading to increased rates of desertification and drought that would also lead to lower productivity of some food crops such as rice and wheat. Additionally, there would be more difficulties to grow some other crops; increasing the consumption of water due to rising temperatures and high evaporation rates; the extinction of some organisms and the spread of malnutrition and some diseases such as malaria.

Temperature rise would also affect water level of the Nile River where it is expected to show decline in water flow until 2040 (according to most scenarios on this topic). Only one scenario predicts a rise in water flow after 2045, while other scenarios predict a reduction in the flow, but at different rates, making it necessary to develop and implement effective methods to deal with this situation, whether in agriculture or energy sectors where Egypt depends on hydroelectric power for 12% of its energy needs.

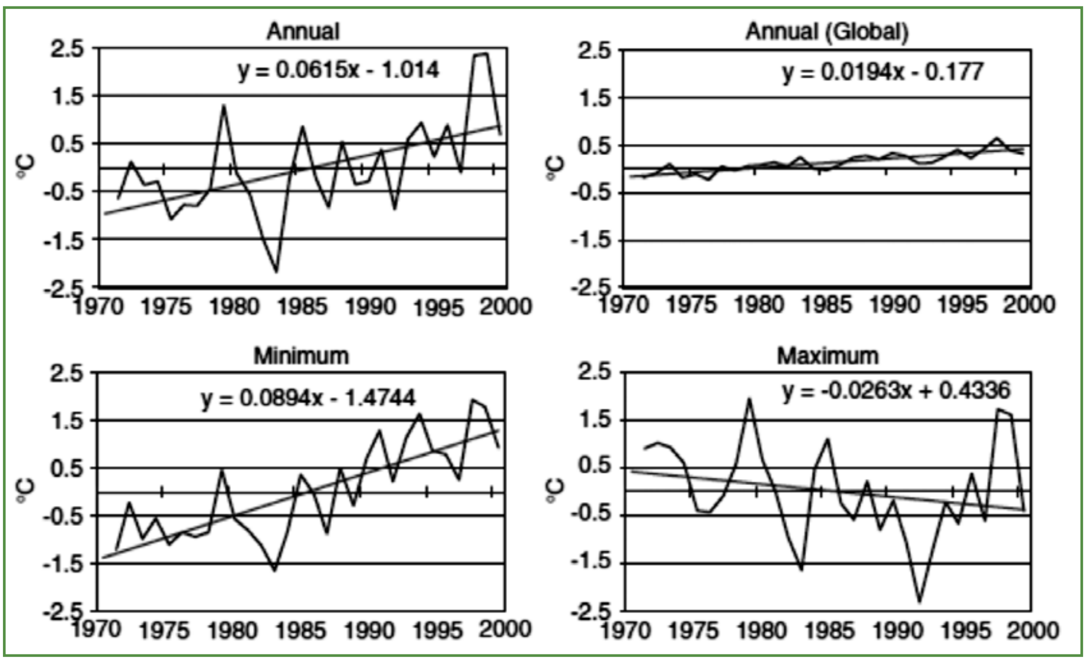


Figure (2-2): Temperature changes in Egypt during last three decades

Source: A study on changes in temperatures due to Climate Change

2-3-3 Impact on Water Resources and Irrigation

Water is the essence of life, so that it is the resource that humans must preserve and develop. Studies have shown that population growth and increasing consumption particularly in agricultural and industrial sectors create great pressure on water resources; some other studies show the occurrence of expanded gaps between periods of rainfall with increase in rates of precipitation which might lead to increased possibilities of floods or longer periods of drought in addition to increased salinity of coastal aquifers due to the more intrusion of seawater.

2-3-4 Impact on Agriculture, Livestock and Food Sources

Agriculture plays an important role in the Egyptian national economy and contributes by about 20% of the Gross Domestic Product (GDP), more than 70% of agricultural land depends on low efficiency irrigation systems that causes loss of large quantities of water, deterioration of land productivity and increased problems with salinity. Expected impacts on this sector can be summarized in the following:

- Lack of crops productivity and negative impacts on agriculture due to the change of heat waves' rates and times (such as during flowering period in citrus fruits).
- Associated social and economic impacts.
- Increased need for water, increased rates of soil erosion due to rising temperatures and high evaporation rates where agriculture consumes about 85% of the total annual water resources. Moreover, the continued use of unsustainable agriculture methods of planting and irrigation management would affect water resources in Egypt; this is in addition to changing crop distribution patterns, affecting the marginal agriculture lands and increasing the rates of desertification.

2-3-5: Impact on Coastal Zones

- Flooding of some low-lying parts of the northern Delta and some other coastal zones.
- Increasing rates of coastal erosion, penetration of salt water in soil, intrusion of seawater into groundwater and lack of agricultural productivity.
- A survey using GIS and remote sensing techniques has shown an impact on the northern coast and cities of the Nile Delta on the long term due to Sea Level Rise.
- Impact on fish production due to the change in coastal zones' ecosystems and increase in sea temperature.
- Associated social and economic impacts.

2-3-6 Impact on Health

There is no doubt that climate change affects basic requirements of health, clean air, drinking water, adequate food and safe shelter. Severe temperature rise contributes directly to death resulting from cardiovascular and respiratory diseases, especially among the elderly.

High temperatures increase levels of pollen and other suspended substances in air which are allergens and can result in asthma.

Natural disasters and changing rainfall patterns contribute to increase the number of patients with epidemiological diseases especially in developing countries. Also, sea level rise and extreme weather events will cause the destruction of homes, medical facilities and other necessary services. It is likely that increasing change in rainfall patterns would affect fresh water supply and the consequent increased risk of diarrhea, and in severe cases water scarcity leads to dehydration and starvation.

Climatic conditions have their impact on water-borne diseases and diseases transmitted by insects, snails or other transmitters. It is likely that climate changes would cause longer vector-borne diseases transmission seasons and change its geographical range. It is expected, for example, that climate change could lead to a substantial expansion in the spread of Bilharzias and Malaria infections which are strongly influenced by climate change. It is expected that Malaria would spread to Egypt by 2030 due to rising temperatures which form a suitable climate for the spread of Anopheles mosquitoes.

The whole human population will be affected by climate change, but some individuals are more vulnerable than others. Residents of coastal areas are in particular the most vulnerable. Children, especially those living in relatively poor communities, are one of the fastest groups affected by health risks resulting from climate change and will be subject to longer health consequences. It is also expected that health effects would be more noticeable on the elderly, the infirm or those already suffering from chronic diseases.

The promotion of safe use of public transportation and bicycles or walking instead of using private vehicles, could reduce carbon dioxide emissions and improve public health.

2-3-7 Impact on Tourism

Water level rise in the Red Sea and Mediterranean would result in a number of negative consequences on tourism projects, including over 600 hotels and resorts. These projects and investments will be affected by rising of water temperatures - especially in the Red Sea area, which would affect the coral reefs causing bleaching and escaping of marine organisms, and difficulty in fishing; in addition the lack of suitable beaches will negatively impact tourism services, leading to its rapid degradation , thus decreasing tourism rates and increasing unemployment rates.

As for the archaeological and historical touristic sites, the high temperature, dense concentration of carbon dioxide and variable weather conditions will lead to the rapid deterioration of historic monuments.

Picture (2-3): coral reefs bleaching

2-4 Environmental Indicators

Table (2-1) shows the total amount of GHG emissions in 2000 (CO_2 Mt. eq.) according to Egypt Second National Communication Report. Also, it shows the calculated emissions in 2009.

Table (2-1) GHG emissions in Egypt (million tons of carbon dioxide equivalents)

Year	Egypt's amount of GHG emissions (CO_2eq Mt)	Egypt's share of the global GHG emissions (%)
2000	*193,267	0,64
2009	**305,1	0,71

Table (2-2) shows the total amount of CO_2 emissions in 2000 according to Egypt Second Communication Report. Also, it shows the calculated emissions in 2009.

Table (2-2): Carbon dioxide emissions in Egypt

Year	Value CO2 (Mt)
2000	*128,29
2009	**217,3

Table (2-3) shows total amount of CO_2 emissions per capita including other gases.

Table (2-3): Carbon dioxide emissions per capita in Egypt

Year	2000	2009
Carbon dioxide emissions per capita (tons / year)	1,98	2,8

Table (2-4): CDM projects in Egypt until December 2009

Title	Indicator
Number of CDM projects registered internationally	5 projects
Number of CDM projects having final approval of the Egyptian Council of Mechanism	10 projects
Number of CDM projects having initial approval of the Egyptian Council of Mechanism	40 projects
Number of CDM projects in the pipe-line phase	23 projects
Total amount of the expected reduction in emissions of greenhouse gases resulting from 55 projects	8 million CO_2eq
Total investment costs for 55 projects	1.3 billion US $

*** Data - Second National Communication Report**

**** Estimated data – Second National Communication Report**

2-5 Egyptian efforts to reduce negative impacts

2-5-1 Obligations towards the United Nations Framework Convention on Climate Change

The Second National Communication:

In 1999, Egypt issued the Initial National Communication in the framework of its commitment with terms of the United Nations Framework Convention on Climate Change. In 2006, a team of Egyptian experts from various sectors such as industry, energy, transport, agriculture, water resources and sanitation, coastal areas, waste, health, urban planning and tourism contributed to the preparation of the Second National Communication. The report aims to take into account policies to mitigate negative impacts of climate change after conducting various studies on different aspects and sectors. The Second National Communication will be presented in 2010.

2-5-2 Institutional Development:

I- National Committee for Clean Development Mechanism

To achieve goals of the United Nations Framework Convention on Climate Change and apply Kyoto Protocol in 2005, the Ministry of State for Environmental Affairs has formed a national committee which includes representatives of Egyptian Ministries of

Foreign Affairs, Electricity and Energy, Trade and Industry, Agriculture, Investment, Transport, Petroleum and International Cooperation and NGOs representatives to activate Clean Development Mechanism in Egypt. Letter of No-Objection has been granted to (55) projects from the establishment of the Committee to 2009. Investment cost for these projects is approximately 1.3 billion U.S. dollars annually which will reduce more than 8 million tons of carbon dioxide equivalents (figure 2-3).

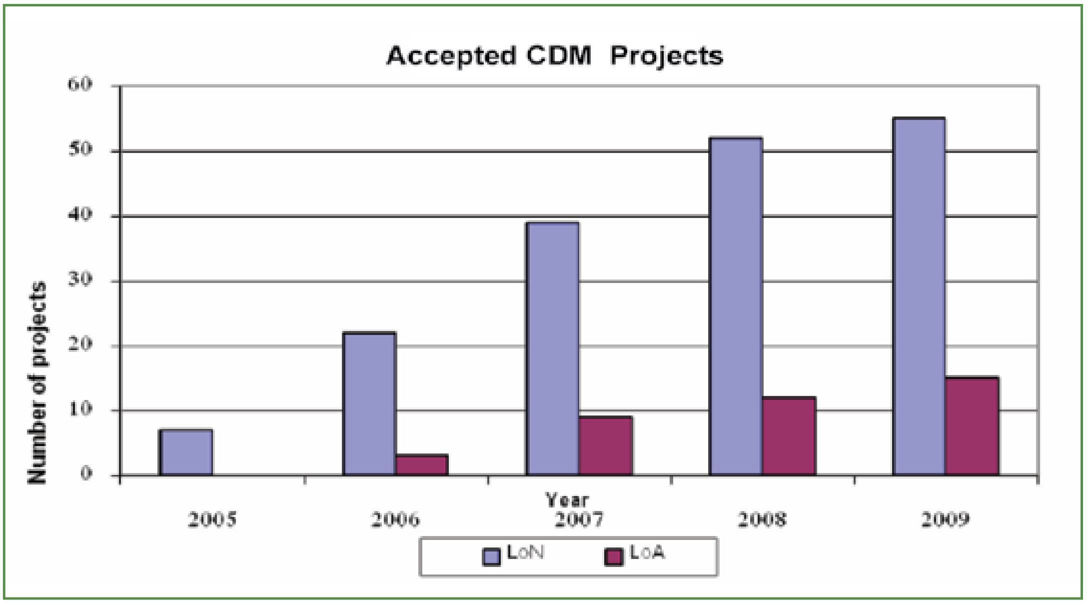


Figure (2-3) shows number of CDM projects that have been approved (initial and final) by the National Committee of Clean Development Mechanism since 2005 till the end of 2009

II- <u>Activation of the National Committee on Climate Change</u>

The National Committee on Climate Change has been activated by the Prime Minister's Decree in 2007. The committee includes representatives from Ministries of Foreign Affairs, Water Resources and Irrigation, Agriculture and Land Reclamation, Electricity and Energy, Petroleum, Trade and Industry, Economic Development and Defense in addition to experts from relevant national agencies. This committee is concerned with development of mitigation and adaptation strategies for relevant sectors and ministries to address climate change phenomenon for the concerned ministries (Agriculture and Land Reclamation, Irrigation and Water Resources, Electricity and Energy). In addition, it will develop its concepts concerning the establishment of a "Center of Excellence" for collecting data and information related to climate change issues. Also, it takes advantage of the institutional experience and capacities of "Information & Decision Support Center –Egyptian Cabinet", establishes a National Center for Climate Change Research and Studies; forming Science and Technology Committee to coordinate with the National Committee for Climate Change and the National Research Centers and prepares a list of mitigation and adaptation pilot projects.

III- Establishment of Climate Change Central Department

For developing and activating the institutional entity of climate change in Egypt; Ministry of State for Environmental Affairs established "Climate Change Central Department" which includes number of "General Directorates for Risks & Adaptation, Mitigation & Clean Development Mechanism, Research and Technology of Climate Change and Climate Change Information". The Central Department aims to achieve the following objectives:

- Improve national performance in the field of adaptation to climate change in the context of National Plans for different sectors.
- Contribute to pursuing low-carbon development strategy for sustainable development.
- Increase national capacity to attract international support and to benefit from it.
- Coordinate with international bodies and developing countries to avoid any commitments for GHG emission reduction on developing countries - including Egypt - contradicting with economic and social development plans.
- Raise awareness towards the climate change issue on all levels.

2-5-3 Pilot and operational projects

I- Mitigation of Climate Change

- Since the eighties, Egypt has carried out number of projects in the field of energy, which had an indirect effect on GHG emissions reduction, especially carbon dioxide. For example, Egypt focused on expanding the usage of natural gas as a substitute for liquid fuel, after a large quantity of natural gas has been discovered. The expanded use of natural gas to generate electricity as well as switching to the gas turbine units from the open system to the compound system to increase efficiency of electricity generation by about 50%. As a result, a significant decrease in carbon dioxide emission has been monitored. Egypt is interested in using renewable energy especially in desert and rural areas, as alternative sources of energy to reduce reliance on traditional sources. The spread of renewable energy technologies is still in its earliest phases.
- Since 1995, Egypt has adopted two programs by the EEAA :
    1. "**Strengthening National Action Plan**" Program, where a number of studies had been conducted in the field of climate change that led to the issuance of a report supporting "National Action Plan -1997".
    2. "**Egyptian Capacity Building for Responding to National Reporting Plans for United Nations Framework Convention on Climate Change**" Program, in collaboration with Global Environment Facility. In light of these two programs and other completed studies, EEAA had issued the National Procedure Plan for Climate Change in 1999; in addition to policies and plans that had been set to reduce GHG emissions.
- "Improve Energy Efficiency and Reduce Greenhouse Gases" is an example

of operational projects implemented by Ministry of Electricity and Energy, funded in partnership with the Ministry of Environment ,Global Environment Facility/ United Nations Development Program, adopted by both Egyptian Electricity Authority and Energy Planning Agency. This project aims at supporting energy efficiency and remove obstacles to reduce GHG emissions on the long term by power-generation processes.

- New and Renewable Energy programs are currently implemented to generate electricity from new and renewable energy by New and Renewable Energy Authority-Ministry of Electricity. The Egyptian program for producing electricity with large capacities from renewable energy systems, includes two sub-programs:
    1. Sub-program of "**Electrical Systems for Wind Energy** ", implemented on the coast of the Red Sea and Gulf of Suez by the New and Renewable Energy Authority with the support of donor countries and the private sector.
    2. Sub-program of "Thermal Generation of Electricity", implemented in Kuraimat including the use of solar or thermal systems for electricity generation with capacity of 127 megawatts.
- A number of pilot projects to transfer technologies to reduce emissions had been implemented, such as a project to collect and burn methane generated from composting solid waste, which aims at encouraging private sector to invest in clean energy projects and waste treatment, for example, Onyx Project in Alexandria.
- To reduce GHG emissions, a national program for planting Timber Forests had been implemented, under the supervision of " Ministry of Agriculture and Land Reclamation" in all regions where projects of waste water or industrial waste treatment plants are found, as in Sarabium / Ismailia, Sadat City / Menoufia, Tour Sinai / South Sinai, El-Kharga Oasis/New Valley, Paris / New Valley, Edfu /Aswan, Luxor City, Qena, Abu Rawash / Giza and Alexandria.

II- <u>Adaptation to Climate Change:</u>

- Egyptian Climate Change Program CCRMP 2008 - 2011 is under implementation with support provided by UNDP and Spanish Fund to achieve Millennium Development Goals. It is a comprehensive national program implemented through various ministries and sectors to apply principles of adaptation and mitigation; it consists of the following components : Supreme Council of Energy to support its objectives in areas of renewable energy and energy efficiency, clean development mechanism (CDM) component to promote and encourage use of clean development mechanism to add new economic benefit for new investment projects, forecasting, and integrated management of water resources component to develop scenarios for climate change impacts and mainstreaming them in national plans for the integrated management of water resources, adaptation for agricultural sector to develop crops tolerant to harsh climatic conditions, water shortages, soil salinity and high temperatures.

- Due to the importance of adopting serious steps to implement adaptation projects and provide financing sources, the Ministry of State for Environmental Affairs is keen on coordinating with donor organizations such as Global Environment Facility ; where " Integrated Management of Coastal Zones". This project is under implementation to achieve integrated planning, improve surrounding environment and preserve biodiversity of ecological system for coastal zones located between Alexandria and Marsa Matrouh.
- Ministry of State for Environmental Affairs is keen on coordinating with relevant ministries and bodies and providing necessary funding to form a mathematical model capable of simulating climate change negative impacts on threatened sectors in Egypt, such as water resources, agricultural crops and coastal areas. To provide necessary data and information for the preparation of specialized national studies that will help planning and economy experts to predict the future of food security and housing in Egypt.
- Ministry of Water Resources and Irrigation made efforts to develop a system for forecasting, monitoring and modeling; conduct a study about Nile Basin influence with the increase and decrease of seasonal and permanent resources and to protect Egyptian coasts overlooking the Mediterranean Sea.
- Ministry of Agriculture and Land Reclamation exerts efforts to produce agricultural crops adapted to climate change impacts "heat, scarcity of irrigation water or increased salinity" and implementing projects to assess abandoned agricultural lands. The Ministry issued a decree to establish "Climate Change Information Center" which is responsible for compilation and circulation of necessary data, studying the relationship between climate change and agriculture, creating channels of communication at the regional and international levels for sources of climate change information, and promoting cooperation and exchange of information between various ministries, research bodies and universities. The decree was made in response to Minister of State for Environmental Affairs' recommendation to establish the center, and to hold quarterly meetings, chaired by the Minister of Agriculture to discuss functions and activities of the Centre.

2-5-4: National Environmental, Economic and Development Study (NEEDS)

Egypt is implementing the project in agriculture and coastal protection sectors in the context of implementing adaptation measures, and in the industrial and energy sectors in the framework of implementing mitigation actions; in order to prepare a list of these projects to be submitted to the Conference of the Parties to find international financing needed. Egypt is preparing financing needs of climate change report on adaptation and mitigation levels, known as (NEEDS) report.

2-6 Future Vision

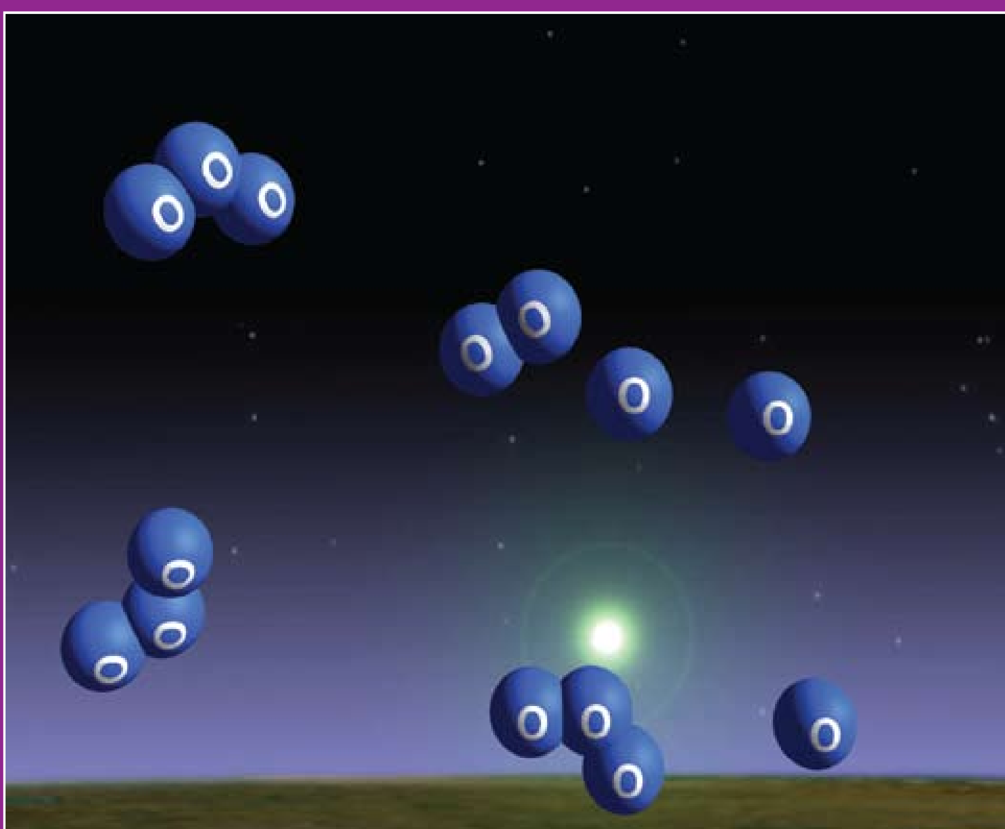
- Upgrade performance on the national and international levels in the field of climate change of various sectors; develop institutional structure for climate change in Egypt.
- Establish and activate a Higher Council for Climate Change chaired by Prime Minister and membership of relevant ministers; Minister of State for Environmental Affairs will be the rapporteur of this Council. Establish a Commission of Science and Technology, with membership of Egyptian scientists in the field of climate change and related areas (agriculture - irrigation - meteorological - health - petroleum – electricity) and chaired by one of its scientists ; establish a Center of Excellence for Climate Change to provide data and information that is affiliated with the Ministry of State for Environmental Affairs to be responsible for supporting the preparation of periodic national reporting to be the core for a "National Centre for Climate Researches" .
- Prepare the "National Strategy for Adaptation to Climate Change" and the "National Strategy for Low-Carbon Economy". In addition to improve the performance of Clean Development Mechanism to attract international investment in that field.
- Raise awareness towards mitigation and adaptation issues on long term.

3-7 References

- The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2007 (AR4)
- The Second National Communication (SNC) – the Egyptian Ministry of State for Environmental Affairs
- World Health Organization (WHO): http://www.who.int/ar
- United Nations Environment Program (UNEP): http://www.grida.no/publications/vg/africa/page/3131.aspx
- Global Environment Facility (GEF): http://www.undp.org/gef
- Ministry of Agriculture and Land Reclamation: www.agr-egypt.gov.eg
- Ministry of Electricity and Energy: www.moee.gov.eg
- Climate Change Central Department Presentation in front of Egyptian Shoura Council- Feb. 2010
- Study about "Recent Temporal and Spatial Temperature Changes in Egypt" – 2005.

Chapter Three

OZONE LAYER PROTECTION



3-1 Introduction

Ozone layer is a natural filter and shield surrounding the Earth to protect all living creatures from the harmful part of Ultra Violet – B rays that threaten human beings health and safety.
The threat is resulting from human beings activities and modern technology that led to the development of new chemical substances and consequently emission of gases depleting ozone layer.

3-2 Ozone layer depletion impacts on the environment and health

The Ultra Violet-B rays from the sun reaching the Earth's surface have harmful effects, by causing some diseases that afflict human beings such as skin cancer, cataract and immunodeficiency. Moreover, such rays negatively affect photosynthesis of green plants, which reduces plant growth and crop production. Furthermore, it has negative impacts on aquatic environment systems and causes disorder of the ecological system on Earth. This is closely linked with global climatic changes. All these negative impacts threaten human beings' health and the environment integrity.

3-3 Environmental Indicators

Environmental indicators of ozone layer are closely associated with world countries' compliance with decisions and amendments of the Montreal Protocol concerning the gradual reduction of using Ozone Depleting Substances; to achieve total stop of such substances according to schedules set by the Protocol and its Amendments.

A. **Halon Sector:**
Environmental Affairs Agency collects Halons from all organizations that have a stagnant stock of Halons. Such stock was compiled due to transferring to other alternatives in fire fighting systems. Collected quantities are handed to Halon Bank at Helwan Company for Engineering Industries (Formerly Military Factory 99), so that they may be recycled and used in various vital sectors in the country where they are urgently needed. It is worth noting that the use of Halon is allowed in some fire fighting systems to protect critical and highly costing equipment. Besides, they are used to maintain technical capabilities of airplanes, ships, tanks, communication systems, central computers and other very important sophisticated and strategic electronic equipment till the transfer to other alternatives that do not deplete the ozone layer in the coming years. Figure 3-1 shows the gradual reduction of imported Halon quantities.

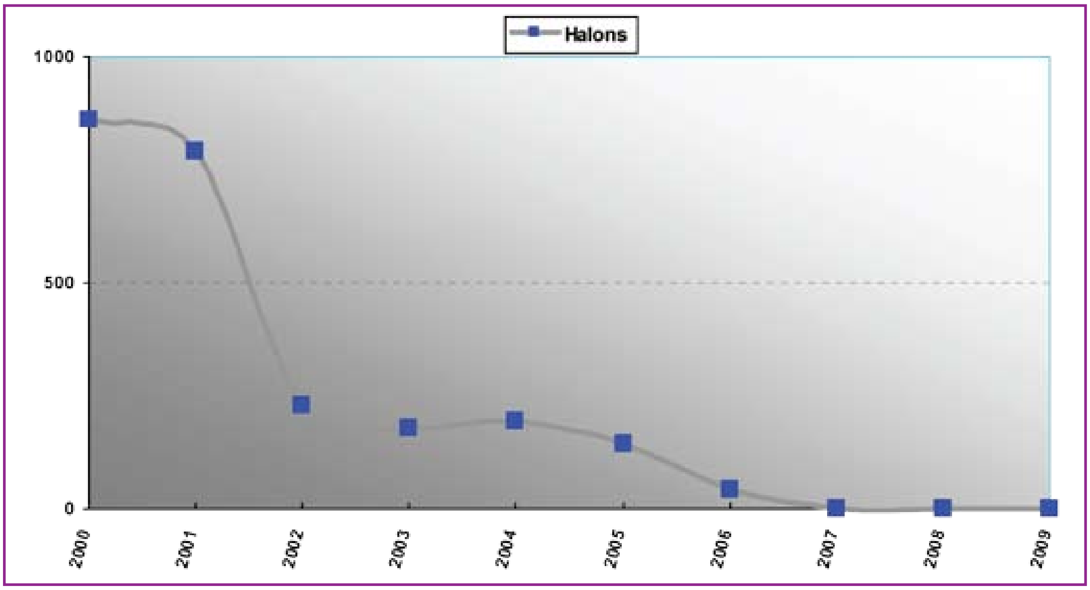


Figure (3-1): Gradual reduction of Halon importation

B. Medical Aerosols Sector:

In collaboration with the Ministry of Health, the Environmental Affairs Agency transforms production lines of medical aerosol, which consume 163 tons annually of (CFC's) depleting substances in sprays used by asthma and chest allergy patients. It is expected to complete the transformation of production lines of Pharmaceutical Companies by 2010.

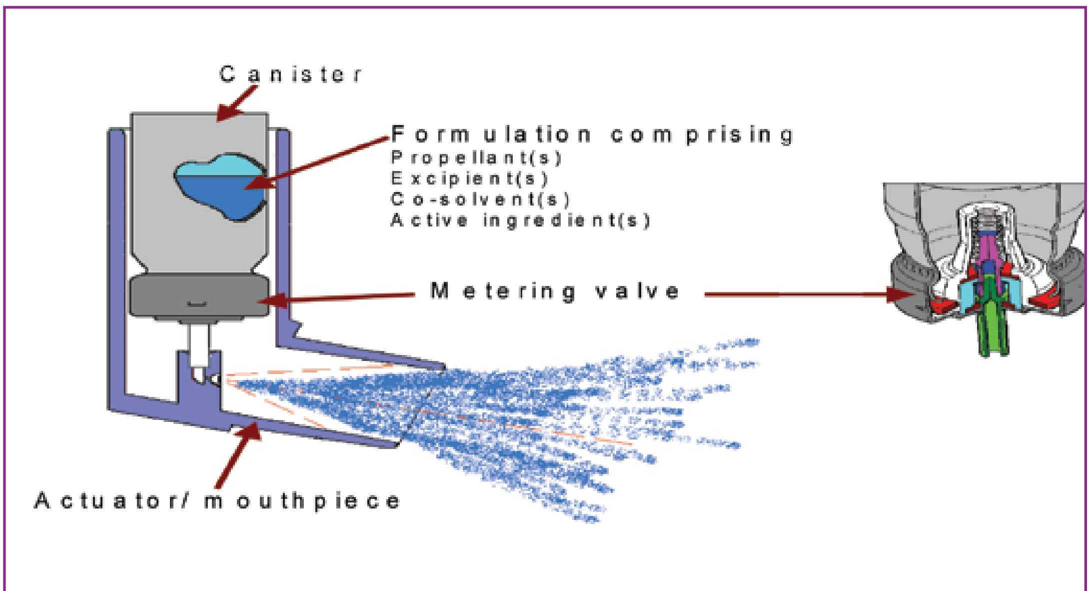


Figure (3-2): Spray used by asthma and chest allergy patients

C. Maintenance and repair sector of cooling and refrigeration equipment:

Egypt has developed a strategy that aims at ceasing importation of CFCs substances depleting ozone layer that are used in maintaining cooling and refrigeration equipment. This strategy will be completely achieved by the end of 2011. Figure 3-3 shows the gradual reduction of imported CFCs substances.

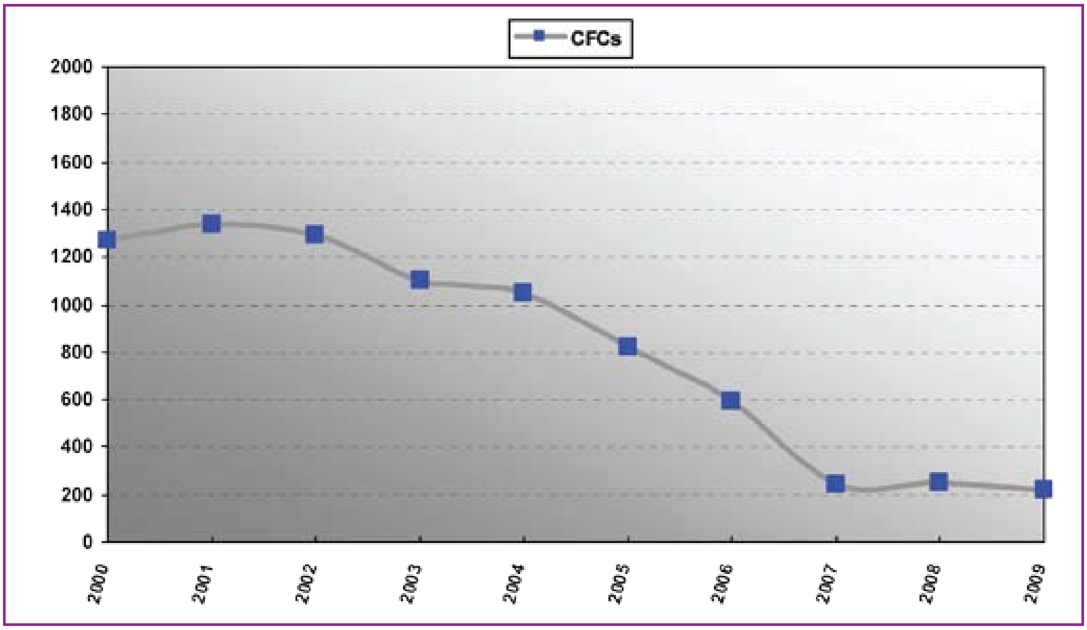


Figure (3-3) : the gradual reduction of imported CFC's substances

D. Methyl Bromide Sector:

- An Egyptian strategy developed in collaboration with the Ministry of Agriculture aims at a gradual reduction in using methyl bromide substances in soil treatment, grain fumigation and crop storing. This strategy is expected to be completely executed by 2013, by ceasing consumption of 317 tons/year of methyl bromide and to transfer to using environment friendly substances that are appropriate to Egyptian conditions.
- In collaboration with the Spanish University of Almeria, three modern greenhouses for vegetables plants grafting on root stocks resistant to insects as alternative to using methyl bromide. The total capacity of each greenhouse is 5 million grafted saplings per year (tomatoes, pepper, cucumber, watermelon, and cantaloupe).
- The project also developed a local alternative to methyl bromide, which is cultivating over rice straw. Strawberry, an important exportation crop, was cultivated in this way. Results were excellent, which emphasizes the importance of the continued expansion in this field, which will help in solving one of the main environmental problems in Egypt, which is burning rice straw.

Picture (3-1): Cultivating strawberry on bales of rice straw

5. Egyptian Strategy for phasing out use of HCFCs substances:

HCFC substances are one of the most important substances that are used in several sectors, mainly manufacturing foam and heat insulation - refrigerators, cooling and air conditioning - solvents. Although these substances have a low Ozone Depleting Potential "ODP", they have high potential in aggravating Global Warming "GWP". MSEA is currently conducting an amendment and updating legislations and regulations related to the use and importation of HCFC substances; in addition to developing a strategy for phasing out use of such substances in various fields.

Table (3-1) shows the timetable of phasing out the use of the ozone depleting HCFCs in "Article 5" countries (including Egypt) that applies to Montreal Protocol.

Table (3-1): Timetable for phasing out use of HCFCs

Substance	Base Level	Production/Consumption Rate Control
First Group HCFC substances	Average Consumption Rate in 2009-2010	Freezing production/consumption levels (1st January, 2013)
		10% reduction (1st January ,2015)
		35% reduction (1st January , 2020)
		67.5% reduction (1st January , 2025)
		100% reduction (1st January, 2030) with a possible exemptions for necessary uses.

3-4 Future Vision

Egyptian environmental policy endeavors to totally phase out use of ozone depleting substances in all sectors. The Egyptian Ministry of Environment depends on the following steps:

- Facilitate compliance with Montreal Protocol for Saving Ozone Layer without impeding development programs or affecting priorities set by the state to achieve sustainable development.
- Provide assistance for national companies that use HCFC substances to achieve their environmental compliance by using environment friendly alternatives.
- Cooperate with all control agencies in the country, provide them with equipment to analyze cooling gases and organize training programs on methods of using such equipment.
- Continue execution of recovery and recycling programs of ozone depletion substances.
- Intensify awareness campaigns of environmental friendly alternatives and direct them to all categories of the society.

Chapter four

NOISE

4-1 Introduction

Noise is a worldwide problem; many countries suffer from due to its harmful impacts on public health in terms of physical, psychological and social aspects. Solving noise problem does not depend on the development of legislations and plans only, but also on changing citizens' behaviors and increasing their awareness regarding rules and laws of noise reduction.

Since 1980, World Health Organization (WHO) highlighted the problem of environmental noise and its health impacts. In 1999, it issued health-based guidelines of noise levels in different communities, which can serve as the basis for establishing noise standards and suitable limits of noise control.

The integrated management for noise control depends on the availability of several key elements including basic monitoring data, noise prediction models, noise levels and standards and safe limits for all sources and different areas. In addition to plans and technical solutions for noise reduction to reach the required levels that include land uses distribution and defining suitable locations of facilities that require quiet areas.

In this framework, MSEA prepared Noise Reduction Plans in coordination with all concerned ministries and authorities. It implemented a plan for monitoring noise levels in governorates of Egypt that experience noise problems in order to determine current noise levels , develop appropriate noise reduction plans & solutions to reach the permissible standards with the purpose of preserving public health.

4-2 Noise Monitoring Network

In the framework of implementing noise-monitoring plan for Greater Cairo governorates, a monitoring plan had been finalized for all districts of Cairo governorate during 2009. Monitoring results for the eastern, northern and western regions were compared to 2008 results, to evaluate the implementation of noise reduction recommendations and identify causes that led to high noise levels during this year compared to the previous one.

By the end of 2009, some of the Noise Monitoring Terminals (NMTs) were redistributed to the rest of Greater Cairo governorates (Giza, Qalyubia, 6th October); 15 NMTs were retained in Cairo and 3 in Helwan Governorates. While 7 NMTs were installed in Giza, 3 in Qalyubia and 2 in 6th October Governorates. All sites were selected to represent various activities found in each governorate to determine their noise levels and sources and develop necessary programs for realizing noise reduction in these areas. Noise monitoring has been finalized for the rest of the districts of Greater Cairo by using Mobile Monitoring Stations. In this regard, noise levels were monitored in Sheikh Zayed City-6th October Governorate, EL Obour city - Qalyubia Governorate and El Sherouq city - Helwan Governorate.

4-3 Noise levels in Cairo Governorate in 2008 & 2009

4-3-1 Noise levels in main squares

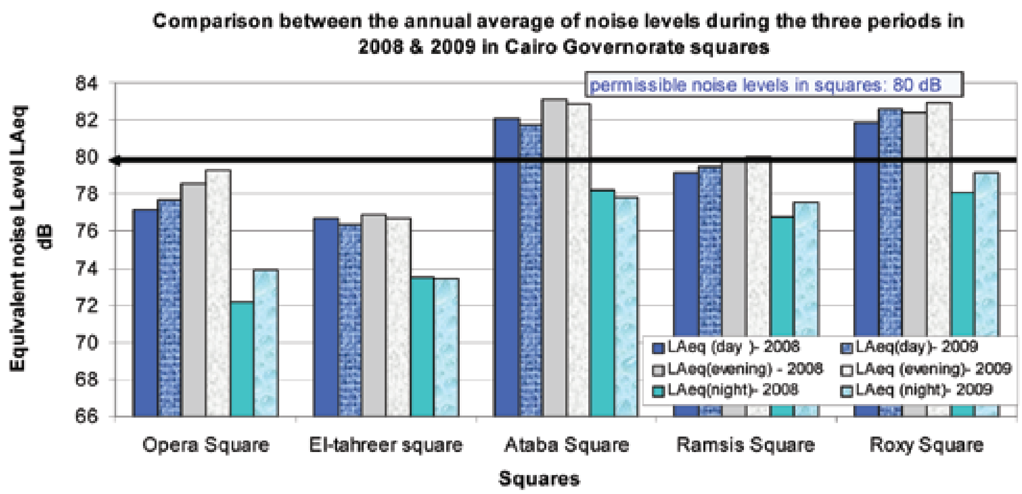


Figure (4-1) Equivalent noise levels for the three-day periods in main squares of Cairo Governorate - 2008& 2009

1. Figure (4-1) shows that the monitored noise levels during day & night have exceeded the permissible limits at the monitoring locations in Ataba & Roxy, while the noise levels at the terminal sites at El-Tahreer, Ramses and Opera squares were acceptable according to the international limits.
2. By comparing noise levels of 2008-2009 which were measured continuously for three times per day (day- evening-night) at the monitoring sites in the above mentioned 5 squares, it was noticed that noise levels were higher by 1-2 dB in 2009 than those of 2008 in the Opera, Ramses and Roxy sites.

Picture (4-1) Noise Monitoring Terminal located in Roxi square

This was due to the increasing number of vehicles and commercial activities in these squares, where collected data from the General Directorate of Traffic Police, indicate that the number of licensed vehicles in Egypt increases annually by 10-15%. The increase of noise levels in the above-mentioned squares occurred despite the application of planning measures for traffic control, such as the presence of surveillance cameras for vehicles and the strictness of enforcing new traffic law.

3- There is no remarkable difference in noise levels during 2008 and 2009 for all the three-day periods for Tahreer and Ataba squares.

4-3-2 Noise levels in industrial areas

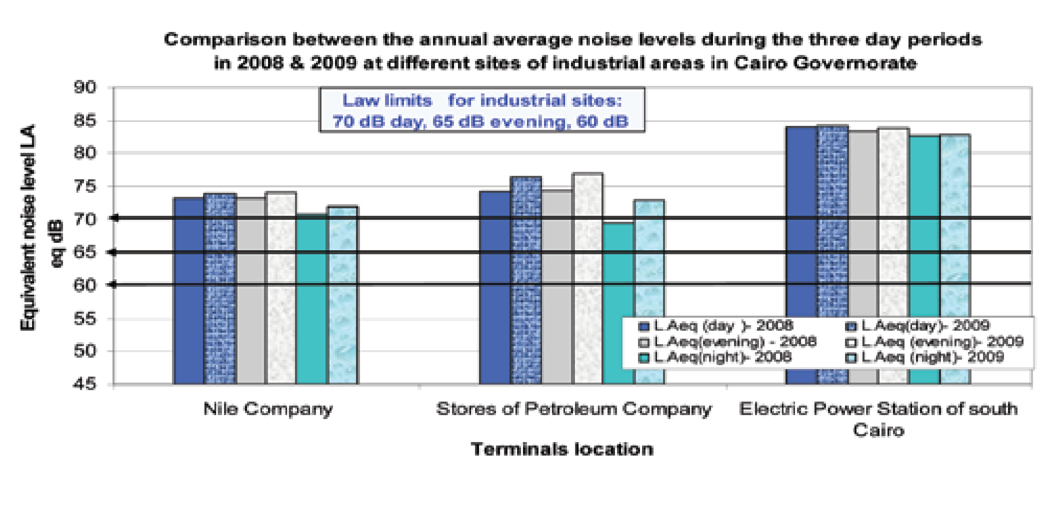


Figure (4-2) Equivalent noise levels for the three-day periods in industrial areas in Cairo Governorate

Figure (4-2) shows that noise levels have exceeded the permissible limits set forth in the Executive Regulation of the Environmental law during the three day periods at the monitoring sites in the three industrial areas (El Amereya – El Sharabeya – El Maasra). It was observed that noise levels at the stores of the Petroleum Company & the Nile Medicine Company in El Sawah Street increased in 2009 more than 2008. No changes were recorded in the noise levels at the Electric power station of South Cairo, noise levels in these areas during 2009 ranged between (73-84) dB during day & evening and (72-83) dB at night. It is worth mentioning that traffic was the major noise source for the increasing noise level and not the industrial establishments.

Picture (4-2) Noise Monitoring Terminal located at Nile Company for medicine – El Amereya

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

During 2009, monitoring sites located in commercial & administrative areas in the northern, eastern and western regions registered a remarkable increase in noise levels exceeding the permissible limits set forth in the Executive Regulation of the Environmental Law. Comparing results of 2009 - 2008, indicated the following results:

First: Northern region

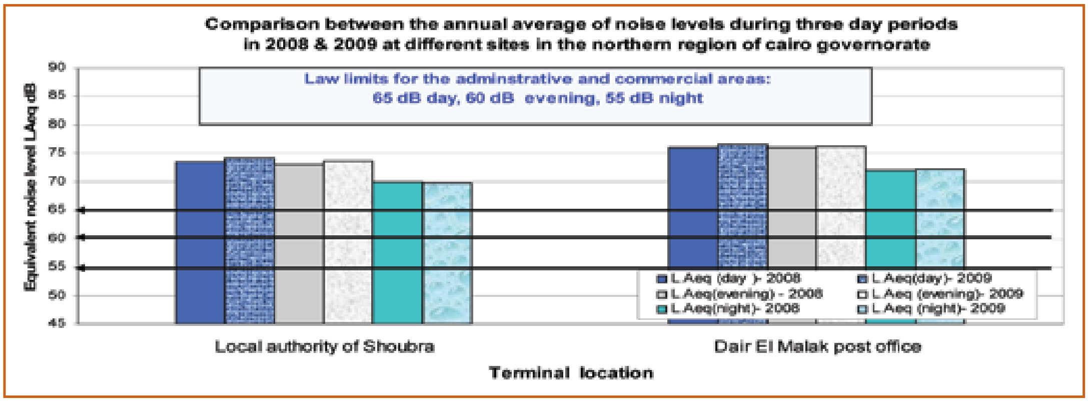


Figure (4-3): Equivalent noise levels for the three-day periods at commercial and administrative areas in the northern region of Cairo Governorate

- Figure (4-3) shows that there is no remarkable difference in 2009 noise levels compared to those of 2008 at the monitoring sites of Shubra Local Authority and Dair El- Malak Post Office locations , where the noise levels ranged between (73-76) dB during day and evening and (70- 72) dB at night.

Second: Eastern region

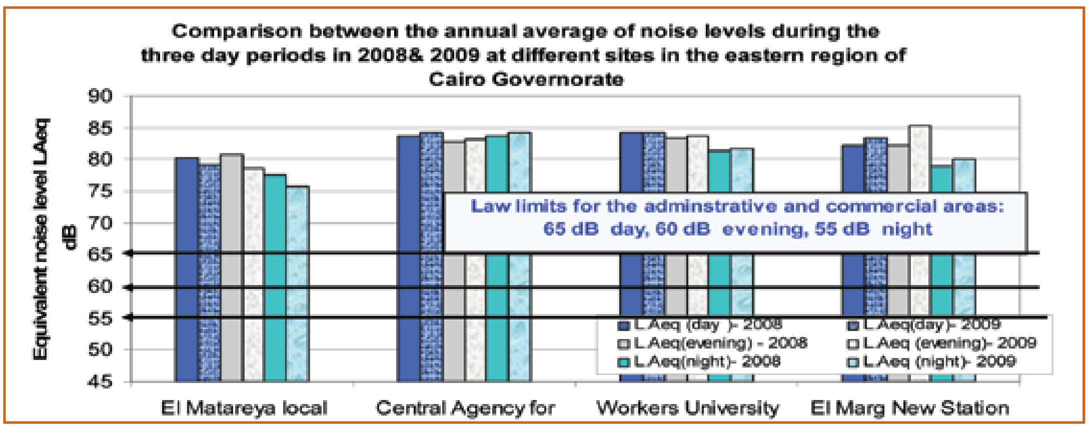


Figure (4-4): Equivalent noise levels for the three-day periods at commercial and administrative areas in the eastern region of Cairo Governorate

- Figure (4-4) shows slight decrease in noise levels in 2009 evening and night periods compared to those of 2008 at the monitoring site of El Matareya local authority. This is due to the decline in student numbers visiting their schools during the last quarter of the year due to their fear of the spread of swine flu, which affected the annual average of the equivalent noise levels. In contrast, 2009 monitored a slight increase of noise levels compared to those of 2008 in the three-day periods at the monitoring site of El Marg New Station.

Picture (4-3) Noise Monitoring Terminal located in Workers University- Autostrad road

This is due to the increase of commercial activities, peddlers and taxis randomly waiting for loading passengers to inside and outside Cairo, in addition to drilling operations in the area. No noticeable difference was observed when comparing results of the monitoring sites of Workers University & Central Agency for Public Mobilization in Nasr City. Noise levels in these areas ranged between (78-85) dB during day and evening, and (76-84) dB at night.

Third: Western region

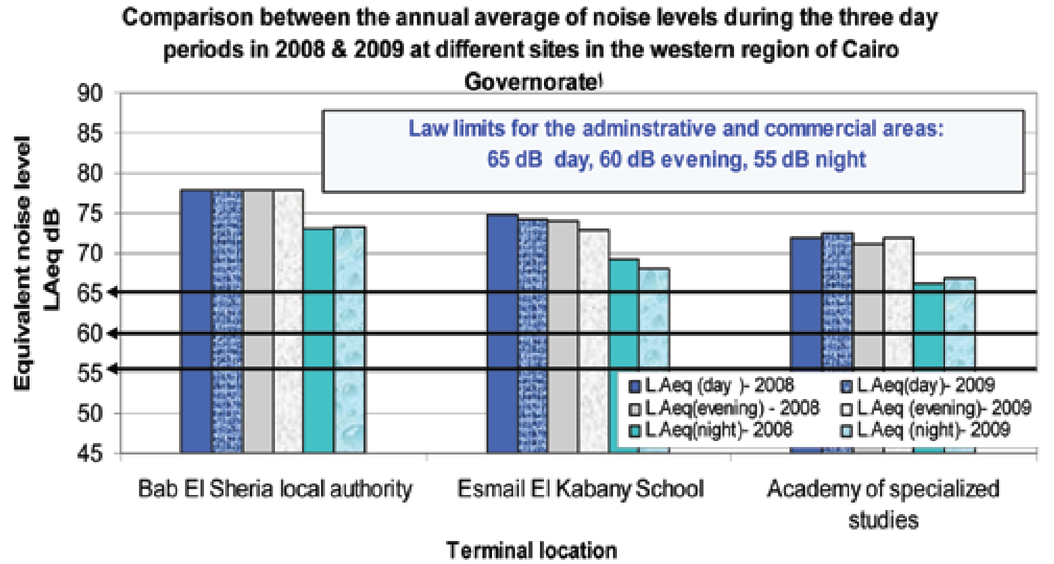


Figure (4-5) Equivalent noise levels for the three-day periods at commercial and administrative areas in the western region of Cairo Governorate

Figure (4-5) shows that there is no remarkable difference between 2009 and 2008 noise levels at the monitoring sites in Bab El Sheria local authority in Port Said Street & the Academy of specialized studies in El Darasa. While noise levels for the evening and night periods decreased in 2009 compared to those of 2008 at Esmail El Kabany School location in El Sarayat Street, due to finalizing underground station construction of "Abdo Pasha & Abassia" during the first half of 2009, which was the main cause of 2008 noise levels increases in Abassia. Noise levels for these areas ranged between (72-78) dB during day and evening and (66-73) dB at night.

Picture (4-4) Noise Monitoring Terminal located at Esmail El Kabany School – Abdo Pasha square

4-3-4 Noise levels in areas located on main roads

Monitored noise levels of 2009 on the main roads in northern, eastern and western regions are still exceeding the limits and standards of the Executive Regulation of the Environmental Law. Comparing results of 2009 - 2008, indicated the following results:

First: Northern region

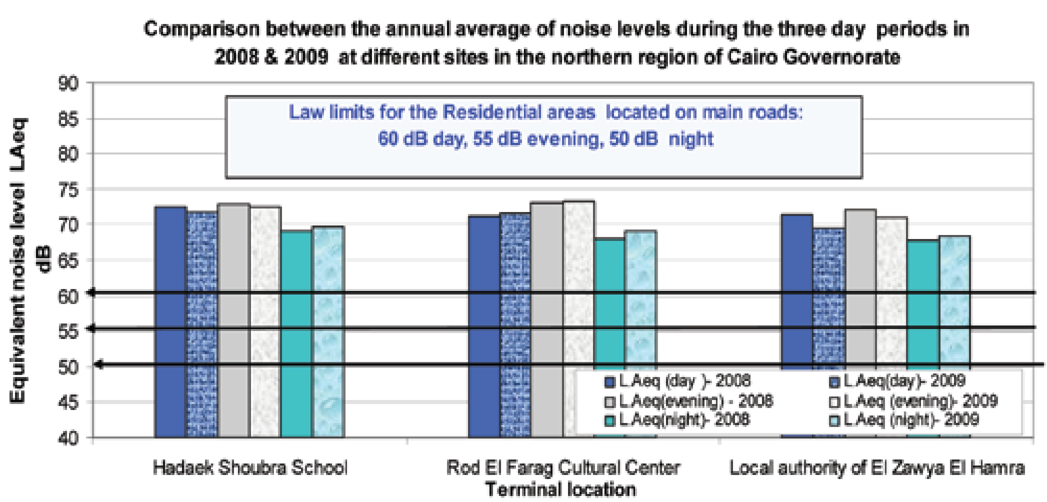


Figure (4-6) Equivalent noise levels for the three-day periods at the sites of commercial activities, workshops or located on public road in the northern region of Cairo Governorate

Figure (4-6) shows noise levels decrease in 2009 for the day periods by (1 – 2) dB at the two terminals located at Hadaek Shoubra School and El Zawya El- Hamra Local Authority. This is due to the decline in student number visiting Hadaek Shoubra School, during the last quarter of the year due to their fear of the spread of swine flu, which affected the annual average of equivalent noise levels. No remarkable difference in noise levels has been recorded for the day and evening periods at the monitoring site of Rod El Farag Cultural Center.

Picture (4-5) Noise Monitoring Terminal located at Hadaek Shoubra School - Shoubra

While noise levels for the night period in 2009 have recorded slight increase than 2008, due to the increase of commercial activities in the area, which is characterized by high population density. Noise levels in these areas for 2009 ranged between (69-73) dB at day and evening and (68-70) dB at night.

Second: Eastern region

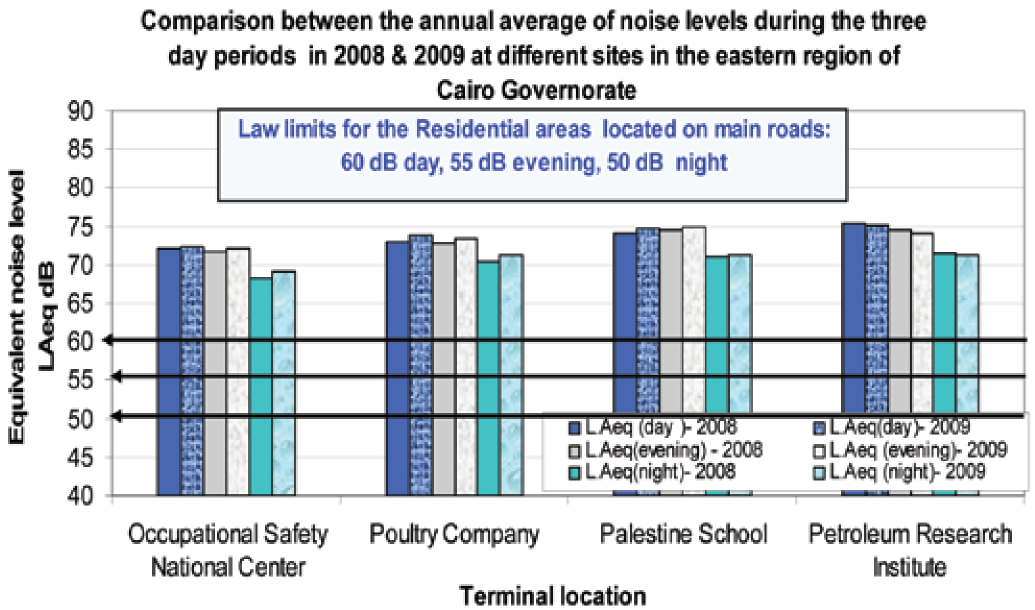


Figure (4-7) Equivalent noise levels for the three-day periods at sites of commercial activities, workshops or located on public road in the eastern region of Cairo governorate

Figure (4-7) shows that no remarkable difference has been monitored in noise levels of 2009 and 2008 at the terminals located at Palestine School - Ain Shams Street, Petroleum Research Institute and the Occupational Safety National Center - El Hegaz Street. While noise levels of this year ranged between (72-75) dB at day and evening periods and (69-71) dB at night in these areas.

Picture (4-6) Noise Monitoring Terminal located at the Occupational Safety National Center – El Hegaz Street

Third: Western region

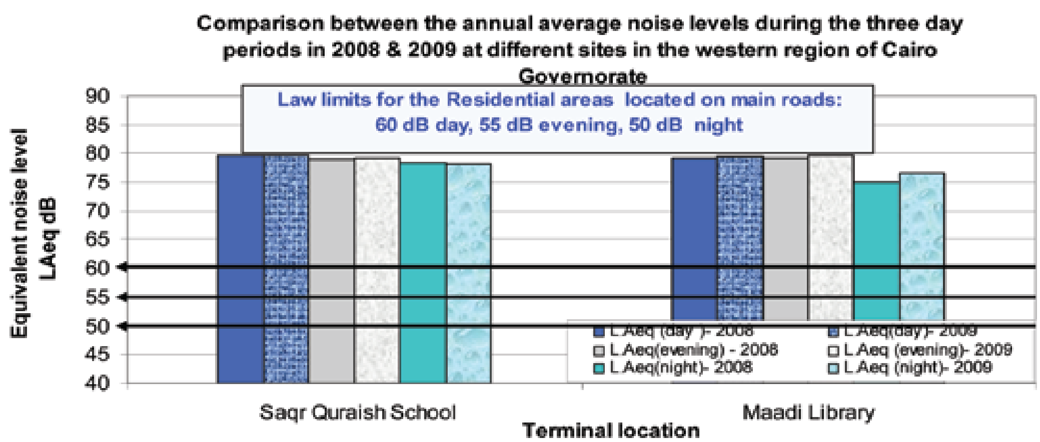


Figure (4-8) Equivalent noise levels for the three-day periods at the sites of commercial activities, workshops or located on public road in the western region of Cairo governorate

- Figure (4-8) shows no occurrence of remarkable difference in 2009 noise levels and those of the previous year at the terminals located in Saqr Quraish School - Autostrad street and Maadi Library on El Nasr street; except for the noise levels at night periods at Maadi Library which monitored an increase in 2009 compared to 2008, due to density of traffic in both directions of the Autostrad street. Noise levels ranged between (78-79) dB at day and evening periods and (76-78) dB at night.

4-3-5 Noise levels in residential areas

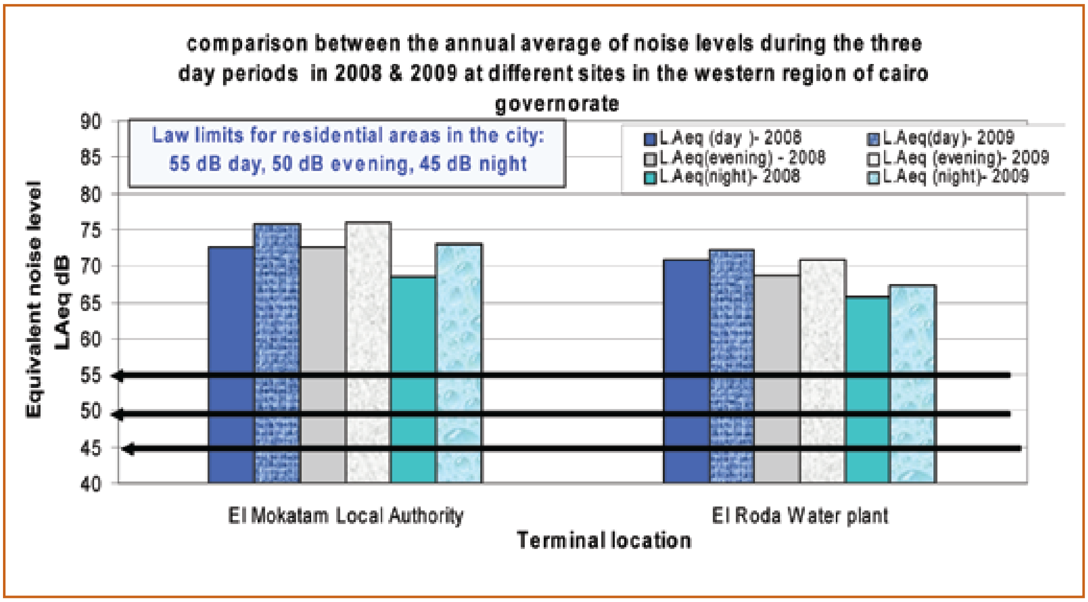


Figure (4-9) Equivalent noise levels for the three-day periods in residential areas in Cairo Governorate

As for the monitoring sites at the residential areas in the western region of Cairo governorate located at El Mokatam local authority & El Roda Water Plant, Figure (4-9) shows an increase of noise levels in 2009 than those in 2008 by (2-3) dB in all day periods. While noise levels in this year ranged between (71-76) dB at day and evening periods and (67-73) dB at night. It is worth mentioning that traffic and increasing vehicles were the major reasons for the increasing noise level in this area.

Picture (4-7) Noise Monitoring Terminal located at El Roda Water plant in El Manial

By comparing 2008 &2009 noise monitoring results in different areas of Cairo governorate, it indicates the stillness of high noise levels despite the adoption of noise reduction plan. This is mainly due to roads noise, annual increase of vehicles numbers that has reached 15% annually, or due to the limited capacity of roads infrastructures and the use of outdated vehicles especially heavy trucks causing high noise levels. Accordingly, standards have been included for controlling noise emitted from all types of vehicles during their manufacturing, licensing and operation. In addition, MSEA cooperated with Ministry of Interior through the General Directorate of Traffic Police to strictly enforce the new traffic law with respect to noise violations, which represent more than 60% of the total sources of noise in Greater Cairo according to results of noise-monitoring network.

4-3-6 Noise levels at landing, taking- off zones and residential areas around Cairo International Airport during 2009

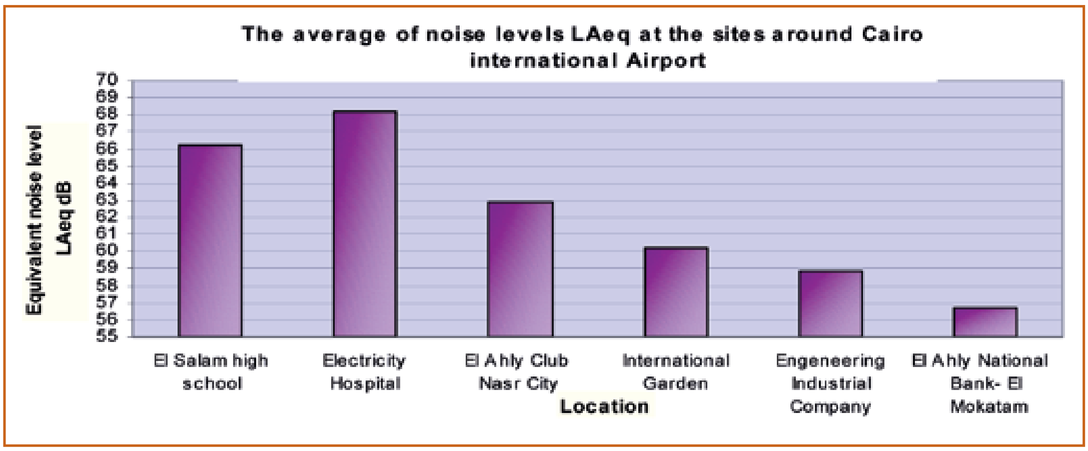


Fig (4-10) Average equivalent noise levels at the locations around Cairo International Airport

Source of data: Ministry of Civil Aviation

Figure (4-10) shows the average equivalent noise levels in the residential areas around Cairo International Airport resulting from aircrafts taking-off and landing, which ranged between (61-68) dB. It has been noticed that the highest noise levels were recorded at the location of the Electricity Hospital as it represents an essential point in the way of aircrafts landing.

4-3-7 Noise levels of Various Activities in the occupational Environment (Industrial- Commercial- Tourism) in different Governorates of Egypt

Table (4-1) Shows number of various establishments that have been inspected in 2009 At the level of (departments and branches) of EEAA

Branch	No. of violating establishments	No. of complying establishments	Total no. of inspected establishments
Alexandria	12	11	23
Cairo	48	40	88
Tanta	106	160	266
Assiut	33	60	93
Aswan	15	3	18
El Mansora	11	25	36
Hurghada	13	6	19
Suez	37	13	50
Total	275	318	593

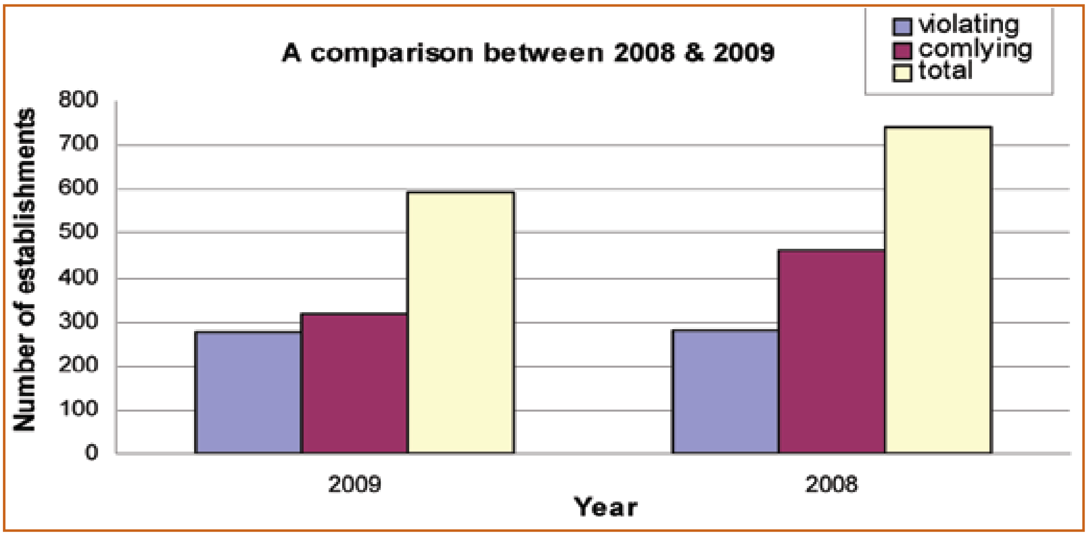


Fig (4-11) Comparison of noise measurements results for establishments - 2008 &2009.

Source of data: EEAA Regional Branchs (RBOs)- General Directorate for Environment Police

The above table 4-1 refers to the total 593 inspected establishments (regarding noise violations) by EEAA's RBOs during 2009. The ratio of complying establishments was 54% and violating establishments was 46% violating noise levels set forth in the Executive Regulations of law 4 / 1994 .The necessary legal procedures were taken against violators.

4-3-8 Vehicles Noise

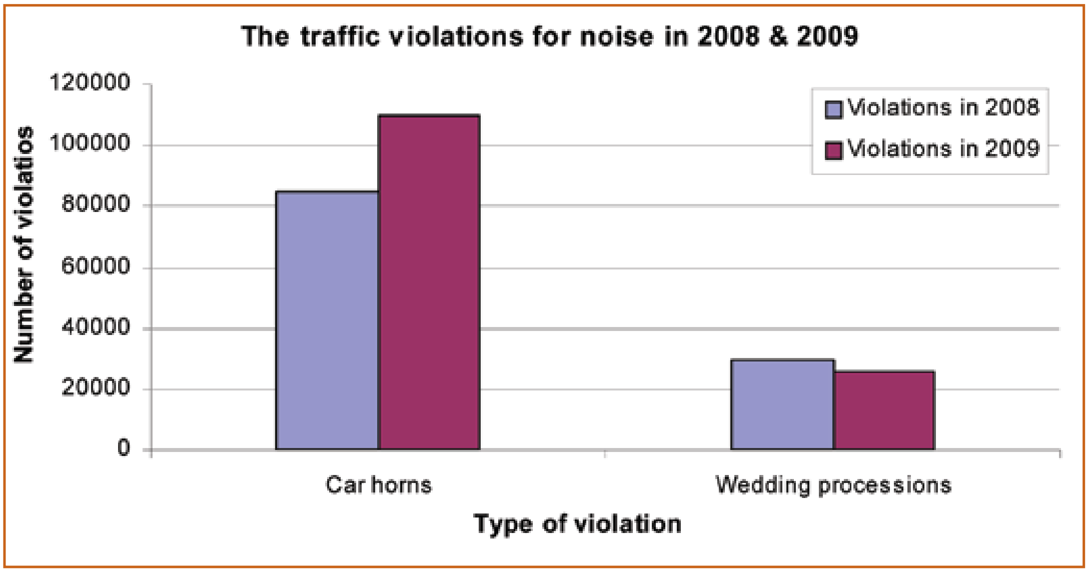


Fig (4-12) Traffic violations for noise in 2008 & 2009

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

Figure (4-12) shows an increase in 2009 traffic violations resulting from the excessive use of car horns compared with 2008, while wedding processions violations decreased in 2009 compared to those of 2008. This is due to the enforcement of new traffic law and exerted efforts by the General Directorate of Traffic Police (Ministry of Interior) in monitoring these violations.

4-4 Future vision

Plan for noise reduction includes the following measures:

1. Develop Environmental Noise Monitoring Network, increase number of mobile terminals to cover remaining governorates aiming to complete noise-mapping database of monitoring results and prepare technical plans for noise reduction in areas suffering from high noise levels to be submitted to decision-makers.
2. Follow up implementation of the National Noise Reduction Plan approved by the concerned ministries to activate stated measures for noise reduction and source control, and ensure the compliance of each ministry with their respective role. In addition, prepare database containing all noise reduction measures that were taken by the different governorates, especially that monitoring results for 2009 showed failure to achieve the noise reduction target.
3. Coordinate with governorates on planting roadsides and median islands with trees and establish noise barriers on highways passing through residential and

sensitive areas such as hospitals, schools, public libraries and parks in order to reduce the noise produced by traffic.

4. Upgrade and sustain cooperation plans with Traffic Police and Environmental Police, in terms of intensifying inspection campaigns on facilities producing noise and taking legal actions against violators.
5. Coordinate with Ministries of Interior, Commerce and Industry to establish test stations to measure noise emitted from vehicles, in order to activate the added standards to the Executive Regulations of the amended Environmental Law 9/2009 concerning vehicles noise.
6. Increase public awareness in schools, universities, clubs and NGOs regarding noise reduction.
7. Conduct training courses for capacity building in the field of noise measurements for relevant ministries and agencies to activate and encourage self-monitoring in facilities and increase public awareness with noise reduction.

4-5 Terminologies

Noise: unwanted sounds
Environmental noise: harmful, unwanted sounds produced by all human activities including noise generated from transportation means, industrial activities, and any other activities in the surrounding environment.
LAeq: continuous equivalent noise level during an interval time at the measurement level A.
L_{day} : continuous equivalent noise level during daytime.
$L_{evening}$: continuous equivalent noise level during evening time.
L_{night} : continuous equivalent noise level during nighttime**.**
dB: noise measurement unit.
A- Weighted (Curve): represents the method of human being auditory system response to pure tones.

References

1. Environmental law no.4/1994 and its Executive Regulations.
2. World Health Organization: "http://www.who/noise guidelines.
3. Environnemental Noise, Bruel & Kjaer "http://www.b&ksv.com"
4. Berglund B & Lindvall, T.Schewela, D (2000) "Guidelines for community noise" WHO

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)

PART TWO

WATER

Chapter five

FRESH WATER

5-1 Introduction

Water covers about 75% of the Earth's surface, as seas and oceans constitute 97.25% representing salt water, and ice covers 2.05% found in north and south poles. However, freshwater represents only 0.7% found in rivers, lakes and in underground water.
As a result of the limited fresh water resources, the increasing population growth, and the continuous increase in industrial and agricultural consumption; world human populations suffer from unsustainable exploitation of water resources and exposure to water pollution that might lead to the deterioration of water quality and quantity in many parts of the world.

Therefore, the issue of water supply became of great concern at the regional and global levels. Water was and continues to be a major reason of conflicts and wars among nations and peoples, regardless of regional and international agreements.
Because of the limited water resources in Egypt, steady increase in population and increasing demands that accompanied industrial, agricultural and tourism developments, it became necessary to maintain the sustainability of water resources, by rationalizing its consumption and protecting available water resources from pollution. Accordingly, the Government of Egypt has set a national plan for integrated management of water resources, to achieve the development and sustainability of the available resources, to develop non-traditional resources, and to establish optimum balance between different sectors' needs of water from the available water sources. The Ministry of Water Resources and Irrigation in collaboration with all concerned ministries and agencies identified the main framework of integrated management and development of water resources systems and ways to conserve water and protect it from pollution.

5-2 Water Resources in Egypt

5-2-1 Nile River

Nile River is the main source of freshwater in Egypt with 55.5 billion cubic meters per year, according to the Convention of Nile water between Egypt and Sudan in 1959. The Nile Basin's area is estimated at about 3.3 million cm2 , including ten countries known as the Nile Basin countries; listed from north to south, as Egypt, Sudan, Eritrea, Ethiopia, Uganda, Kenya, Republic of Congo, Burundi, Rwanda, and Tanzania.

- Water sources of the Nile

The Kagera River is the first source of the Nile River where it moves northward to flow into Victoria Lake forming Nile Victoria, that moves northward towards Albert Lake forming Albert Nile till it reaches Sudan, where it is named Bahr El-Gabal and joins with Bahr Al-Ghazal at Nuo Lake. Then, it is called White Nile till reaching

Khartoum city to meet with the Blue Nile that is flowing from Ethiopian Plateau, where it's known as the Nubian Nile till it reaches Aswan city where the Nile River name begins till reaching Greater Cairo and branches to the Rosetta branch in the west and Damietta branch in the east.

5-2-2 High Dam and Lake Nasser

Lake Nasser is the second-largest artificial lake all over the world; it is also, the strategic reservoir of water in Egypt with storage capacity of approximately 162 billion cubic meters and total area of about 5,237 square kilometers. It extends 350 km inside the Egyptian territories, and 150 km inside the Sudanese territories.
The lake plays an important role in conserving and storing water during flood seasons, to be used later on during periods of lower Nile water flow. Accordingly, the pattern of agriculture in Egypt has been changed from one agriculture rotation every year during flood season to three rotations during the year. Therefore, the proper management of the lake is one of the important perquisites in various development programs in Egypt's agricultural, industrial and other activities by regulate Egypt's water consumption under the current circumstances of increasing demand for water.

5-2-3 Rain

In spite of the very small amounts of rain fall in Egypt as part of the total water resources estimated at 1 to 1.3 billion cubic meters annually, it represents a significant proportion that cannot be neglected. Nevertheless, the government has made significant efforts to collect rain water in constructed tanks or natural reservoirs to utilize for direct use or to recharge aquifers.

5-2-4 Groundwater

Due to the enormous amount of underground water available in Egypt that is estimated at about 11.6 billion cubic meters annually, it is considered one of the most important water sources in Egypt. The current amount of produced groundwater in Egypt is only about 6.2 billion cubic meters annually. Some reservoirs are found at greater depth that requires higher costs for extraction. Also, the lack of full exploration for underground water in the Egyptian deserts is mainly due to being mostly uninhabited.

5-2-5 Non-Conventional Sources of Water

These sources include the following types:

1. Reuse of agricultural drainage water.
2. Reuse of treated municipal wastewater.
3. Reuse of treated industrial wastewater.
4. Desalination of sea water.

5-3 Governmental actions to develop and protect water resources in Egypt

The Government is making great efforts to best use available water resources by efficient utilization of water and by reducing sources of pollution. Furthermore, the Government continues to create non-conventional water resources to fill the gap between the available natural resources and the demands of various sectors of the economy. Several measures were implemented under the auspices of concerned ministries and agencies as follows:

1. Establishment of Supreme Council for the Nile River and Waterways Protection from pollution according to Article (47), as repeated in (2, 1) of Environment Law No. 4 / 1994 as amended by Law No. 9 /2009 and its Executive Regulations. The council is chaired by the Prime Minister with membership of concerned ministers (Water Resources and Irrigation, Environmental Affairs, Health, Industry, Agriculture and Land Reclamation, Local Development; Housing, Utilities and Urban Communities, Tourism and River Transport Authority). The council is responsible for taking necessary measures to protect the Nile River and waterways from pollution. The council meetings are held at least every three months to follow up the status of the Nile River and to take corrective actions in time.

2. Applying principles of integrated management of water resources, and in this regard, Egyptian government has been taking several operational steps as follows:-

   - In 2003, Ministry of Water Resources and Irrigation published the National Plan for Water Resources, in cooperation with Ministries of Agriculture, Environmental Affairs, Trade and Industry; Housing, Utilities and Urban Development, Health, Finance, Local Development, Media, Economic Development and Tourism. This plan aims at managing water in an integrated manner and preserving it from pollution according to available water resources and needs while taking economic, social, environmental and legal aspects into consideration. All relevant stakeholders take part in all stages of the plan's development and implementation. The main objective of the plan is to develop general and effective policies for all concerned ministries and agencies in Egypt to cooperate in achieving the principle of integrated management for water resources, through executing a number of actions and plans contained in policies of each ministry or agency participating in the plan; insure non duplication during implementing policies to reflect the principle of "benefits of others should be taken into consideration while making a decision". This would lead to sound and integrated management of water resources and reduce risk of separate decisions' making.

   - Higher Ministerial Committee for Water has been established, which is considered the mechanism to follow up and implement the National Plan for

Water Resources, it includes ministers of the concerned ministries with water. This committee deals with the following:

- ❖ Identify priorities, strategic directions and mobilize political support for the national plan.
- ❖ Follow up work progress; supervise plan's implementation, and coordinate between concerned ministries and agencies.
- ❖ Provide sources of funding and approve time frame for plan’s implementation.
- ❖ Grant approval for plans presented by governorates for water resources.

- A technical committee is formed by the Ministerial Committee, and it serves as its technical secretariat and is responsible for the following:

  - ❖ Coordinate between ministries and pilot governorates participating in the plan's implementation.
  - ❖ Follow up progress in implementing the plan at various levels, review assessment and follow up reports concerned with implementation of various projects of the plan.
  - ❖ Suggest strategic framework to update National Plan for Water Resources and set priorities for the higher ministerial committee to make decisions concerning urgent issues.
  - ❖ Suggest financial resources and time frame for the implementation and to activate data and information exchange.
  - ❖ Review governorates plans for water resources.

- A Water Resources Unit has been established in each concerned ministry participating in the National Plan for Water Resources. Three governorates (Fayoum, Qana, and Behyra) have the first stage units that are to be generalized in other governorates later on. These units serve as a technical secretariat for the technical committee, with the task to:

  - ❖ Coordinate between various stakeholders during implementation phases of the Plan; identify, analyze and assess procedures covered by operational water plans.
  - ❖ Follow up progress in implementing the National Plan, and to prepare related reports regarding problems that need to be solved to implement the Plan; and to propose solutions and recommendations to the technical committee.
  - ❖ Review operational plans and time frame for the Plan's implementation by the participating ministries and pilot governorates.
  - ❖ Develop a clear system for data and information exchange on a regular basis among participating parties.

- Ministry of Irrigation and Water Resources is currently implementing a twinning project for water quality management, in cooperation with European Union as support to Egyptian government, to strengthen national policy and improve water quality in the Nile River basin. This project includes setting a systematic plan for the integrated management of Lake Nasser's water resources, which is similar to what has been developed by the European Union for the Rhine River that runs through five EU countries. This project aims at:

    - ❖ Integrated management of Lake Nasser water resources.
    - ❖ Transfer and support of expertise to the Egyptian side.
    - ❖ Speedy response to any accident that may occur in the Lake, and how to deal with these types of accidents.

3. Manage and develop groundwater resources by expanding groundwater exploration in eastern, western deserts and Sinai.

4. Expand sea water desalination and the usage of brackish groundwater for tourism and limited agriculture use.

5. Link plans of horizontal expanding (land reclamation) with available water resources and to expand water collection, harvest of rainwater and flood.

6. Raise the efficiency of various uses of water resources (agricultural - household - industrial) through:

    - Expand in using modern irrigation techniques, laser for leveling agricultural lands, lining and continuous clean up for canals and drainages.
    - Conduct periodic maintenance of drinking water networks, and drainages to reduce water loss.
    - Encourage industries preserving water; expand in using closed-circuit systems and reuse of water in industrial facilities.
    - Reduce usage of chemical fertilizers and pesticides, encourage and support use of biological control.

7. Improve water quality and protect it from pollution as follows: -

    - Implement monitoring programs for water quality in Nile River and Lake Nasser through three monitoring networks directed by Ministries of Water Resources and Irrigation, Health, and Environmental Affairs; in addition to the network managed by the ministry of Irrigation to monitor main canals, banks, and groundwater.
    - Amend laws and their executive regulations concerning protection of water resources to deal with development and advanced technology used in the industry for wastewater treatment, such as law No. 48 / 1982 for the protection

of water resources from pollution and its executive regulations, amended by resolution No. 402 / 2009, and Law No. 4 / 1994, amended by Law No. 9 / 2009 regarding environment protection and its Executive Regulations.

- Periodic inspection of establishments that drains into waterways to ensure compatibility of their industrial discharge with settled regulations and criteria related to discharging liquid waste on waterways and canals.
- Restrict issuance of clearance procedures for industrial establishments for discharging their treated industrial wastewater into waterways.
- Help industrial enterprises to reconcile their conditions according to the environment law by providing them with technical and financial support.
- Encourage use of clean and environmentally friendly technologies.

8. Expand in providing economically, environmentally sound technology for sewage networks and treatment stations in all of Egypt; in addition to raising the efficiency of existing networks and stations.

9. Allocate a separate budget for periodic maintenance of drinking water and sanitation networks to prevent any water leakage, as follows:-

   - Allocate 22 billion Egyptian pounds to upgrade and develop drinking and sanitation water sectors during the fiscal year 2008/2009, compared to the 15.8 billion pounds during 2006 / 2007, in the framework of government's commitment to upgrade main services for country. Major portion of these investments were oriented to infrastructure projects and utility services (drinking water and sanitation sector).
   - The National Authority for Drinking Water and Sanitation developed the National Strategy for Villages Sanitation, in coordination with all concerned ministries and agencies, which aims at the safe disposal of sanitation to reach 100% coverage for cities and 40% for villages by 2012. The main objectives of this strategy include the following: -

     ❖ Ensure safe disposal of liquid waste.
     ❖ Enhance public health level for citizens.
     ❖ Provide sanitation networks for poor villages.
     ❖ Improve environmental performance of sanitation system.
     ❖ Raise the efficiency of household and industrial consumption by reducing water leakage from connection pipes, and by maintaining water meters. Calculate consumption fees according to a progressive scale to encourage industries to reduce their water consumption and to equalize the cost recovery systems.
     ❖ Expand in providing sanitation services to villages by using appropriate technologies at lower cost.

- Ministry of Housing prepared an integrated operational plan for National Strategy for Villages' Sanitation in coordination with concerned ministries and agencies based on the following criteria: -
  - ❖ Use of new non-traditional technologies.
  - ❖ Construct surface networks suitable for the Egyptian villages' conditions to reduce investment cost.
  - ❖ Provide required land and electrical power to run these projects.

❖ Coverage status of networks and sanitation treatment plans during 2009:

1. Covered 166 out of 222 cities (75%).
2. Covered 486 villages out of 4,617 (10.5%).
3. By the end of the current Five-Year Plan 2007/2012, the percentage will reach up to 100% in cities and 40% in villages.

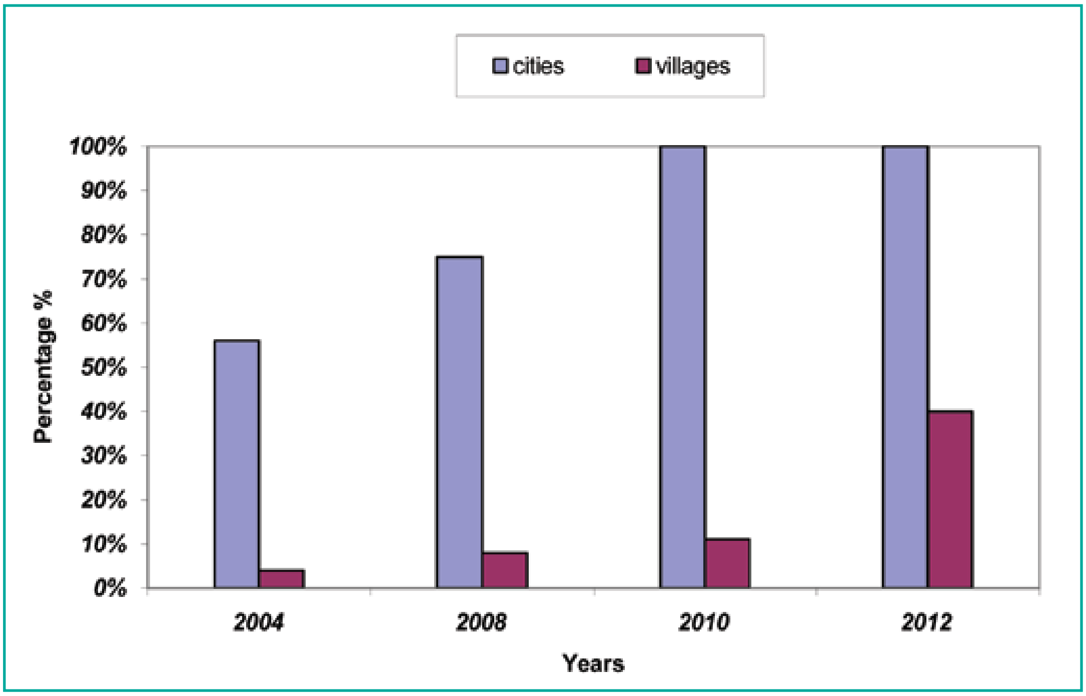


Figure (5-1) Shows sanitation coverage percentages from 2004 to 2012

The Ministry of Water Resources and Irrigation is the main responsible authority in charge of the implementation of all related actions for developing, managing and protecting water resources in cooperation with concerned ministries and agencies. Ministry of Water Resources and Irrigation is also in charge of the management of Nile water and surface and ground water resources; in addition to planning, designing, managing and maintaining irrigation and drainage systems in Egypt. The strategy of Ministry of Water Resources and Irrigation is based on several main focus points, including: -

1. Preserve, develop, rationalize consumption and raise efficiency of all available water resources.
2. Maintain water quality, protect it from pollution and control negative environmental impacts in order to protect public health.
3. Develop available resources and introduce non-conventional resources.
4. Increase water resources in cooperation with Nile Basin countries.

5-4 Actions taken by Ministry of State for Environmental Affairs to protect water resources from pollution:

5-4-1 Industrial discharges into waterways:

Nile River has a first priority within Ministry of State for Environmental Affairs that gives it great attention to protect water resources from pollution resulting from industrial discharge. Accordingly, the MSEA has determined three main criteria to eliminate pollution from the Nile and its branches, as follows: -

- **First pivot:** Stop drainage of untreated industrial wastewater into Nile River, waterways and reuse industrial wastewater.
- **Second pivot:** Follow-up on reconciliation plans of environmental conditions for industrial establishments.
- **Third pivot:** Modify manufacturing technology and use environmentally sound raw materials in industrial process.

Accordingly, the MSEA conducts the following tasks:

1. Encourage industrial facilities to reuse treated industrial wastewater in planting green areas around factories. Force facilities to reconcile their environmental conditions, whether by implementing projects to construct treatment units for their industrial wastewater according to environmental law concerned with discharging industrial wastewater into aquatic environment, or by discharging waste into sanitary networks or by using discharges to irrigate green areas.

2. Follow up on facilities that are implementing reconciliation plans (by modifying industrial processes, constructing waste treatment unit, implementing projects to discharge into sewage network or stopping discharge completely) through the Central Department of Inspection in Cairo and the Inspection Departments in EEAA Regional Branches. In addition to Coordinating with General Directorate for Environmental Police to conduct regular periodic inspection and take all legal actions against violators to force them to stop discharging into waterways completely or to comply with the relevant laws.

3. Take legal actions against violating companies according to Executive Regulations of Law no. 4 / 1994, amended by Law no. 9 / 2009 regarding environment protection, by warning or by taking violating companies to court

and impose strict penalty.

4. Follow-up on companies' efforts to achieve environmental compliance, such as separation of industrial wastewater from sewages and from the new oxidation lakes to ensure implementation according to the planned timetable.
5. Provide financial support to established industrial facilities that have credit to implement their reconciliation plans through the I and II phases of EPAP project, and to the Private and Public Sector Industry Project with total investment estimated at 416.4 million Egyptian pounds for (41) industrial establishments.
6. Require industrial facilities to submit an environmental impact assessment study as a condition for establishing a new facility or expanding an established one.
7. Implement periodic monitoring program for water quality in waterways and industrial effluents before being discharged into aquatic environment.
8. Implement several training programs and environmental awareness programs aimed to raise environmental awareness among citizens at all levels , through various advertising tools (television, radio……etc) , as well as training courses in different issues of the environment.

❖ Current status of industrial discharge into the Nile River

The Ministry of State for Environmental Affairs achieved success in realizing one of its priorities to preserve water quality of the Nile River where in about 93% of the establishments located along the Nile have adjusted their environmental conditions with regard to about 469.3 million m3 / year of waste discharge (about 98.37% of the total amount of industrial waste produced by these establishments). This was accomplished by stopping draining completely or by diverting it to sanitation network after being treated or being recycled within the establishment, or by adjusting their status according to standards of drainage into waterways. The following are the details of the current status of 102 establishments located on Nile River, its branches or drainages are as follows:

1. Sixty seven establishments have stopped their industrial discharge of wastewater by diverting their drainage to sanitation network or recycling them, 8 establishments have adjusted their drainage according to standards of Law No. 48/1982 of protecting water resources from pollution, amounting to draining of 452.3 million m3 / year (about 94.8% of the total amount of drainage into the Nile River).
2. Adjustment of plans for 20 establishments is ongoing, with total drainage amount of 17.1 million m3 / year (3, 6% of total drainage into the Nile River).
3. Adjustment of plans that are under preparation for 7 establishments with total drainage amount of 7.7 million m3 / year (1.6% of the total drainage amount into the Nile River).

5-4-2 Sanitation:

To preserve water resources from negative impacts of sewage on waterways, Ministry of State for Environmental Affairs is concerned with using and applying biotechnology in treating wastewater and in conducting some experiments that would reduce pollution as follows:-

1. Use biological treatment (use of micro-organisms technology) to treat wastewater of Abu Rawash station before being discharged into El-Rahaoi drainage to improve its water quality, where 470 thousand m 3 / day were treated with efficiency reached up to 80%.
2. Use economically and environmentally friendly technology in treating water in Bahar El-Bakr drainage before being discharged into Al-Manzala Lake (25 thousand m3 / day) under a project conducted in collaboration with the Ministry of State for Environmental Affairs, Global Environment Facility and United Nations Development Program with an estimated cost of 4.9 million dollars, to remove 75% of contaminants by using selected local plants to absorb inorganic pollutants.

Provide sewage services for low income villages is one of the main priorities for the Ministry of State for Environmental Affairs in cooperation with other concerned ministries and agencies. This is in particular with villages that are disposing sewage directly into waterways. Accordingly, the following actions have been conducted:

- Identifying villages with priority to be covered by sewage services due to negative impacts on waterways; this was conducted in coordination with other concerned ministries and agencies. The following points were taken into account while selecting the 775 villages located near waterways and the 620 villages with high level of groundwater, taking into consideration the following:

  - Integrate efforts within each governorate, to realize actual environmental improvements.
    Submit an environmental impact assessment study for each selected site before constructing sewage treatment plants.
  - Provide spaces and infrastructure to use treated wastewater in planting wood forests in villages with desert boarders.

- Coordinate with the Ministry of Housing, Utilities and Urban Development to provide sanitation service to low income villages, in the framework of the Neediest Villages' Project, as they illegally discharge their sewage into waterways.

- Safe usage of treated wastewater in cultivating green belts and timber forests according to the Egyptian Code for using treated wastewater in agriculture, issued by Ministry of Housing. Since 2005, the Ministry of State for Environmental Affairs initiated the implementation of the following actions:

  - ❖ Cultivate green belts around Greater Cairo, main crossroads and new cities that is irrigated with treated wastewater. The first phase has been completed with 14 km starting from the intersection of Katameya / Al Ain Sukhna road with the ring road towards the intersection of Cairo / Suez road. The second phase implementation is under way.
  - ❖ Implement a National Program for Safe Usage of Treated Wastewater in timber forests cultivation, to utilize all water treated amounts. Twenty seven forests were planted in 16 governorates during 2009 in cooperation with Ministry of Housing, Utilities and Urban Development and Ministry of Agriculture and Land Reclamation.

5-5: Monitoring programs of fresh water and drainages:

The Government of Egypt is greatly interested in the necessity of controlling and monitoring water quality to ensure good quality freshwater and proper drainage in Egypt, and to take corrective actions immediately.
The increase in development and industrial activities highlighted the necessity to establish a national network for controlling, monitoring water quality and identifying pollution areas and points. Therefore, a national network was established for monitoring water quality, where periodic monitoring is conducted to determine quality of surface and groundwater in Egypt, through measurements of different parameters - physical, chemical, heavy metals, fertilizers, organic matters, biological, and pesticides. This network is associated with ministers concerned with water quality as follows:

- A network of Ministry of Water Resources and Irrigation, which consists of 232 monitoring sites including Lake Nasser, Nile River with its two branches, EL- Riyahat, main canals, agricultural drainages in Upper and Middle Egypt, Fayoum and Delta; in addition to 203 monitoring points for groundwater in different reservoirs distributed in Egypt. Periodic Monitoring programs conducted by the National Center for Water Research affiliated to the Ministry of Water Resources and Irrigation through its specialized institutes.

- A network of Ministry of Health, which consists of 169 sites for periodical monitoring of water quality along the Nile, its two branches, and some of its major canals with special interest in drinking water intakes. This program is implemented by Environmental Monitoring and Occupational Studies Center.

- A network of Egyptian Environmental Affairs Agency, which consists of 69 monitoring sites along the Nile River to monitor the impact of waste water, especially industrial waste water and to monitor hot spots at drainages. This program is implemented by EEAA's Central Lab and Regional Branches Laboratories.

Through these networks, the quality of fresh water in Egypt can be monitored; currently there is a mechanism to exchange monitoring data among the different institutions.

.

5-5-1 Water Quality in Lake Nasser:

Water Quality of Lake Nasser is considered the reference point for water quality in River Nile, as it is the first recipient of water flowing from Sudan, before being affected by any development activities surrounding the River Nile.
Monitoring results conducted periodically on the quality of Lake Nasser water during 2009, by the Environmental Monitoring and Occupational Studies Centre that is affiliated to Ministry of Health and EEAA Central Labs , indicate that water quality of Lake Nasser is of good quality ,as indicated below:-

1. pH values ranging between 5.7 - 8.7.
2. The average concentration of organic materials for biological oxygen demand (BOD_5) and chemical oxygen dissolved (COD) did not exceed the permissible limits for Nile water quality standards (6 mg / L, 10 mg / L , respectively). Additionally, it did not exceed the permissible limits during the period from 2004 to 2009 as represented in Figure (5-2).

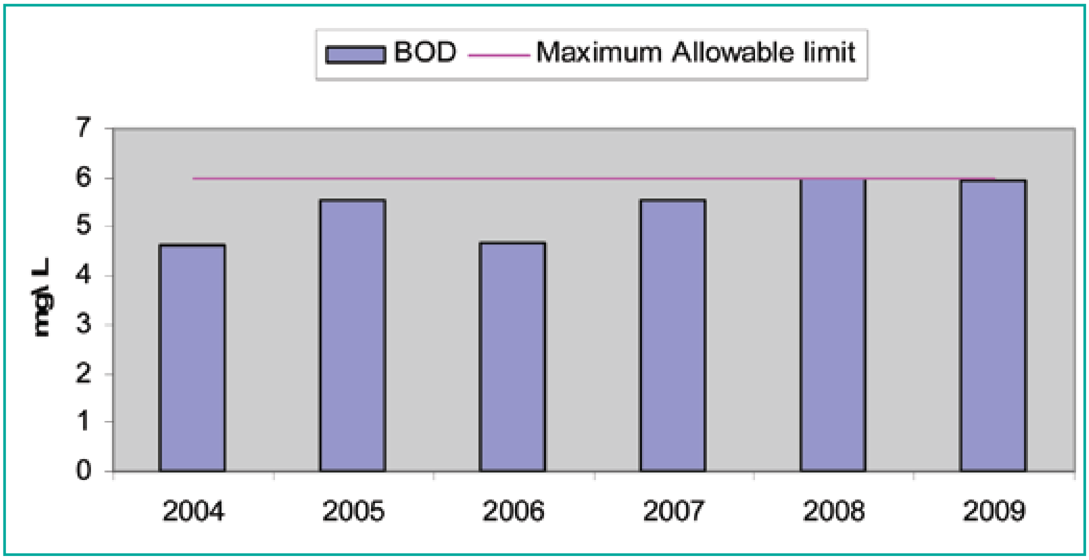
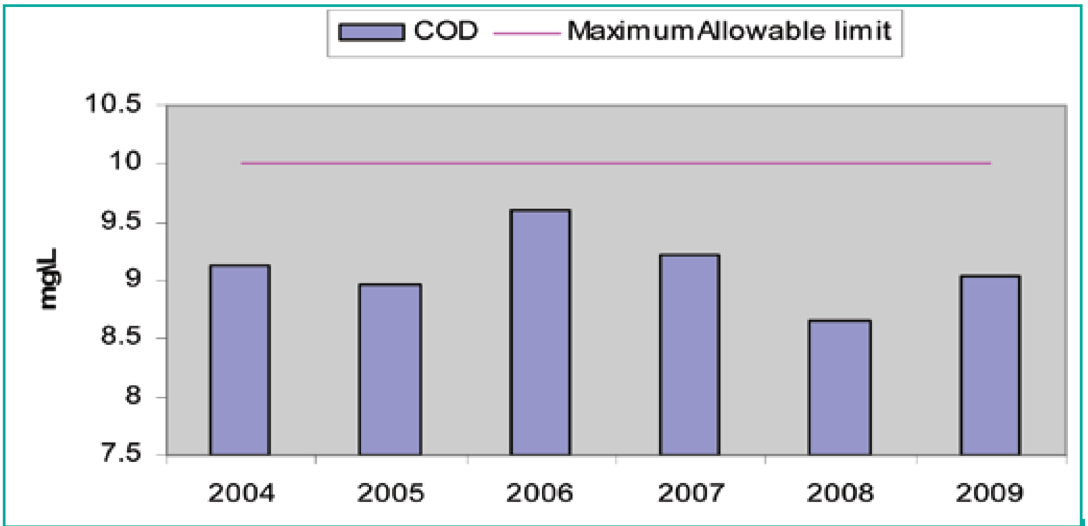


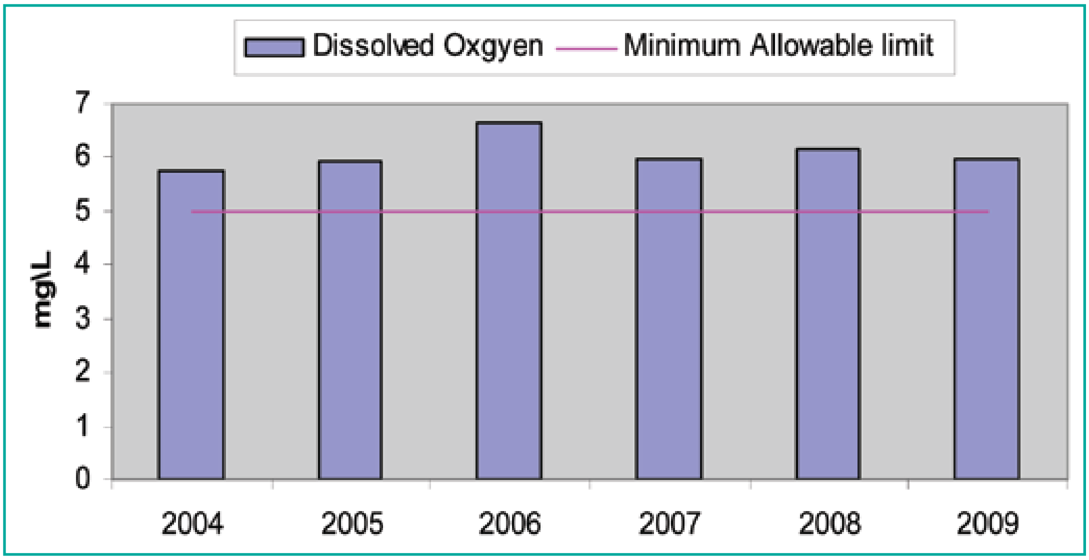
Figure (5-2) shows a comparison between the average values of biological oxygen demand (BOD_5) over the past six years

Figure (5-3) shows a comparison between the average concentrations of chemical oxygen demand in Lake Nasser during the period from 2004 to 2009.



Figures (5-3) shows a comparison between the average values of chemical oxygen consumed (COD) over the past six years in lake Nasser

3. Nevertheless, values of dissolved oxygen concentration were higher than the allowable minimum limits (5 mg / L) in all monitoring points during 2009, where concentrations ranged between (5.9 - 6.6 mg / L). Figure (5-4) shows a comparison between these concentrations from 2004-2009.



Figures (5-4) shows a comparison between dissolved oxygen in Lake Nasser during 2009.

4. Total dissolved salts ranged between 164 - 182 mg / L, which is much less than the maximum permissible limits (500 mg / L).
5. All concentrations values of ammonia, nitrite, nitrate and phosphate were less than the readable limits of devices used in measurements.
6. There was no evidence of the presence of heavy metals, and all values of iron and manganese concentrations were less than the readable limits of devices used in measurements.

Previous results show that Lake Nasser must be protected from pollution and development projects near the lake must be subjected to environmental impact assessment studies to insure sustainability of water quality of the lake..

5-5-2 Water Quality of River Nile:

Monitoring results, clearly indicate the improvement in water quality of River Nile and its branches, as concentration of BOD, nutrients, TDS, heavy metal, chlorides and fluorides, were within the permissible limits prescribed in the Law for areas along the River Nile; it's also indicated that dissolved oxygen concentrations were higher than the minimum permissible limit prescribed by Law, which indicates water cleanliness, and clear improvement in water quality. This was demonstrated by the results of analysis conducted by Environmental Monitoring Centre affiliated to Ministry of Health and EEAA laboratories in different governorates during 2009, where the results were as follows:

1. pH ranged from 7.45 to 8.7 along the River Nile, which indicates water tendency to be alkaline.

2. Average concentrations of organic matters, represented by the biological oxygen demand (BOD_5) were lower than the permissible limit (6 mg / L) in all governorates as indicated in (Figure 5-5). This is attributed to improved efforts to reduce discharge of municipal wastewater into the River Nile.

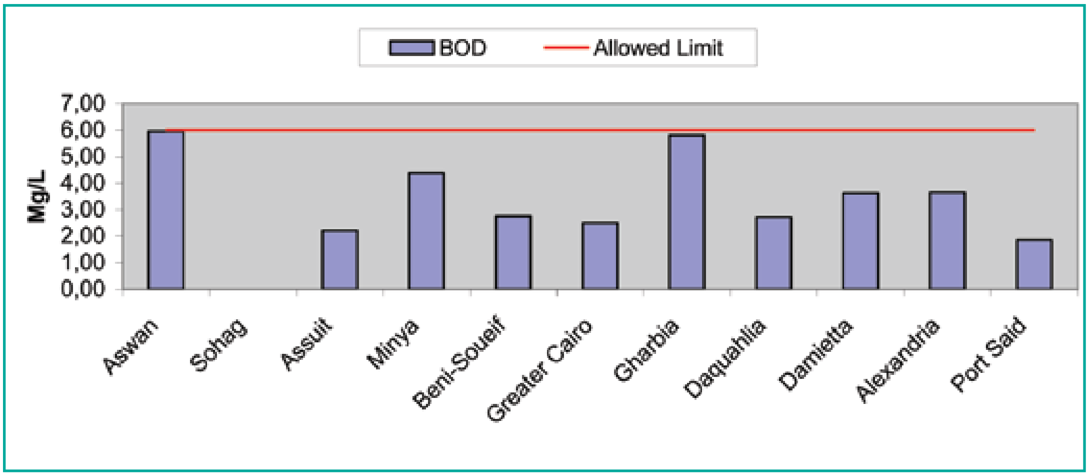


Figure (5-5) shows a comparison between the average values of biological oxygen demand (BOD) among all governorates in 2009.

By comparing the average concentrations of organic matters in different governorates located along the Nile, there was reduction in concentrations during 2009 as recorded for all governorates, than the permissible limits, as shown in Figure No. (5-6).

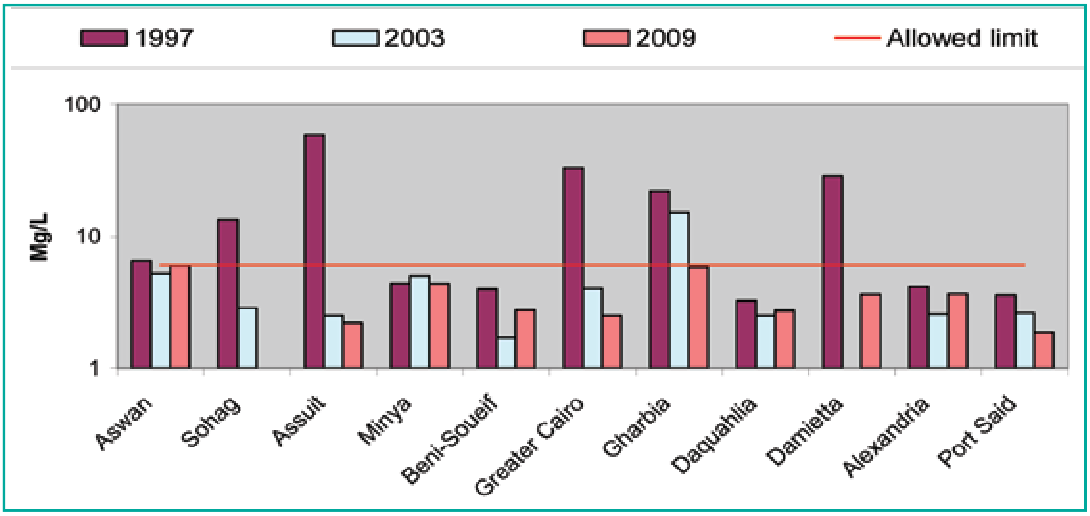


Figure (5-6) shows a comparison between the average values of biological oxygen demand (BOD5) over all governorates from (1997- 2009).

3. Average concentrations of chemical oxygen demand (COD) is less than the allowable limit in most governorates. There was a slight increase in concentrations of Greater Cairo, Gharbia and Beni Sweif governorates. The increase was also clear in both Alexandria and Damietta governorates. Figure (5-7) shows a

comparison between average concentration values of chemical oxygen demand (COD) in different governorates during 2009.

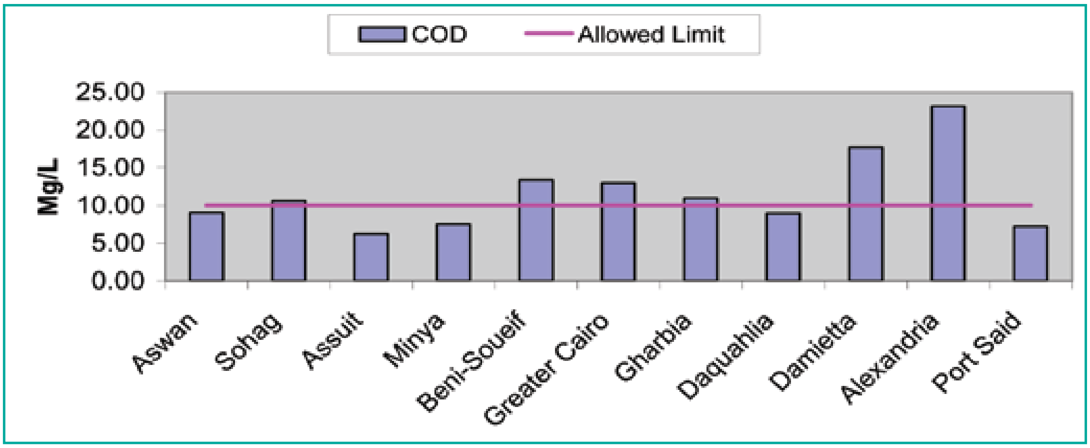


Figure (5-7) shows a comparison between the averages of chemical oxygen demand (COD) among all governorates in 2009

Figure (5-8) Shows a comparison between the average concentrations of organic matters (chemical oxygen demand) from 1997 to 2009 in various governorates, where it indicates clear increase in its concentration during 1997 in most governorates with the highest increase of (78 - 110 mg / L) in both Assuit and Greater Cairo respectively during the same year; nevertheless, the concentrations did not exceed permissible limits in most governorates during the following years.

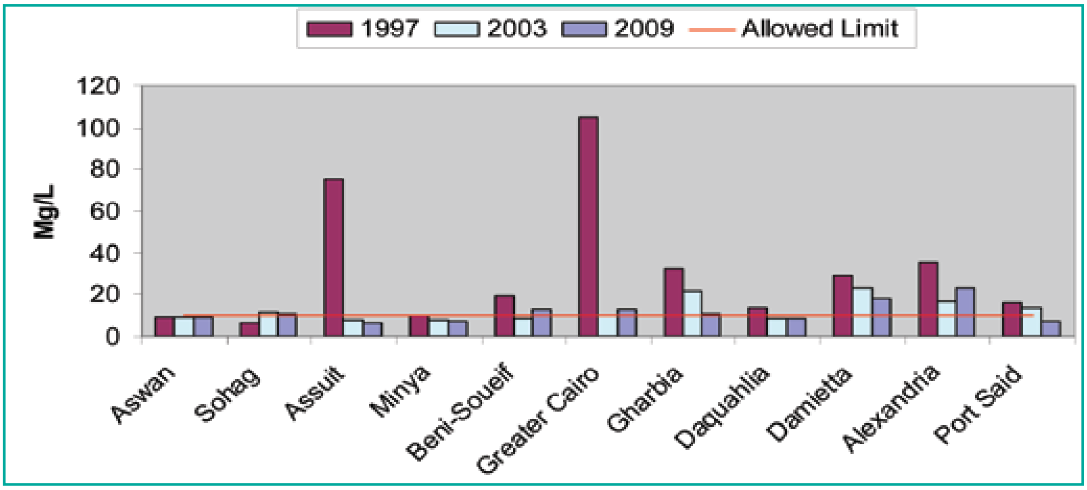


Figure (5-8) shows a comparison between the average values of chemical Oxygen demand (COD) over all governorates from (1997- 2009).

4. Monitoring results of Dissolved Oxygen (DO) concentration in all governorates was higher than the minimum allowable limit for water quality (5 mg / L), as shown in Figure No. (5-9), which indicates the vitality of water and its ability of self-purification.

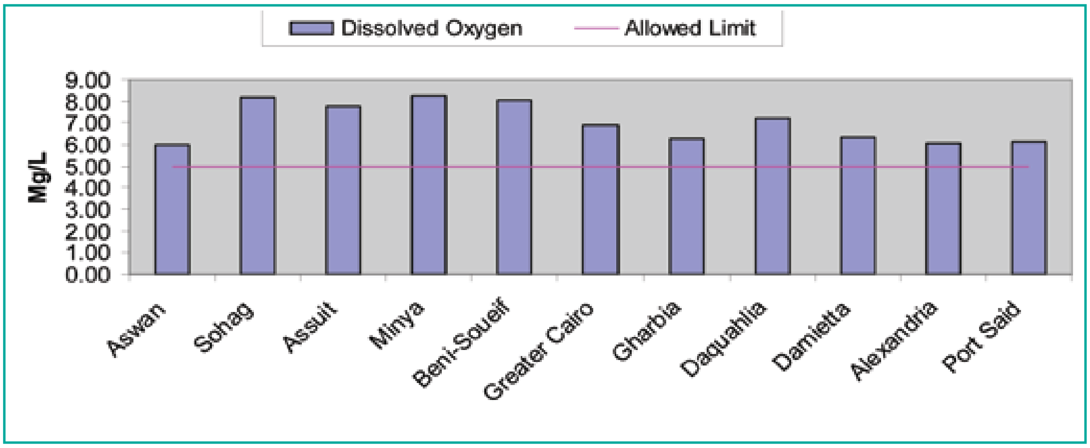


Figure (5-9) shows a comparison between average concentrations of Dissolved Oxygen (DO) in all governorates in 2009

Figure (5-10) shows that average concentration of the Dissolved oxygen values from 1997 to 2009, were higher than the minimum allowed limit in all governorates.

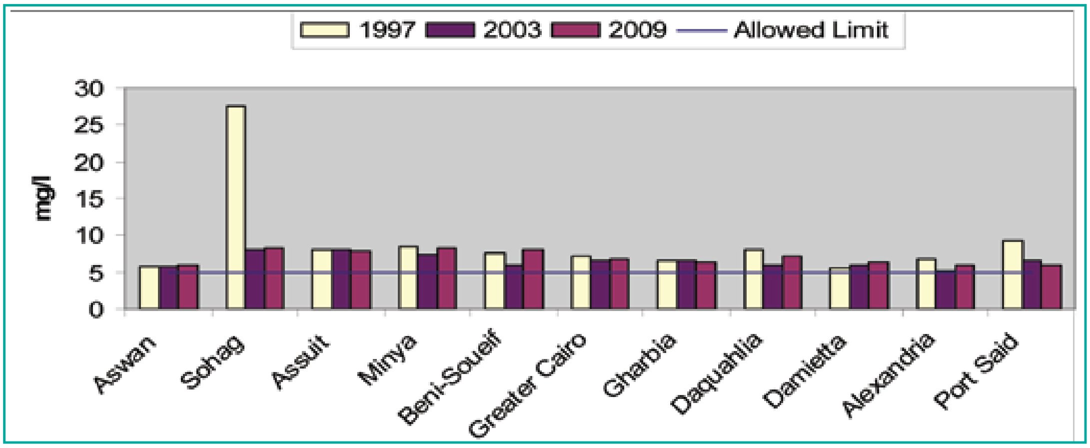


Figure (5-10) shows a comparison between average concentrations of Dissolved oxygen (DO) from 1997 to 2009

5. Nutrients concentrations (ammonia, nitrate and phosphate) were within the permissible limits in most monitoring points; ammonia concentrations were less than the permissible limit (0.5 mg / L), but it slightly exceeded this limit at one point in Alexandria (0.57 mg / L); nitrate concentrations ranged between (0.024 and 1.95 mg / L), which is much less than the permissible limit (45 mg / L). Also, results indicated that phosphate concentrations ranged between (0.016 and 0.6 mg / L) which is also less than the permissible limit (1 mg / L). Figure (5-11) shows the average of nutrients concentrations in different governorates during 2009.

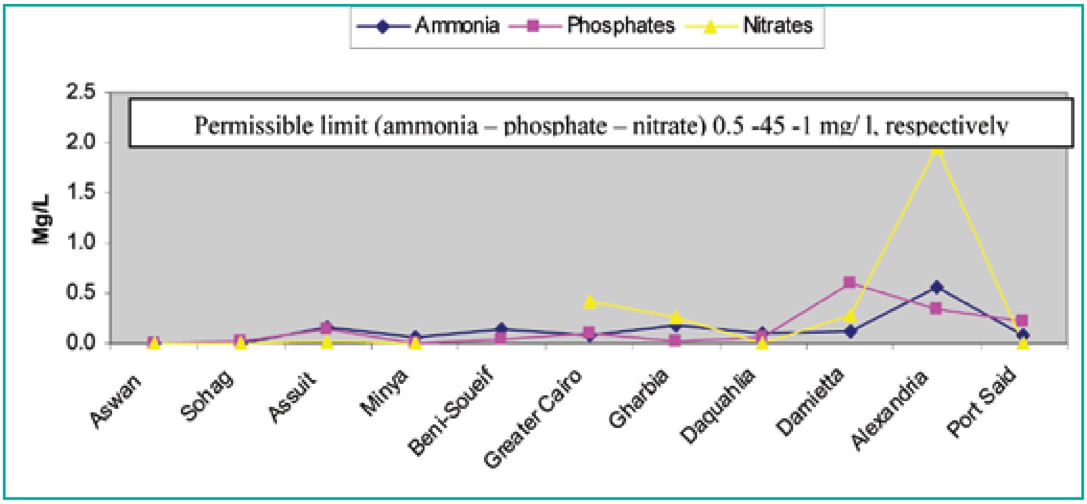


Figure (5-11) shows a comparison between average concentrations of nutrients in 2009

6. Average concentrations of total dissolved solids (TDS) ranged between (171 - 300 mg / L) which is much lower than the permissible limit (500 mg / L), as shown in figure (5-12).

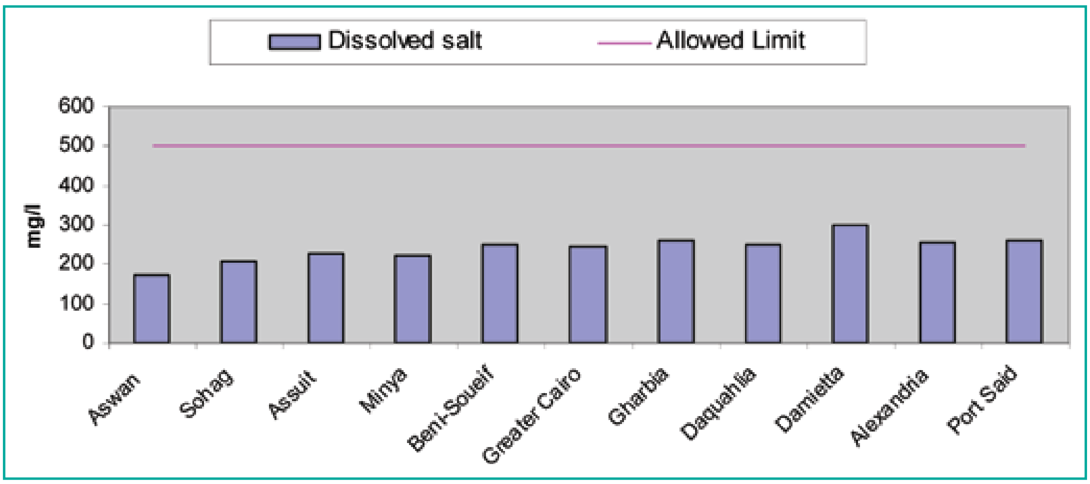


Figure (5-12) shows comparison between average concentrations of total dissolved solids in different governorates during 2009

7. Results showed that the average concentration of fluoride and sulfate were within the permissible limits at all monitoring points, their average concentrations ranged between (0.11 - 0.56 mg / L), and (20.39 - 48.86 mg / L) respectively while the permissible limits for each of them were (0.5 and 200 mg / L), respectively.

8. Iron and Manganese average concentrations ranged between (0.05 and 0.72 mg / L) and (0.04 and 0.1 mg / L) respectively, which were less than the permissible limit (1.0 mg/L and 0.5 mg / L) respectively. There were no noticeable manganese concentrations in most of the monitoring points.

9. Average concentrations of heavy metals along River Nile, such as Arsenic, Cadmium, Chromium, Copper, Mercury, Lead, Selenium and Zinc were within permissible limits and their average concentrations were 0.02 , 0.004 , 0.027, 0.029, 0.001 , 0.029 , 0.004 and 0.055 , respectively .

5-5-3 Sediments Quality in River Nile

Monitoring results of sediments issued by Ministry of Water Resources and Irrigation (National Center for Water Research) for 2008, at various monitoring sites indicated the following : -

1. Nitrates concentration during February and August ranged between 2.6 and 6.0 mg / kg in February and 4 to 10 mg / kg, in August.

2. Organic matters ratios during February and August ranged between 0.27% - 3.11% in February and 0.07% - 0.69%, in August.

3. Copper concentrations exceeded the permissible limit of the Canadian guidelines (35.7 mg / kg) in four sites during February, while it exceeded this limit in all sites during August.

4. Arsenic concentration did not exceed the permissible limit during August (123 mg / kg) except at Esna Barrage, where it exceeded the permissible limit in most samples during February.

5. Lead concentration ranged between (6.4 - 20.8 mg / kg) during February which indicates significant improvement compared with the previous year where it was within permissible limit (35 mg / kg), but it did not show any values during August.

5-5-4 Water Quality in Rosetta Branch

Monitoring results issued by laboratories affiliated to Ministry of Health and Environmental Affairs Agency in different governorates, indicate the following:

1. Dissolved Oxygen (DO) concentration along Rosetta Branch was higher than the minimum permissible limit of water quality (5 mg / L) during 2009; however, concentration was improved in the middle section of the branch compared to 2003-2007 as shown in Figure No. (5-13).

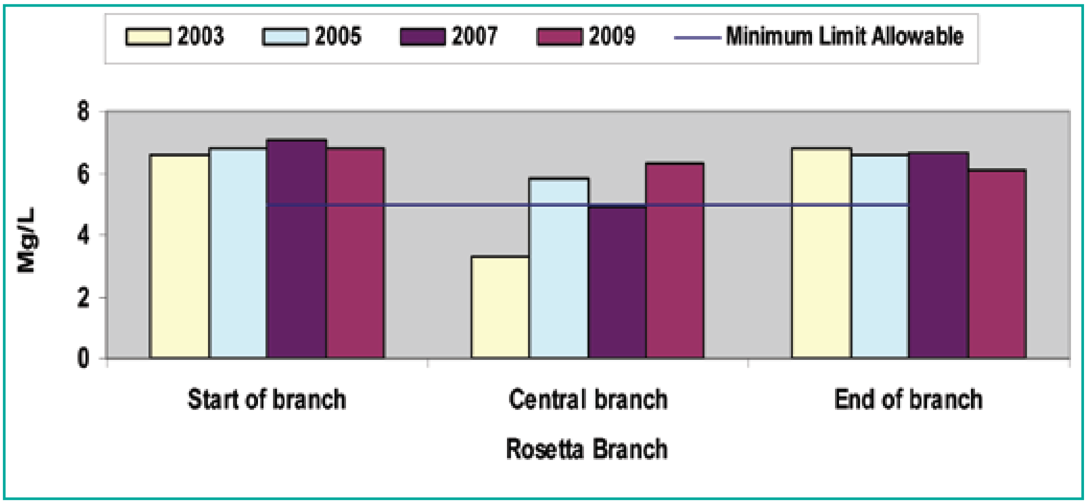


Figure (5-13) shows a comparison between average Dissolved Oxygen (DO) in Rosetta Branch from 2003 to 2009

2. Average concentrations of organic matter (COD) has slightly exceeded the permissible limit (10 mg / L) during 2009, but there was an improvement compared with years 2003 - 2007 as indicated in figure (5-14).

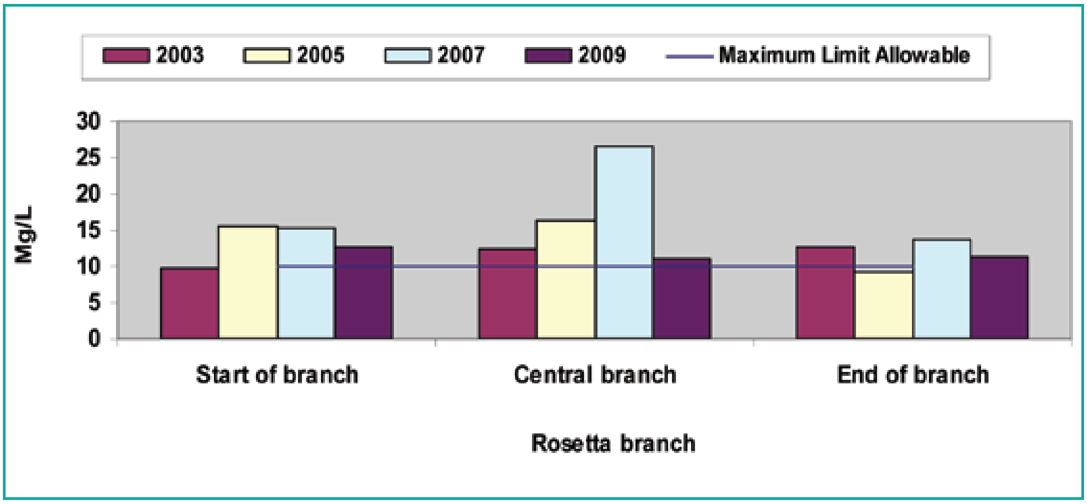


Figure (5-14) shows a comparison between average results of Chemical Oxygen Demand (COD) in Rosetta Branch from 2003 to 2009

3. Average concentrations of organic matters represented as Biological Oxygen Demand (BOD5) was less than the permissible limit (6 mg / L) at the beginning, middle and end of the branch. Although, there was a slight increase in concentration at the end of the branch compared to the previous year; however, it remains less than the permissible limit, as shown in figure (5-15).

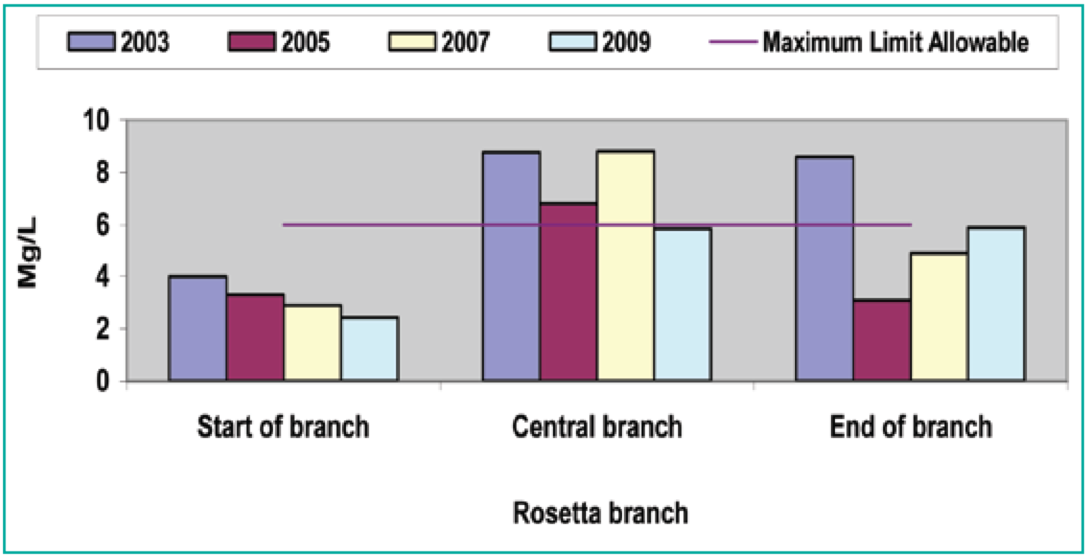


Figure (5-15) shows a comparison between average concentrations of Biochemical Oxygen Demand (BOD5) in Rosetta Branch from 2003 - 2009

4. There was an apparent reduction in average concentrations of ammonia during 2009 at the beginning and middle of the branch compared to the previous years which indicate that the concentration was much less than the permissible limit (0.5 mg / L) along Rosetta Branch, as shown in figure (5 - 16).

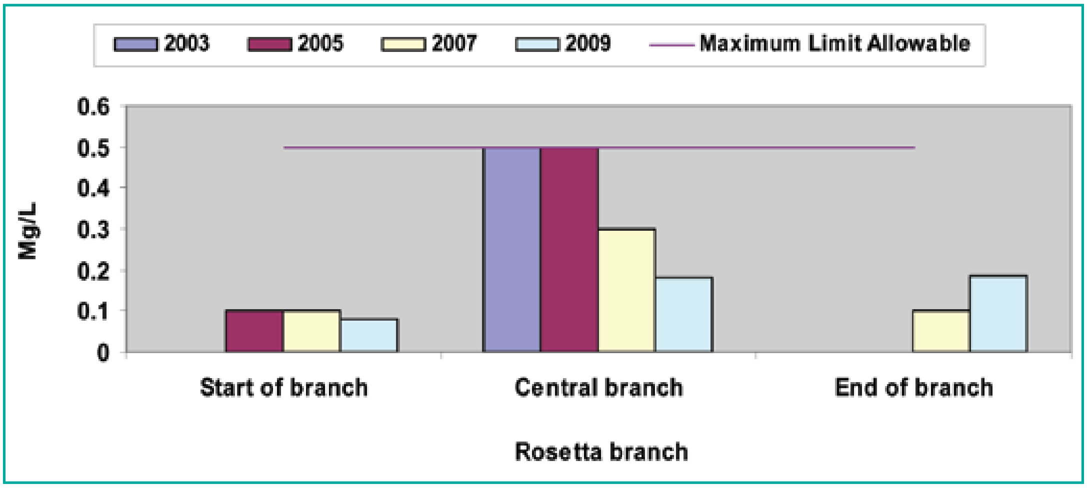


Figure (5-16) shows a comparison between average concentrations of ammonia in Rosetta Branch from 2003 - 2009

5. Results indicated that phosphate average concentrations were much less than the permissible limit (1 mg / L) along the branch during 2009 at all monitoring points. Figure (5-17) shows a comparison between these concentrations along the Branch from 2003 - 2009.

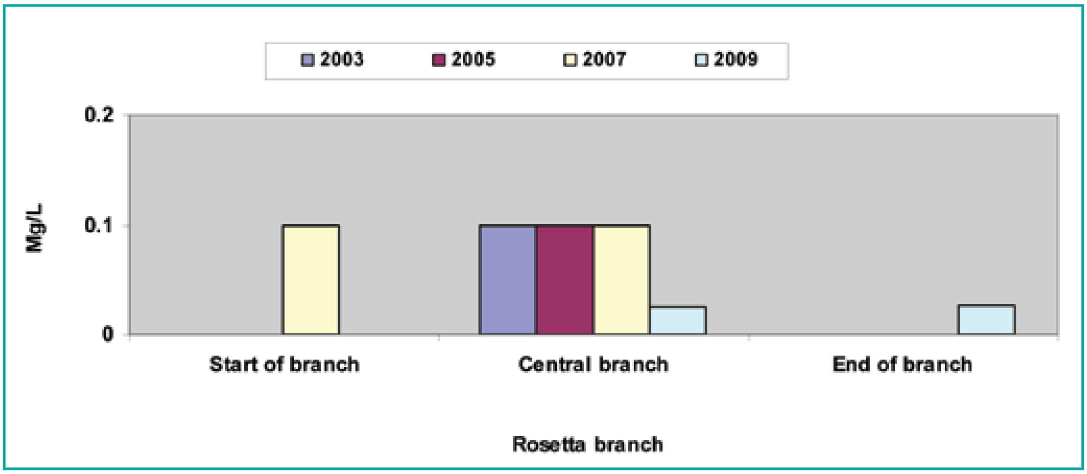


Figure (5-17) shows a comparison between average concentrations of phosphate in Rosetta Branch from 2003 - 2009

5-5-5 Water Quality in Damietta Branch

Monitoring results of pollution indicators during past years along Damietta branch indicate the following:-

1. Concentration of Dissolved Oxygen (DO) was higher than the minimum permissible limit for water quality (5 mg / L) as shown in figure (5-18); which is a sign of purity of the water and its ability of self-purification.

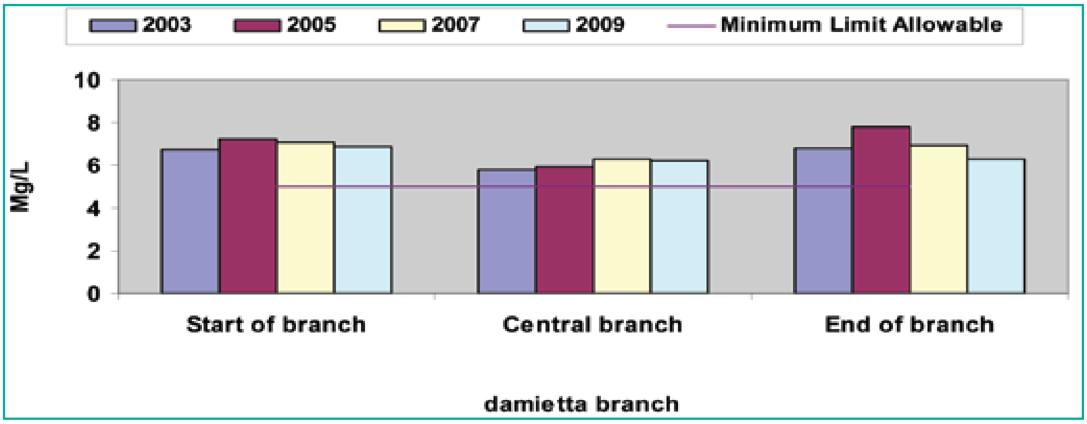


Figure (5-18) shows comparison between averages concentrations of Dissolved Oxygen (DO) in Damietta Branch from 2003 - 2009

2. Although a slight increase in average concentrations of organic matter (COD) was monitored in the middle and beginning of the branch that exceeded the allowed maximum limit for Nile water quality (10 mg / L); an improvement was noticed at the beginning of the branch if compared with 2005 and 2007. Despite the recorded increase in concentrations of COD at the end of the branch, its values were not very high, as shown in figure (5-19).

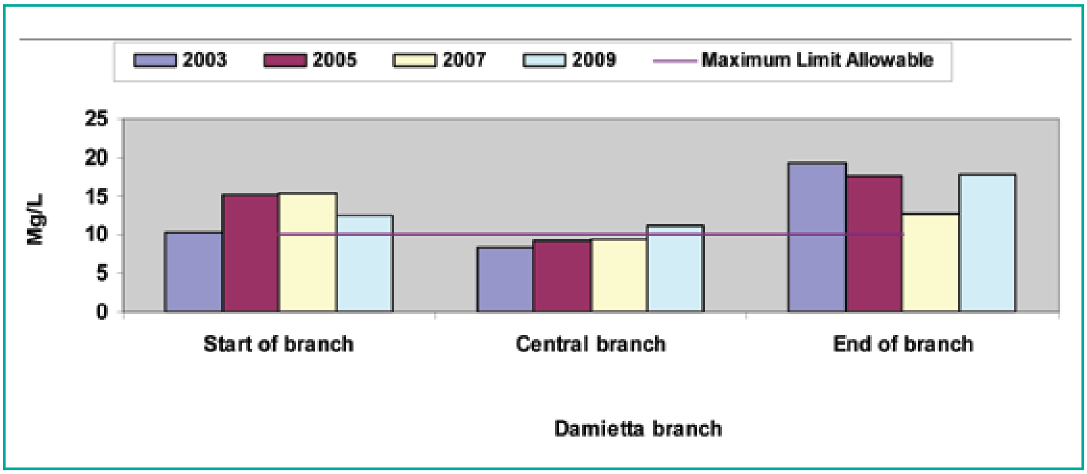


Figure (5-19) shows a comparison between average concentrations of Chemical Oxygen Demand (COD) in Damietta Branch from 2003 – 2009

3. Average concentrations of organic matter represented by biological oxygen demand (BOD5) during 2003-2009 were less than the permissible limit for Nile water quality (6 mg / L) along Damietta branch, as shown in figure (5-20).

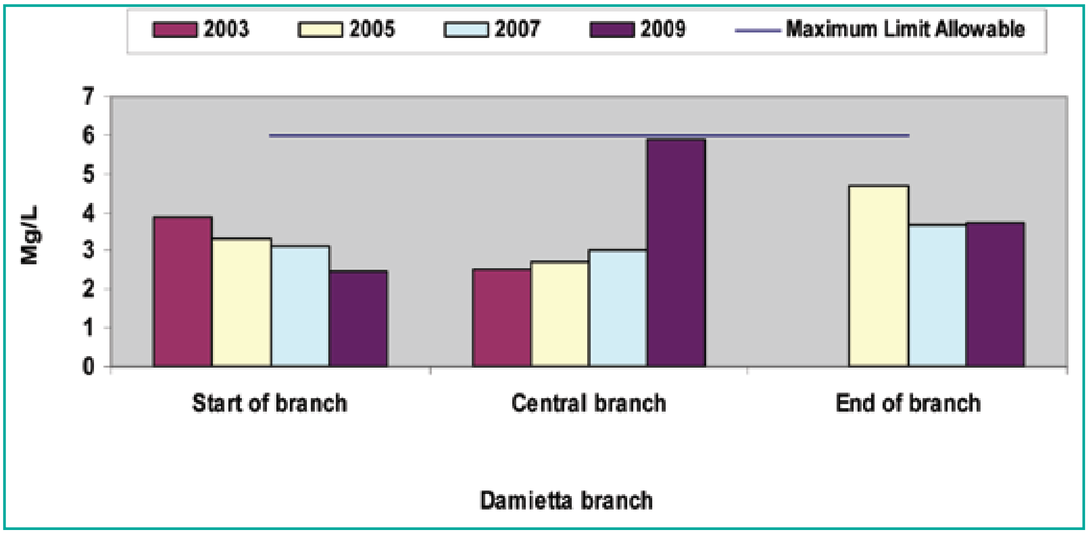


Figure (5-20) shows a comparison between average concentrations of Biological Oxygen Demand (BOD) in Damietta Branch from 2003 - 2009

4. Average concentrations of nutrients (ammonia and phosphate) were less than the permissible limits during 2003 – 2009 in most monitoring points along Damietta branch, as shown in figures (5-21) and (5-22) respectively.

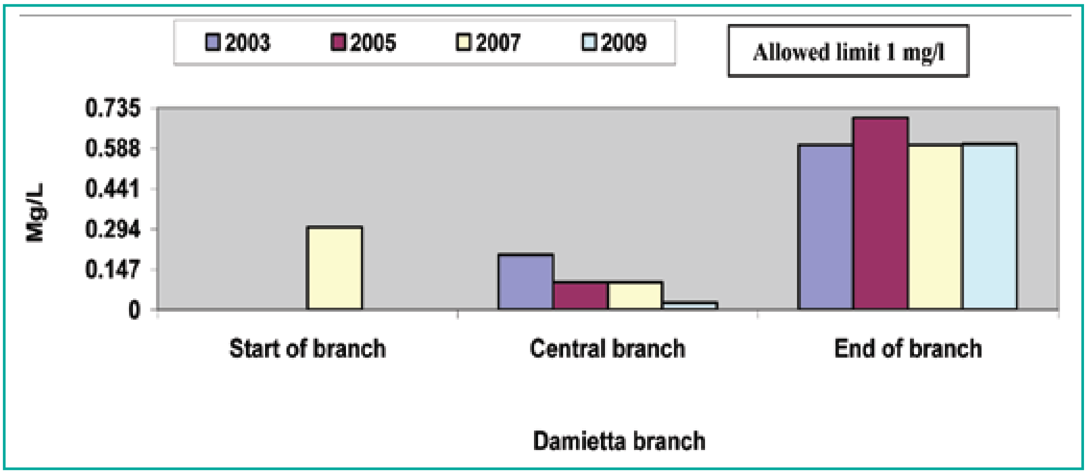


Figure (5-21) shows a comparison between average concentrations of phosphate in Damietta Branch over period 2003 - 2009

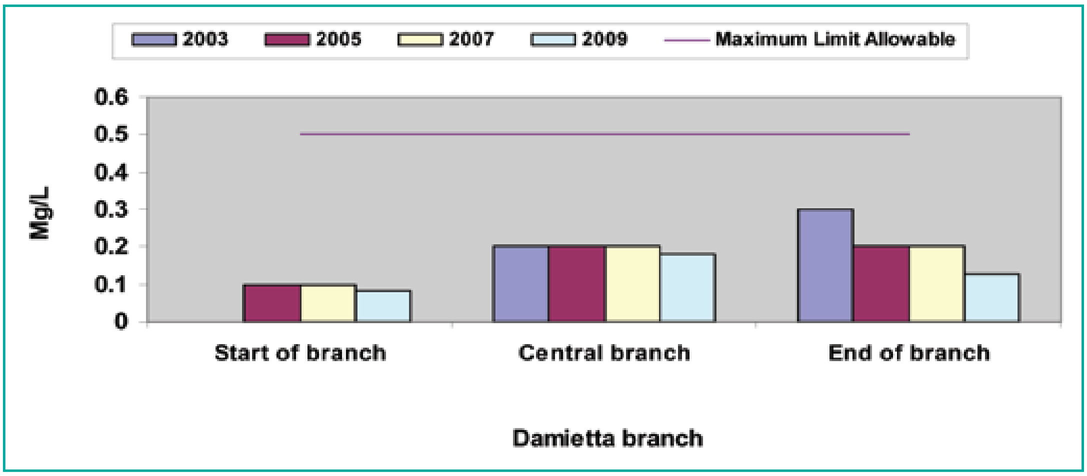


Figure (5-22) shows a comparison between average concentrations of ammonia in Damietta Branch over period 2003 – 2009

5-5-6 Water Quality in Canals and Drainages:

Monitoring results of water quality of canals and drainages all over Egypt, issued by National Water Research Center affiliated to Ministry of Water Resources and Irrigation during 2008, included the following :-

5-5-6-1 Upper Egypt canals

Monitoring results indicate the following:

1. All values of E. coli bacteria were within the limits.
2. All values of dissolved oxygen concentration (DO) were within the limits except the monitoring point at Kalabia Canal during August.
3. Organic matters concentration (biochemical oxygen demand (BOD5) did not

exceed the permissible limit during winter and summer (February-August), except at Sacola point on Baher Youssef which exceeded the permissible limit during February.

5-5-6-2 Fayoum Canals

Monitoring results of waterways feeding Fayoum region (Baher EL- Nazla, Baher Kasr EL- Banat and Baher Wahbi) indicate the following:

1. Organic matter concentration (biological oxygen demand (BOD5)) did not exceed the permissible limit in most of Fayoum canals; however, it reached more than 18 mg / L in the Wehbe canal.
2. E. coli bacterial counts exceeded the Egyptian standard limits in all canals.
3. Nitrate and Phosphate concentrations were within the Egyptian standards of Executive Regulations of Law No. 48 /1982.
4. Ammonia concentration exceeded the permissible limit (0.5 mg / L) in all canals in Fayoum.
5. The average values of total dissolved salts in Fayoum canals exceeded the permissible limit (500 mg / L), with its highest concentration monitored in Baher Wehbe and lowest in Kasr El-Banat canal.
6. Average concentrations of heavy metals in Fayoum canals were within permissible limits of Egyptian standards.

5-5-6-3 Delta region canals

Monitoring results in 2008 indicate the following:

1. Average concentration of dissolved oxygen in about 60% of monitoring sites of Delta canals were within standard limits (5 mg / L) prescribed in Law No. 48 / 1982.
2. Organic matters concentration (biochemical oxygen demand (BOD5) exceeded the permissible limit (6 mg / L) at all canals.
3. Average of ammonia concentrations at most monitoring points of Delta canals exceeded the permissible limit (0.5 mg / L).
4. E. coli bacterial count exceeded safe limit (1000 cells / 100 ml) as prescribed by World Health Organization.

5-5-7 Water Quality of Groundwater in Egypt

Groundwater is an important source of water in Egypt, as it is considered a safe low-cost source for drinking water and as a strategic reservoir for water. Due to the importance of groundwater, Ministry of Water Resources and Irrigation established a national network to monitor groundwater that consists of 203 monitoring sites, distributed all over Egypt; the Institute of Groundwater Research carries out a monitoring program and analysis; and results issued during 2008 indicated the following:

5-5-7-1 Aquifers of Delta and Greater Cairo region:

1. Results indicated the presence of high concentrations of iron in about 55% of wells located in Delta and Greater Cairo region.
2. Concentration values of salinity were good, and the results indicated good quality of most of the samples that could be used for drinking and irrigation, except in the northern regions of the Delta which need treatment for salts concentration; also, results indicated the presence of high concentrations of sodium chloride at several monitoring points in Northern Delta due to the infusion of seawater into groundwater in the region.

5-5-7-2 Nile Valley Aquifer:

High concentrations of iron were monitored in about 51% of the total wells. This indicates its unsuitability for drinking; also, 49% of the salts concentrations have indicated their unsuitability for use in agricultural purposes, as an example of the high concentrations of salts recorded are in Atfeh Al-Sharqih, Al-Qubabat, west Al-Fashn, Minya, West Tahta, West of Luxor and Esna.

5-5-7-3 Western Desert Aquifer:

In general, concentrations of salinity in monitored wells at Western Desert region have shown good quality of water in most wells and did not exceed the standards for drinking and agriculture purposes ; while chloride and sulfur concentrations in 21%, and 14% of the wells respectively, exceeded these standards in Siwa.
Also, high concentrations of iron and manganese were monitored; and about 25% and 2.3% of the monitored wells have exceeded permissible limits of iron and manganese, respectively for drinking purposes.

5-5-7-4 Eastern Desert and Sinai Aquifer:

Monitoring results of groundwater quality in Sinai and Eastern Desert areas indicate the presence of high concentration of chloride, sulfur and sodium exceeding the permissible limits in about 53%, 63%, and 67% of the monitored wells, regarding chloride, sulfur and sodium, respectively, particularly in the Eastern Desert.
An increase in salinity was recorded in about 70% of the monitored wells in Sinai and Eastern Desert, in addition to increase in Manganese concentration in about 3% of the wells that exceeded guidelines for drinking water; however, iron concentrations were within the permissible limits.

5-6 Egyptian Northern Lakes

Northern Lakes (Bardawil - Manzala - Burullus - Edku - Mariuot) are economically important, due to their fish production which is estimated at more than 77% of total Egyptian lakes production. All are connected to the Mediterranean with the exception of Mariuot Lake. Because of the shallow depths of the Northern Lakes, slow water movement and high fertility; they are considered natural hatcheries for various species of economic fish species. Northern Lakes also constitute an important refuge for hundred thousands of migratory birds during migration season.

The Ministry of State for Environmental Affairs has set a priority to protect the northern lakes from pollution and to maintain their sustainable development, within its priorities and strategy for water resources protection; so that periodical monitoring of pollution sources, quantities and type of discharges from these sources; also monitoring water quality and sediments in these lakes became a perquisite to determine impacts of various pollutants, and to set priorities for rehabilitation and development to ensure their sustainability as fish resources and to maximize their benefits.

As there has been no designated periodic monitoring program of the environmental status of these lakes, the MSEA started implementing a national program for periodic environmental monitoring of northern lakes in August 2009. This is in collaboration with the National Institute of Oceanography and Fisheries to monitor water quality, sediments, phytoplankton and zooplanktons in Northern Lakes.

This monitoring program aims at: -

1. Assessing the current environmental and geological status of each lake.
2. Periodic follow-up on these lakes to determine environmental conditions, nature of pollutants and their accumulation in each lake.
3. Developing corrective national program to stop pollution sources, reduce pollutants and halt lakes' deterioration.
4. Developing future plans for lakes' protection, resolving their problems and realizing their potential sustainable development.
5. Establishing a comprehensive database for Northern Lakes based on quality control and quality assurance in managing these lakes.

The operational framework of this program includes the following:

1. Review all previous studies of each lake to determine historical changes and their relationship with prevailing conditions.
2. Develop an updated map for each lake clarifying environmental conditions affecting them.
3. Implement a monitoring program for the four seasons, by collecting samples as follows:

First: Water measurements

Collect samples seasonally from the same specified sites of each lake to be analyzed for hydro-chemicals, heavy metals and bacterial presence as well as for total pesticides, petroleum hydrocarbons, phytoplankton, zooplankton, and benthic fauna and flora analysis.

Second: Benthic sediment measurements:

Collect two samples from bottom sediments every year from the same specified sites. These samples are to be analyzed for water content, particles size and total organic carbon; total organic phosphorus, total organic nitrogen, heavy metals, pesticides, and polyaromatic hydrocarbons.

5-6-1 Monitoring results of water and sediments quality in Northern Lakes during August 2009:

Monitoring results of the first campaign (August 2009) for northern lakes, which is considered as an initiation to develop a baseline data for sediments and water quality for those lakes, have shown that Bardawil Lake has good water quality, and sediments since it has not been exposed in the past to pollution sources. Additionally, there were no significant differences between the lakes in other measurements, because of the geological nature of various regions surrounding the lakes and sources of drainage into each lake. Current status of the northern lakes will be identified after completing the monitoring program. The monitoring results of the northern lakes (August 2009) are shown as follows:

5-6-1-1 Bardawil Lake:

Bardawil Lake occupies most of the Mediterranean coast in North Sinai Governorate; it is one of the shallow lakes with high salinity and is considered the least polluted lake. It extends about 85 km with an area of 650 km2, with depth ranging between 0.3 to 3 meters. The lake is also, considered one of the most important areas attracting migratory birds in winter. It has a coast sandy strip with width range of (1 km - 100 km) that separates the lake and the Mediterranean. It connects with the Mediterranean through the small Boghas (Zranic) from the east. The Lake contains high-quality fishes with annual average production of about 2.3 thousand tons that are mostly exported. The following are the main challenges facing development of Bardawil Lake from an environmental perspective:

- Clogged straits (Boghazes).
- Lack of environmental awareness among fishermen.
- Ministry of Agriculture's project to reclaim 400 thousand feddans that would lead to a significant change in the properties of water and fish species in the lake.

1. Bardawil Water Quality

Monitoring results of water quality in Bardawil Lake during the first monitoring campaign in August 2009 indicated the following:

- Water has high transparency as the sun rays penetrate to the bottom of the lake in most parts, and that water tends to be alkaline with pH values that ranged between 8.26 - 8.94.
- Salinity was higher than the Mediterranean Sea, as a result of the shallowness of the Lake and continued water evaporation. Salinity has changed according to their nearness or remoteness from the Boughazes, where it decreases near El-Boughaz and increases as we go far to the west.
- All values of dissolved oxygen were ranged between (7.5 and 9.3 mg / l), which is a sign for vitality of the water.
- Concentrations of ammonia varied between (0.06 and 0.28 mg / L) and phosphate concentration was very small which ranged between (0.02 and 0.03 mg / L).
- Values of organic matter (BOD) ranged between (2.8 and 4.7 mg / L), as shown in figure (5-23), and values of organic matter (COD) ranged between (2.8 an 4.7 mg / L); these values indicate absence of organic pollution.

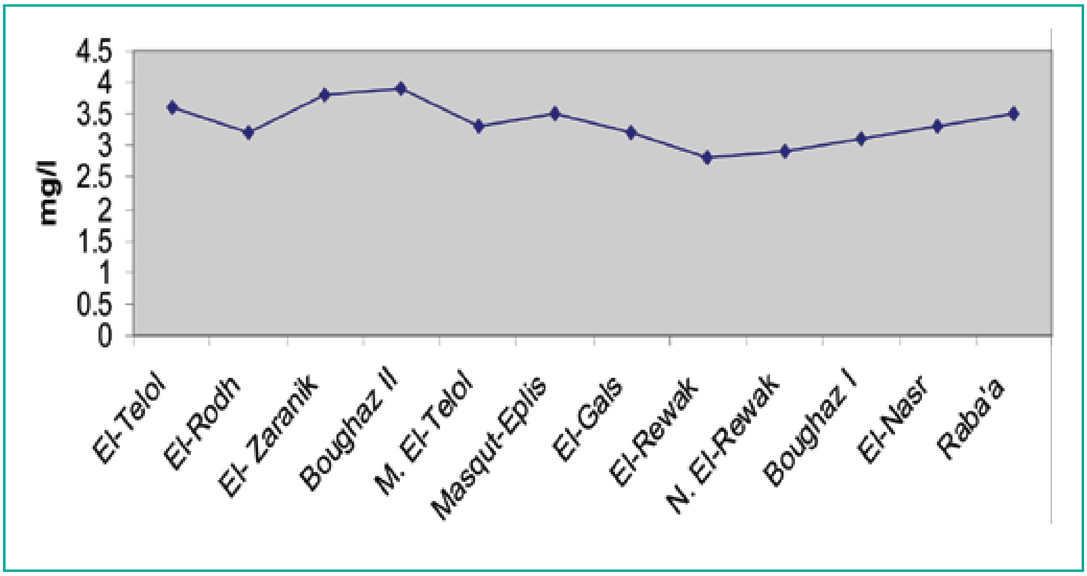


Figure (5-23) shows a comparison between values of biological oxygen demand (BOD5)

- Bacterial count did not exceed the permissible limit in all stations, with the exception of only two monitoring points characterized by the presence of large numbers of small fishing boats and collection places for fish production, as shown in figure (5-24).

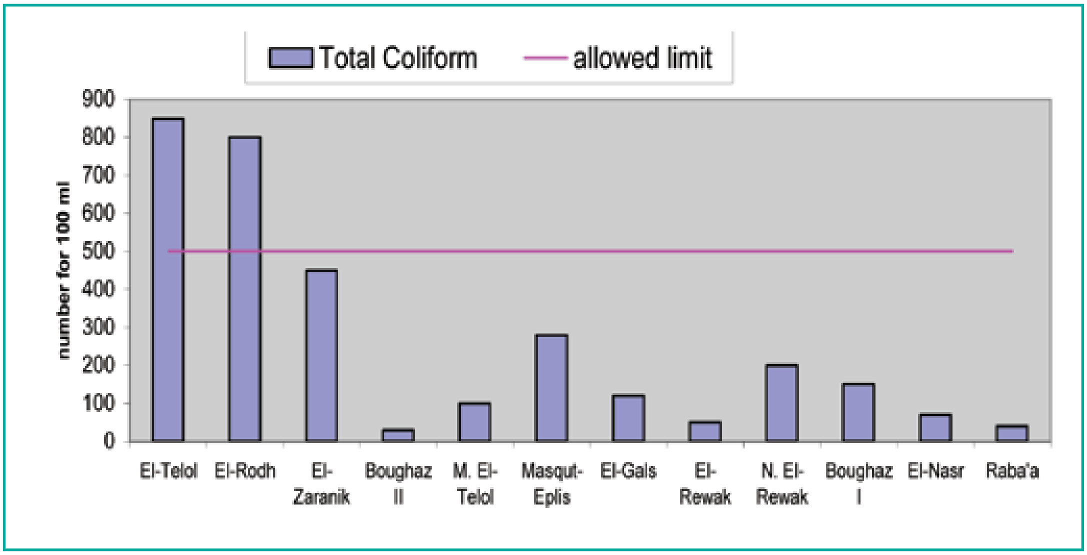


Figure (5-24) shows a comparison between values of total coliform

- In general, concentration of heavy metals was very low, nevertheless, there was slight increase in manganese; and iron showed a relatively higher concentration that ranged between (0.141and 0.598 mg / L), as shown in figure (5-25).

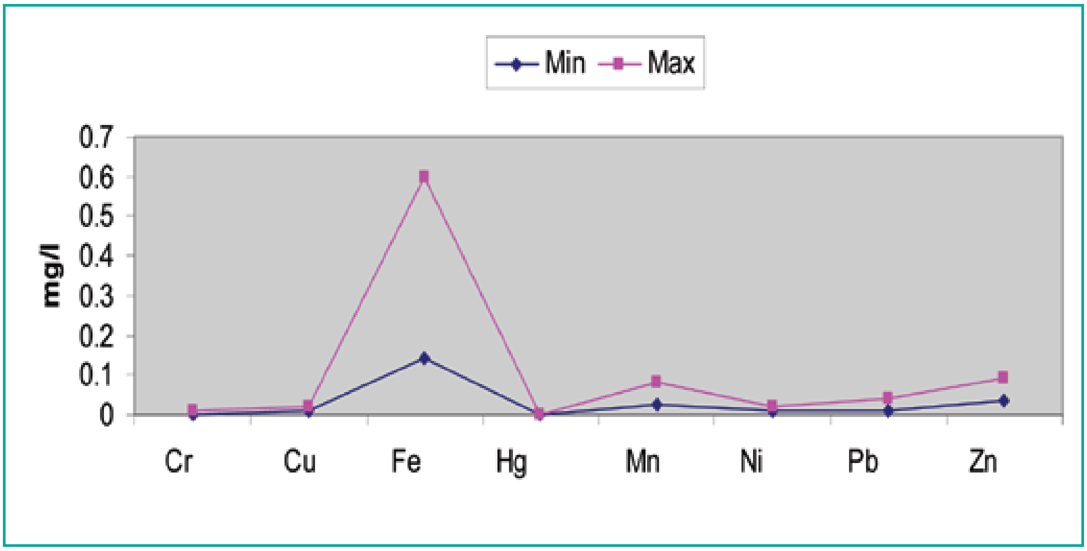


Figure (5-25) shows comparison between min and max values of heavy metals

2. **<u>The quality of sediment</u>**

Monitoring results of sediments in Lake Bardawil during the first campaign in August 2009 indicated the following:

- Slight increase was recorded in the concentration of total nitrogen in the middle of the lake that gradually decreased at stations of high salinity, particularly at El-Rewak, El-Nasr and Raba'a stations, where it ranged between 0.61 and 0.99 mg /g.
- In general, concentrations of total phosphorus were low and highest values were monitored near EL-Boughaz.
- There was no detection of heavy metals in the sediment, with exception of iron which is recorded in all lakes as a natural component of lake sediment, as shown in figure (5-26).

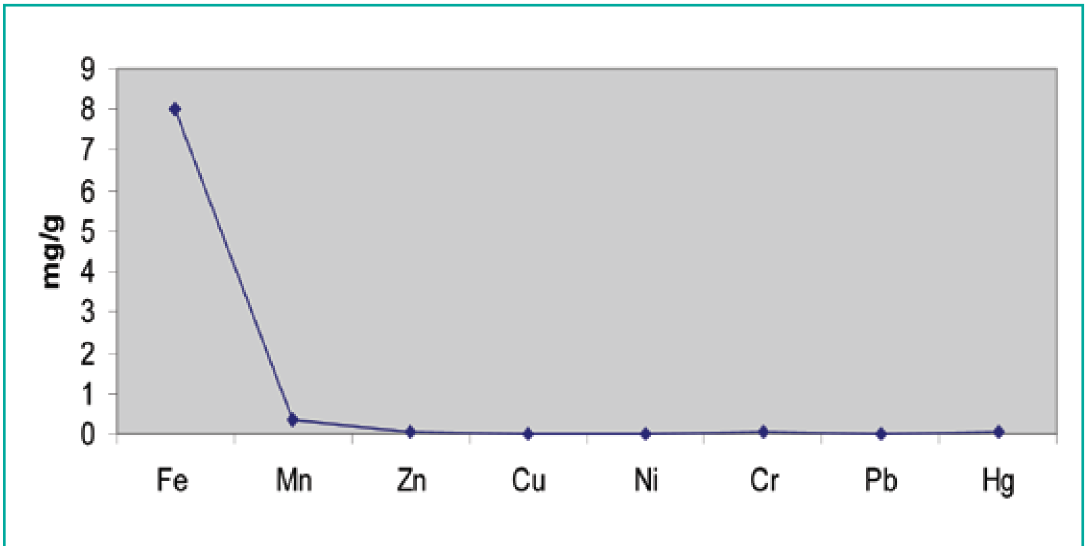


Figure (5-26) shows average values of heavy metals in the sediment.

- Concentrations of polychlorinated biphenyls compounds (PCBs) ranged between the minimum sensitivity limits of the used device and 106.33 ng / g.

5-6-1-2 Lake Burullus:

Lake Burullus located at the north-east of Rosetta Branch, is the second largest natural lake in Egypt ,with an area estimated at about 70 thousand feddans, with length of 70 km and width that varies from 6 to 17 km; the depth varies between 0.4 and 2 meters. The lake connects with the Mediterranean through Boughaz Al-Burullus and the River Nile through Brembal channel. Eight drainages discharge into it from east and south as Drainage No. 3 - Ketchener – Baher EL-Tera - Baher EL-Batala - Drainage No. 7 – Nashart drainage - Drainage No. 9 and EL- Moheet drainage.

1. Water Quality

Monitoring results of water quality in Lake Burullus during the first campaign that was conducted in August 2009 indicate the following:

- Water tends to be alkaline with pH values ranging between 8.26 and 8.94.
- Ammonia concentration ranged between (0.10 and 0.17 mg / L), where the highest value was recorded in front of drainage 8 and 9.
- Values of phosphate concentration ranged between (0.16 and 0.67 mg / L).
- Dissolved oxygen concentrations ranged between (6.6 and 9.8 mg / L), which indicate vitality of water in the lake.
- Salinity concentrations ranged between (0.3 and 4.7 g / L) and transparency of the water ranged between (15 and 35 cm).
- No significant increase was monitored in organic material (BOD) concentration, as it ranged between (4.5 and 7.6 mg / L) and its highest values were recorded at West of EL-Boughaz.
- A noticeable increase was recorded of organic matter concentration (COD) , that ranged between (17.5 and 25.5 mg / L) and its highest values were in front of East Burullus drainage, as shown in figure (5-27).

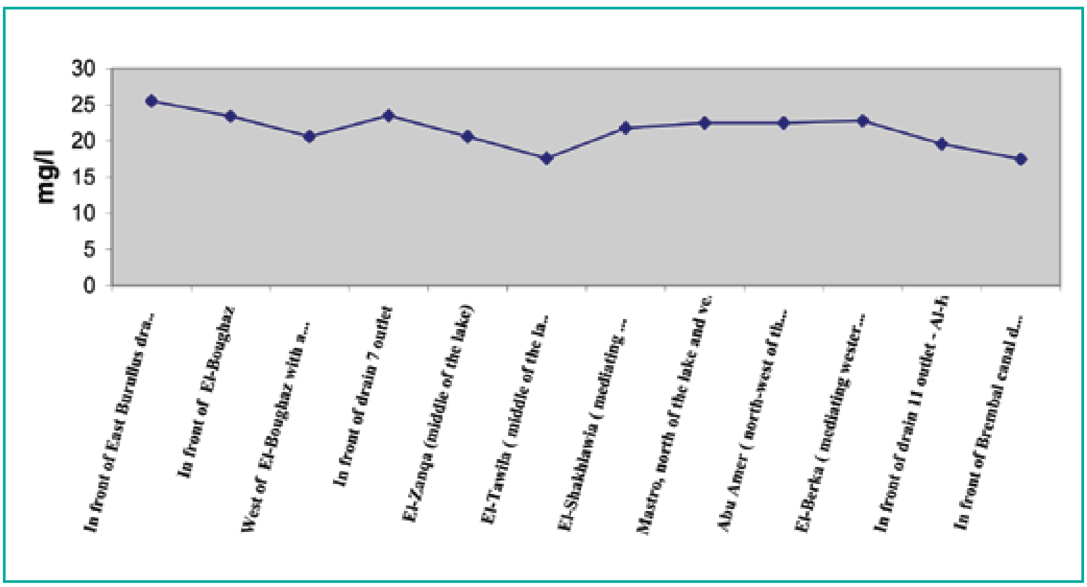


Figure (5-27) shows a comparison between chemical oxygen demand

- Monitoring results of most metals were very low, except for manganese and iron, which were at the highest values of 0.845 mg / L.
- Values of pesticides concentrations were very low in all monitoring points, but there was slight increase in front of East Burullus drainage.
- Compounds of polychlorinated biphenyls showed an increase in front of or near drainages, as shown in figure (5-28).

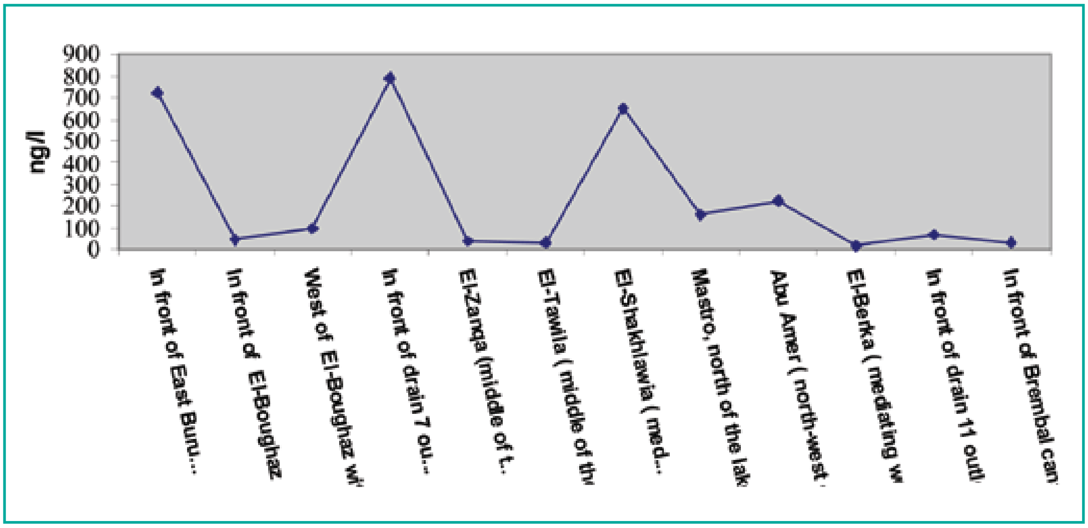


Figure (5-28) shows a comparison between polychlorinated biphenyls

2. Quality of sediments

Monitoring results of sediments quality in Lake Burullus of the first campaign conducted in August 2009 indicated the following:

- Phosphate concentration values ranged between 0.94 and 1.17 mg / g.
- No evidence of heavy metals presence with exception of iron that ranged between 2.7 and 51 mg / g.
- Polychlorinated biphenyls compounds concentrations ranged between 0.68 and 100.18 ng / g.
- Concentration of total pesticides were very small as it ranged between (zero and 18.5 ng / g), as shown in figure (5-29).

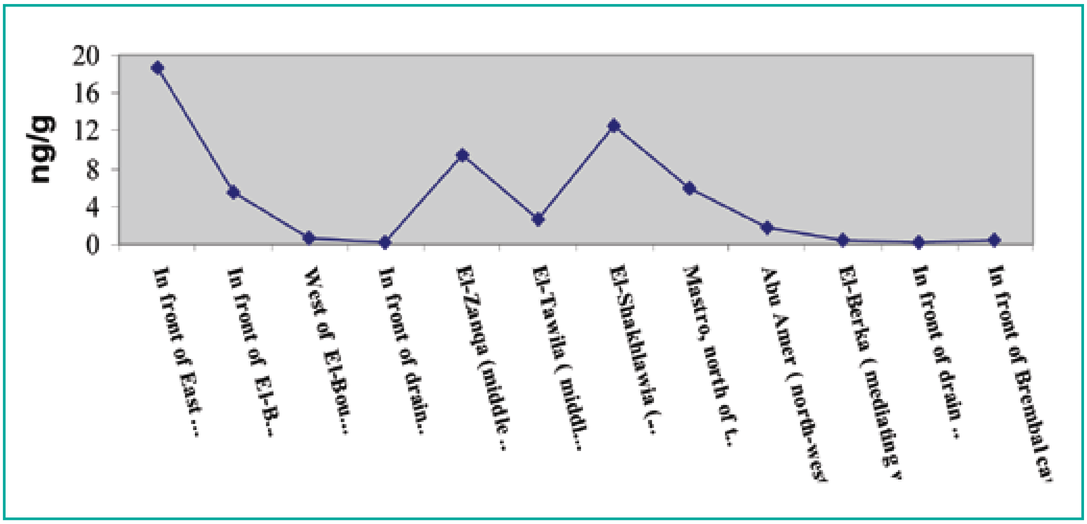


Figure (5-29) shows concentration of total pesticides

5-6-1-3 Lake Edku:

Lake Edku is the smallest of the northern lakes, located West of Rosetta Branch and is about 35 km east of Alexandria. Its length is 17 km, width varies from 5 to 11 km with an area of 4,000 feddans and depth ranges from 60 to 150 cm. The lake is connected to the Mediterranean through Boughaz Edku. Fish production estimated at 9,500 tons per year. Berseek, Edku, El-Khairy, and El-Boseely drainages flow their water into the lake.

1. Water Quality

Monitoring results of water quality in Lake Edku conducted during the campaign in August 2009 indicated the following:

- Water tends to be alkaline and its pH values ranged from 7.68 to 8.87.
- Water transparency ranged between 30 and 50 cm, and salinity values ranged between (0.6 and1.8 g / L).
- Dissolved oxygen concentrations ranged between (7.1 and 18.2 mg / L) with an exception of one point in front of El-Khairy drainage where its concentration was 2.7 mg / L. Values of DO indicated that there is no negative impact of this drainage on the rest of the lake.
- Organic matter (BOD) values ranged between (6.2 to 8.1 mg / L), and its highest values recorded were in front of Boughaz Edku, while COD value ranged between (9.6 and 22.1 mg / L), as shown in figure (5 -30).

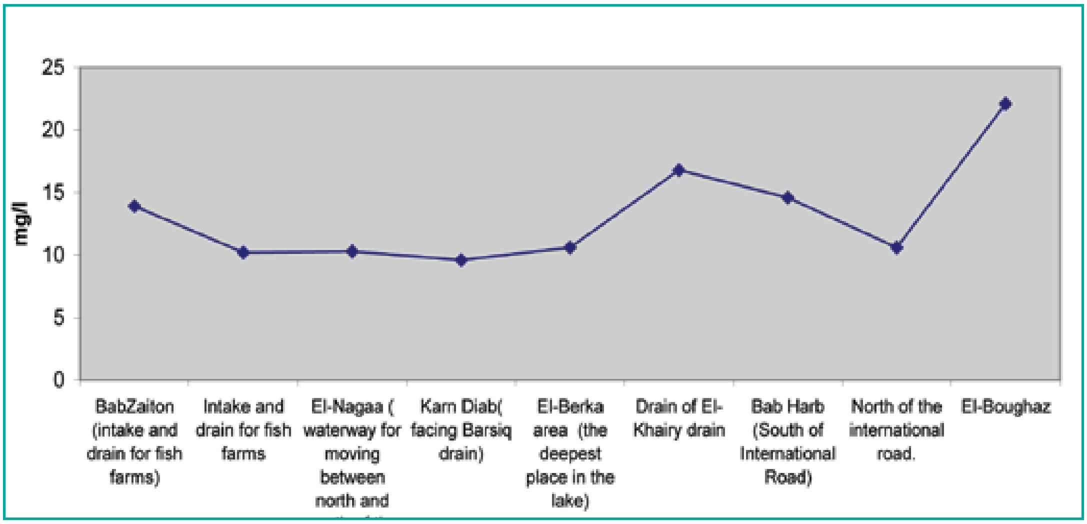


Figure (5-30) shows a comparison between the chemical oxygen demands

- Ammonia concentration in all monitoring points were small and ranged between (0.028 and 0.04 mg / L), despite the increase in concentration in front of El-Khairy drainage (0.566 mg / L).
- Total phosphate concentration ranged between (0.17 and 0.3 mg / L).
- Count of total Coliform bacteria exceeded the standard limit (500 cells / 100 ml) in most of the stations, as shown in figure (5-31).

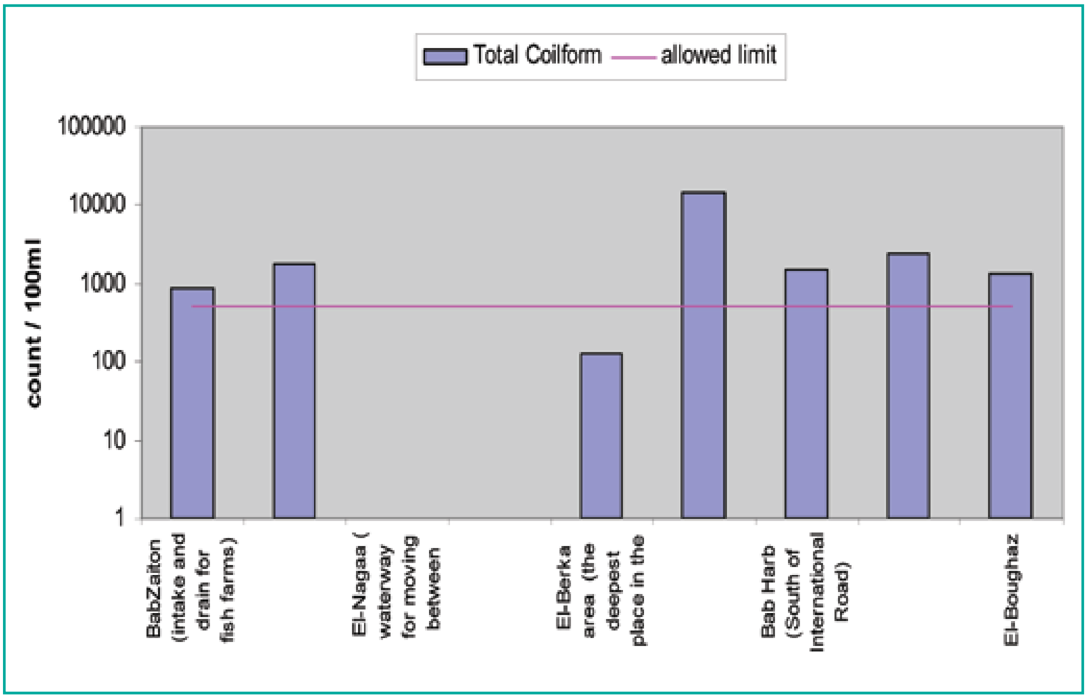


Figure (5-31) shows count of total Coliform bacteria

- Iron, copper, manganese, nickel, lead and zinc concentrations were recorded, which may be due to the presence of industrial wastewater, as shown in figure (5-32).

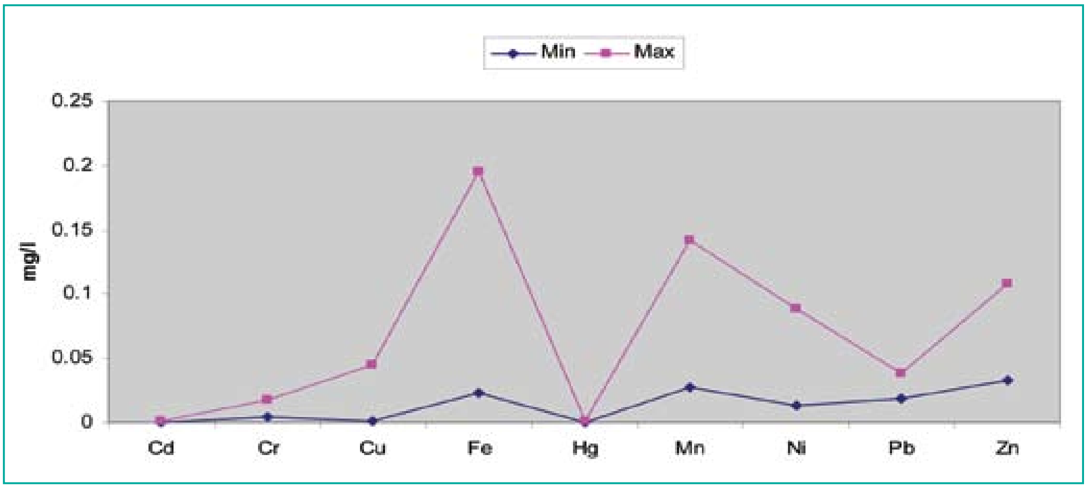


Figure (5-32) shows concentration of heavy metals

- Monitoring results indicate the presence of polychlorinated biphenyls compounds and its highest value was recorded in the El-Berka area.
- Pesticides concentration ranged between (zero and 703 ng / L) and the highest value was recorded in front of Bab Zaiton station (intake and drainage of fish farms), as shown in figure (5-33).

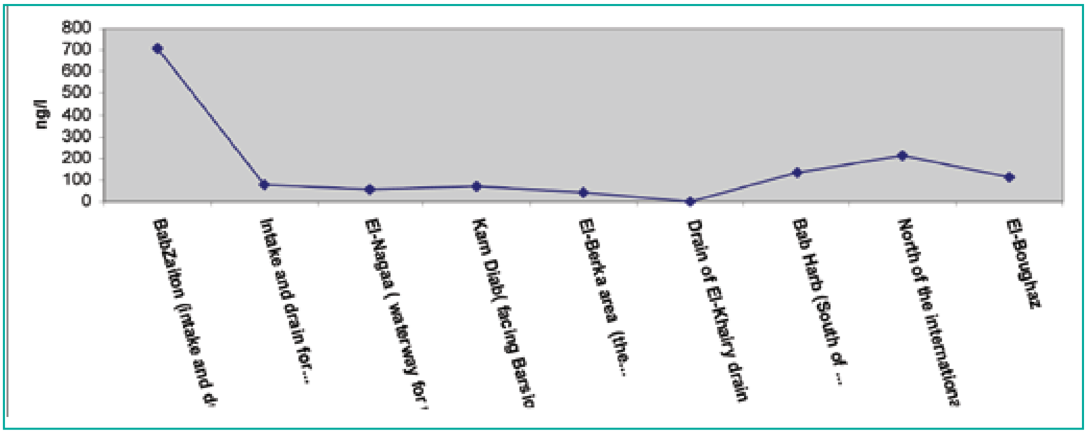


Figure (5-33) shows concentration of total pesticides

2. The quality of sediments

Monitoring results of sediments quality in Lake Edku during the first campaign conducted in August 2009 indicated the following:

- Total phosphate concentrations ranged between (0.09 and 0.11 mg / g).
- Total nitrogen concentrations ranged between (185.36 and 300.44 mg / g)

which are relatively high.

- Despite heavy metals were found in water, they were not found in sediments with the exception of iron, which ranged between (7 and 40 mg / L).
- Polychlorinated biphenyls compounds concentrations ranged between (0.97 and 10 ng / g); however, there was a noticeable concentration of 74.42 ng / g in front of the fish farms Zaiton drainage.
- Total pesticide concentrations ranged between (2.29 and 300.02 ng / g), which gives an indication of the cumulative effect of pesticides in sediments, as shown in figure (5-34).

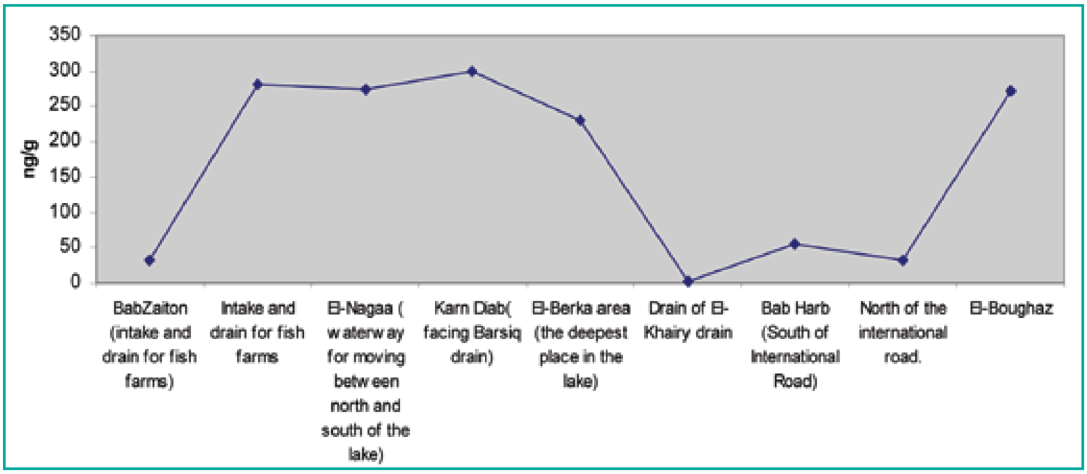


Figure (5-34) shows concentration of total pesticides

5-6-1-4 Lake Manzala

Lake Manzala is the largest of the four northern lakes, it is a shallow lake located at the north-east of the Nile Delta, located within the boundaries of five governorates: Dakahliya, Damietta, Port Said, Ismailia and Sharkia, and bordered from the east by Suez Canal, and from the west by Damietta Branch and the Mediterranean from the north. Its coastal line is about 293 km with maximum width of 30 km.

The lake is connected to the Mediterranean through three Boughazes (Boughaz EL-Gamel, Boughaz EL- Baghdadi, and the new Boughaz EL- Gamel) where they are separated by a sandy beach with height ranging between (0.5 and 2 meters) extending along the coast line of the lake. The lake is connected to Suez Canal through Boughaz Alkaboty and Damietta branch through El-Ratama and El-Safra canals.

1. **Water Quality:**

Monitoring results of water quality during the first campaign in August 2009 indicate the following:

- Water tends to be alkaline with pH values that ranged between 7.8 and 9.2.

- Transparency ranged between 12 and 75 cm.
- Salinity ranged from 1.8 to 20.2 g / L.
- Dissolved oxygen was within the permissible limits except for the point in front of Hadous drainage, which completely disappeared in front of Bahr El-Bakr drainage.
- Ammonia concentration ranged between (0.12 and 2.22 mg / L), where the highest concentration was in front of Bahr El-Bakr drainage.
- Total phosphate concentration ranged between (0.04 and 1.1 mg / L).
- Organic material (BOD) values ranged between (3.2 and 24.6 mg / L) ,the highest values were recorded in front of Bahr El-Bakr drainage, while organic matter (COD) ranged between (14 and 34.3 mg / L), as shown in figure (5 -35).

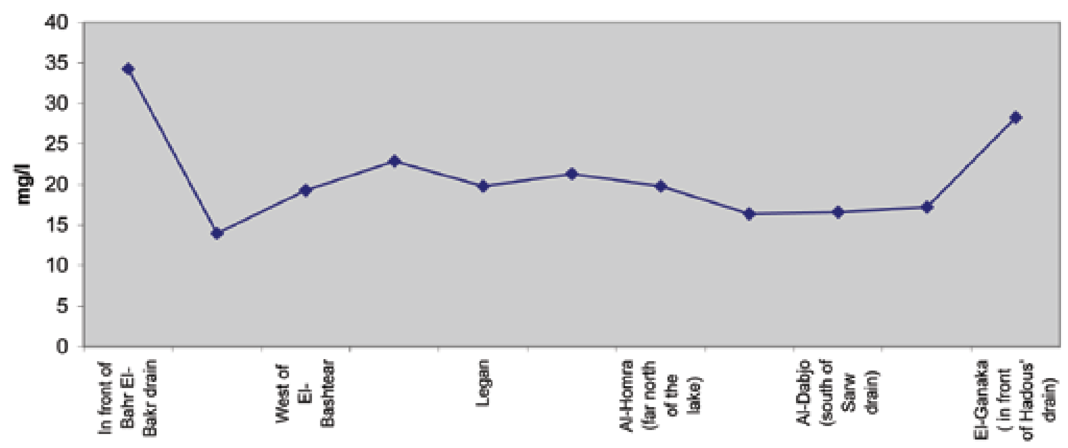


Figure (5-35) shows concentrations of chemical oxygen consumed

- There were slight traces of metals concentration with exception of iron and manganese concentrations, that reached (1.65 and 0.17 mg / L) respectively, as shown in figure (5-36).

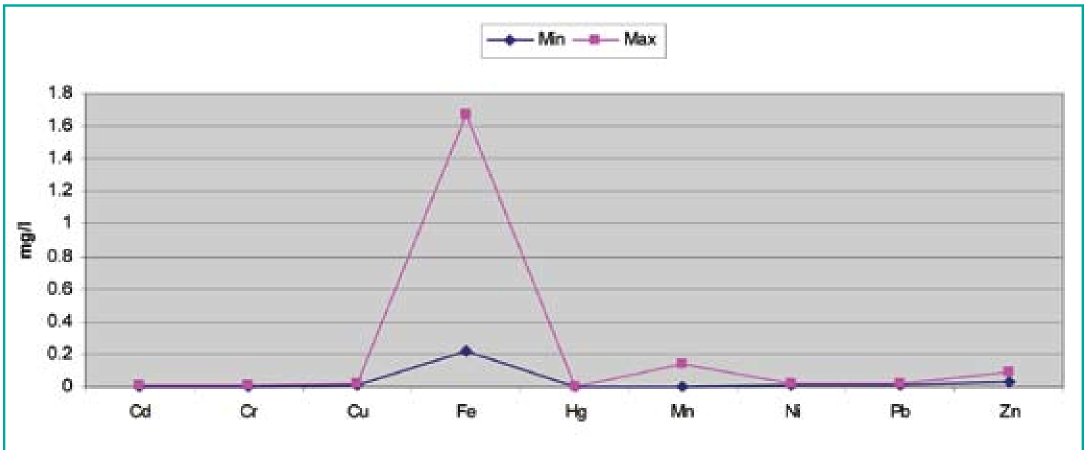


Figure (5-36) shows concentration of heavy metals

- Coliform bacterial count is below the permissible limit in most of the monitoring points but it exceeded this limit in front of Bahr El-Bakr, Hadous drainages and nearby areas.
- Presence of polychlorinated biphenyls compounds has been noticed in front of or near drainages.
- Total pesticides concentration in most points was less than the sensitivity of reading limit of the measuring device; highest values were recorded in front of Bahr El-Bakr drainage and El-Temsah Lake.

2. <u>Sediments quality</u>

Monitoring results of sediments quality in the lake during the first monitoring campaign in August 2009 indicate the following:

- Total phosphate concentrations ranged between (0.09 and 0.11 mg / g).
- Total nitrogen concentrations ranged between (0.11and 0.23 mg / g), as shown in figure (5-37).

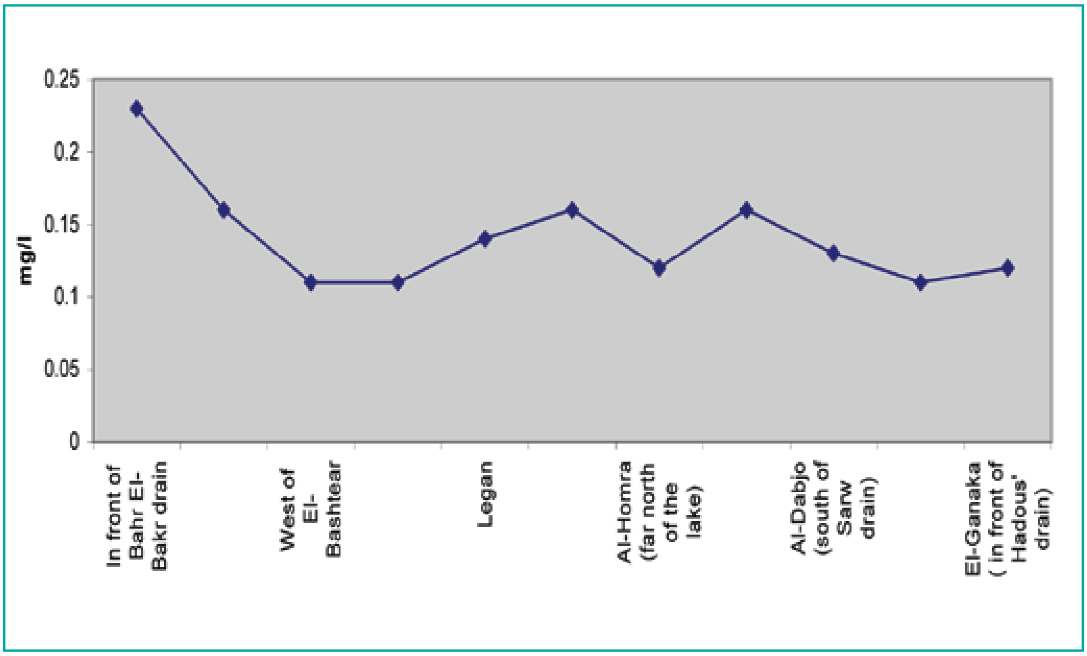


Figure (5-37) shows concentration of total nitrogen

- Concentration of all metals, were very small, with exception of iron which ranged between 2 and 40 µg/g.
- Concentrations of polychlorinated biphenyls compounds ranged between 13.2 and 73.2 ng / g, as shown in figure (5-38).

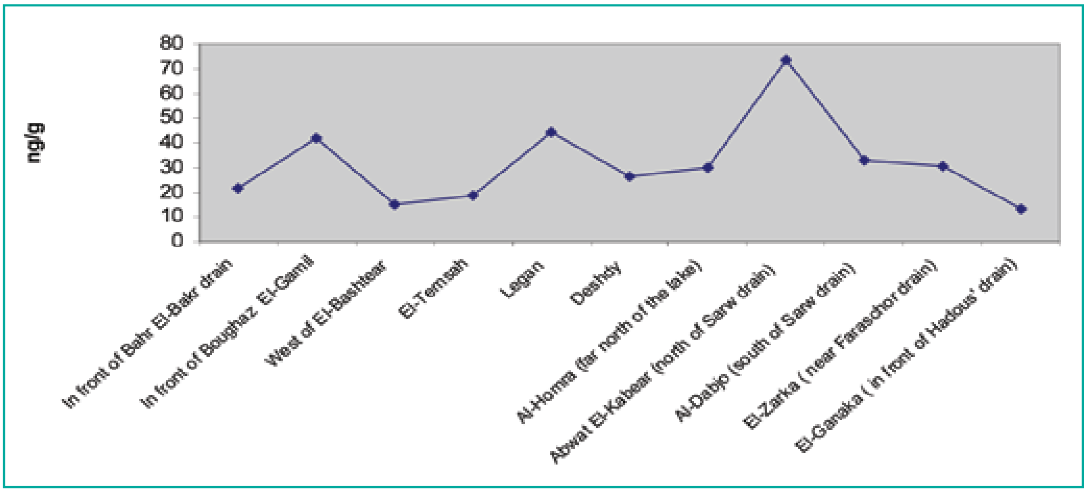


Figure (5-38) shows concentration of polychlorinated biphenyls compounds

- Total pesticides concentrations ranged between (zero and 0.7 ng / g), as shown in figure (5-39).

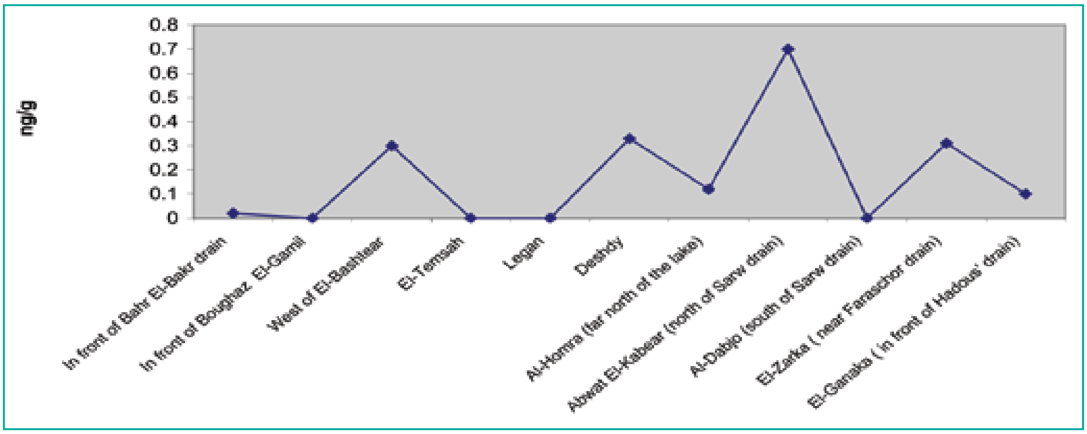


Figure (5-39) shows concentrations of total pesticides

5-6-1-5 Lake Mariut:

It is a closed lake and one of the Egyptian northern lakes located south of Alexandria, divided into four basins by international roads and railway lines. The lake doesn't connect naturally with the Mediterranean. The surface area of the lake estimated at 63.46 km2. However, this area has decreased as a result of draining a large part to be used as an agricultural land. The major water sources of the lake are El-Omoum drainage, El-Qalaa drainage and Nubaria canal.

1. Water Quality

Monitoring results of water quality in Lake Mariut during the first campaign in August 2009 indicate the following:

- Water in the lake tends to be alkaline where the pH values ranged between 7.26 and 8.38.
- Transparency of the water ranged between 15 and 100 cm.
- Salinity ranged between (1.1 and 7.5 g / L).
- Organic matter (COD) values ranged between 22.1 and 63.6 mg / L and organic matter (BOD) was between 12.6 and 41.5 mg /L. The highest values were recorded in front of El-Qalaa drainage, as shown in figure (5-40).

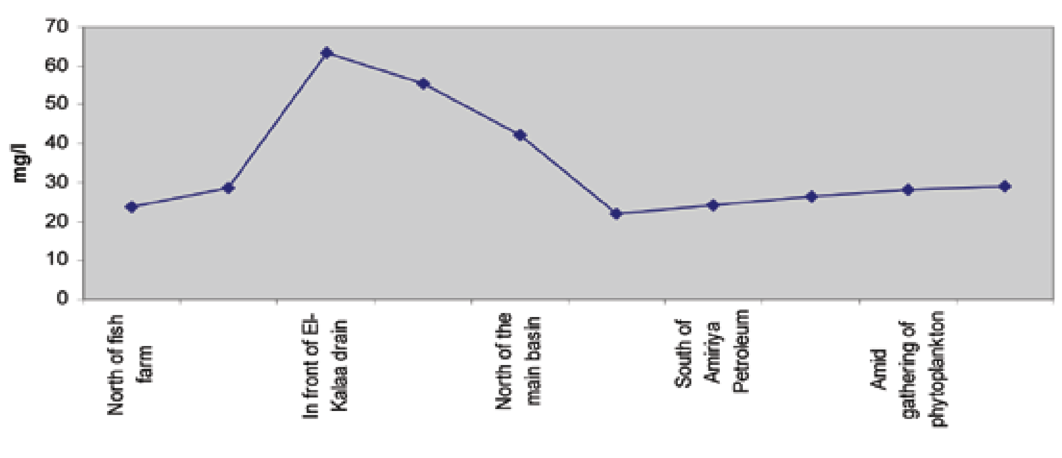


Figure (5-40) shows concentration of chemical oxygen consumed

- Dissolved oxygen in the lake ranged between (2.2 and 13 mg / L), where there was none in front of Bahr El-Bakr drainage.
- Ammonia concentration ranged between (0.034 and 0.7 ng / L), while it reached (2.2 to 3.07 ng / L) in front of El-Qalaa drainage and in the middle of the 3,000 feddans' basin.
- Total nitrogen concentrations ranged between (2.18 and10.803 ng / L).
- Total Coliform exceeded the standard limit (500 cells / 100 ml) at all monitoring points except at the south and north of the fish farm.
- Concentration of iron was the highest among all heavy metals, as shown in figure (5-41).

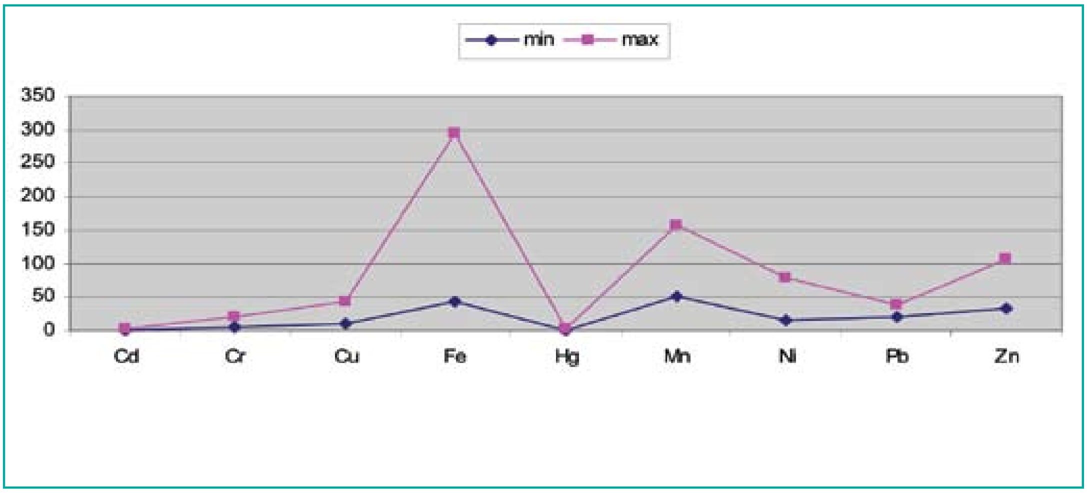


Figure (5-41) shows concentration of heavy metals

- Concentrations of polychlorinated biphenyls ranged between (11.78 and 664.43 mg/L).
- Concentrations of total pesticides ranged between (11.446 and 191.363 mg/L).

1. Quality of sediments:

Monitoring results of sediments quality in lake Mariut during the first campaign conducted in August 2009, indicate the following:

- Total phosphate concentrations values ranged between 0.99 and 1.87 mg / g.
- Total nitrogen values ranged between 1.68 and 5.69 mg / g, as shown in figure(5-42).
- Concentrations of polychlorinated biphenyls ranged between (15.22 and 172.22

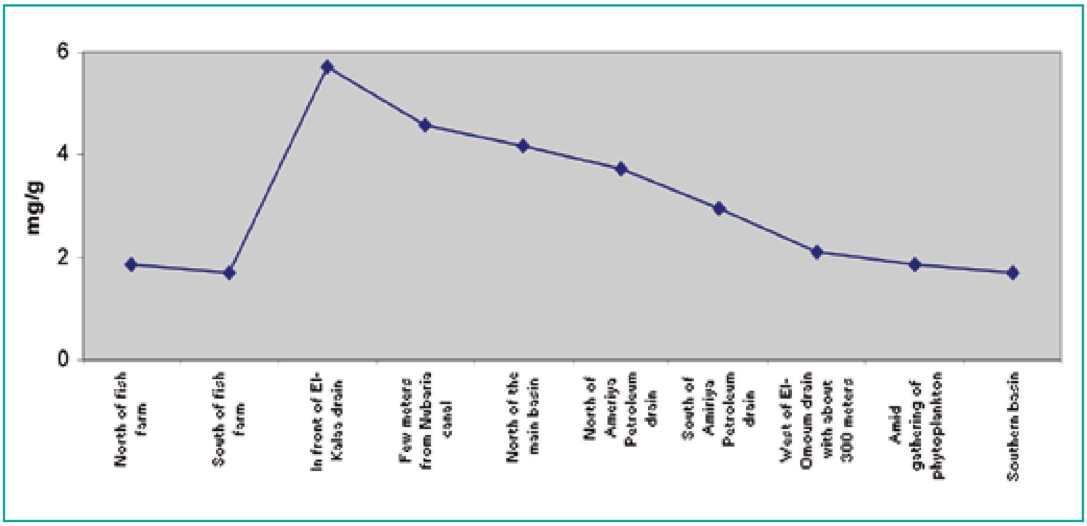


Figure (5-42) shows concentration of total nitrogen ng/g) and the highest value was recorded at South of Amiriya drainage.

- Heavy metals concentrations were not detected, while iron concentrations ranged between (0.14 and 37.5 mg/g).
- Concentration of total pesticides ranged between (0.08 and 6.64 ng/g).

❖ Comparison between monitoring results of the five northern lakes:

First: Water quality in lakes:

Monitoring results showed that iron concentration was the highest compared with other heavy elements concentration, its values ranged between (0.078 and 0.715 mg / L) with highest value recorded in El- Manzala Lake. All values of heavy metals in the rest of the lakes were recorded to be less than 1 mg / L, as shown in figure (5-43).

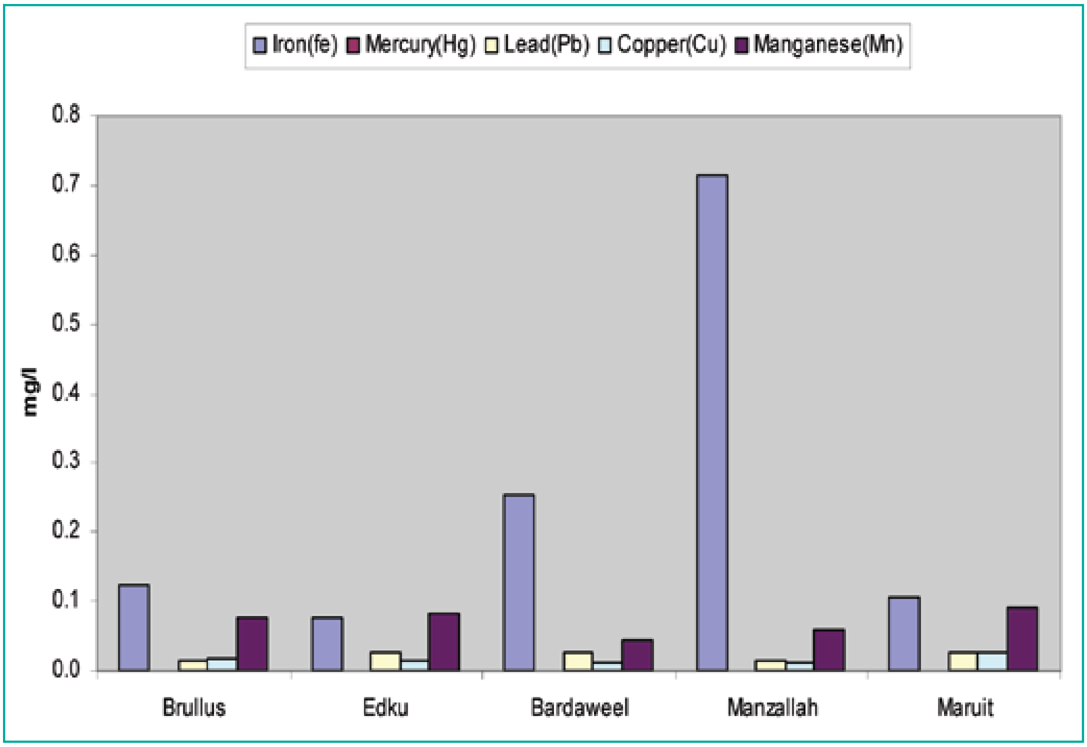


Figure (5-43) shows average concentration of heavy metals

1. Monitoring results of nutrients average concentrations (ammonia - nitrate - phosphate) were recorded at less than 1 mg / L; while ammonia average concentration recorded at its highest value at Mariut Lake which ranged between (0.099 and 0.776 mg / L), as shown in figure (5-44).

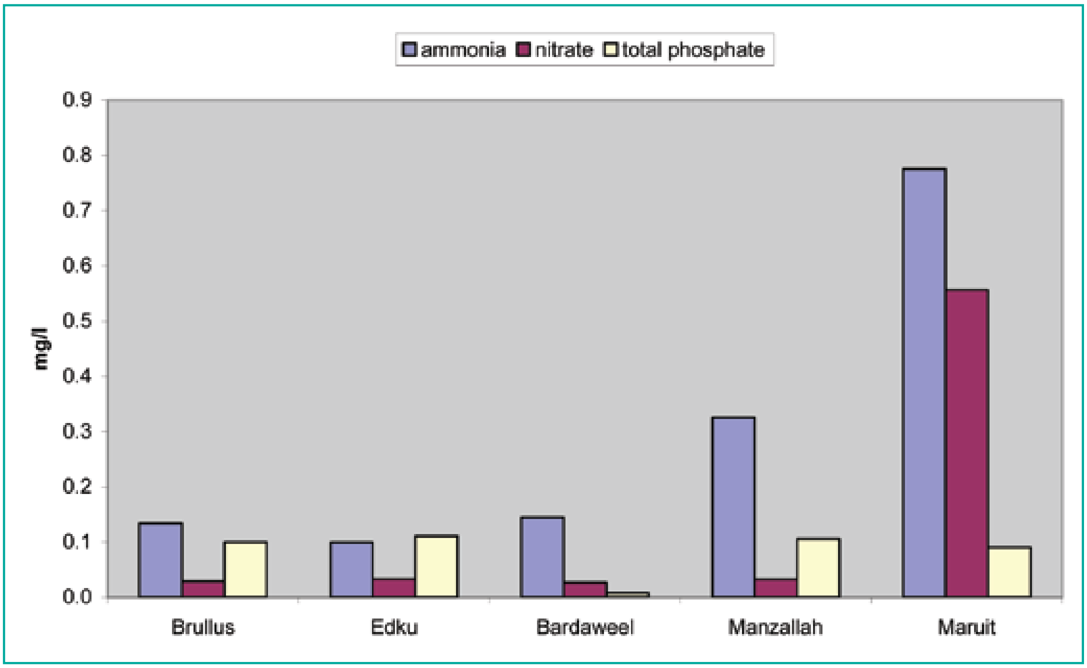


Figure (5-44) shows average concentration of nutrients

2. Pesticides monitoring results indicate that average concentration of pesticides represented by polychlorinated biphenyls ranged between (0.203 and 0.901 ng / L); and its highest value recorded in El-Bardawil Lake. However, concentration of total pesticides were ranged between (0.018 and 0.158 ng / L), and its highest value was recorded in Edku Lake, as shown in figure (5-45).

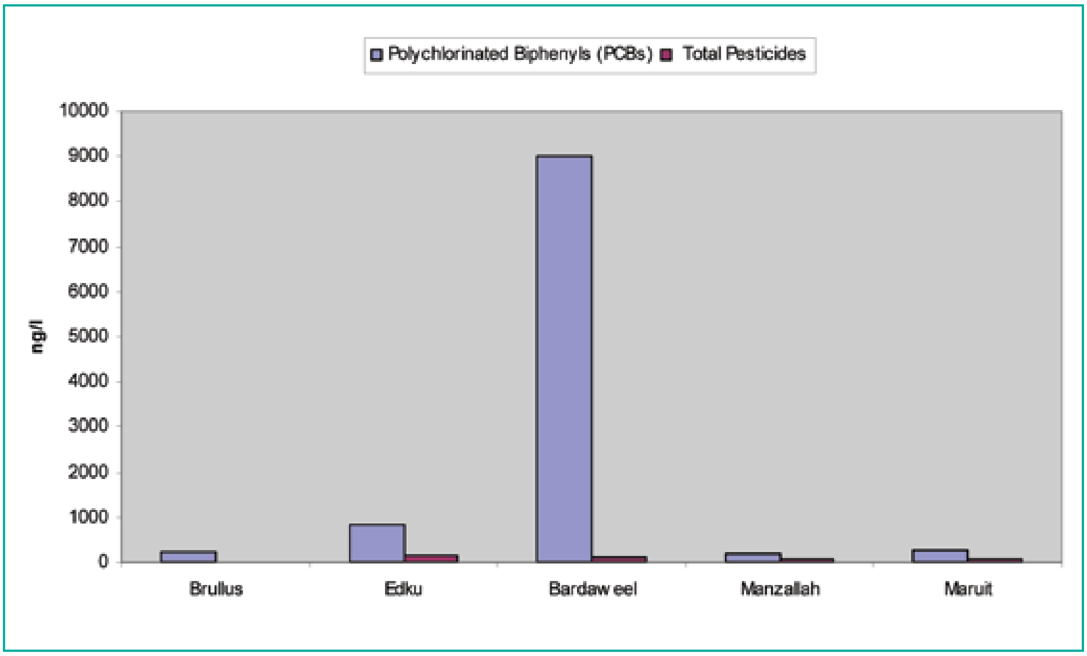


Figure (5-45) shows average concentration of pesticides

3. Monitoring results of the Bacteriological pollutants indicate that total Coliform count ranged between (31.9 and 1292.92 cells / 100 ml), and the highest value was recorded at El- Burullus Lake. However, count of the E.Coli bacteria ranged between (33.75 and 941.01 cells / 100 ml), and its highest value was recorded at Mariut Lake. Count of the Fecal Streptococcus bacteria ranged between (9 and 206 cells / 100 ml) with the highest value recorded at El-Burullus Lake, as shown in figure (5-46).

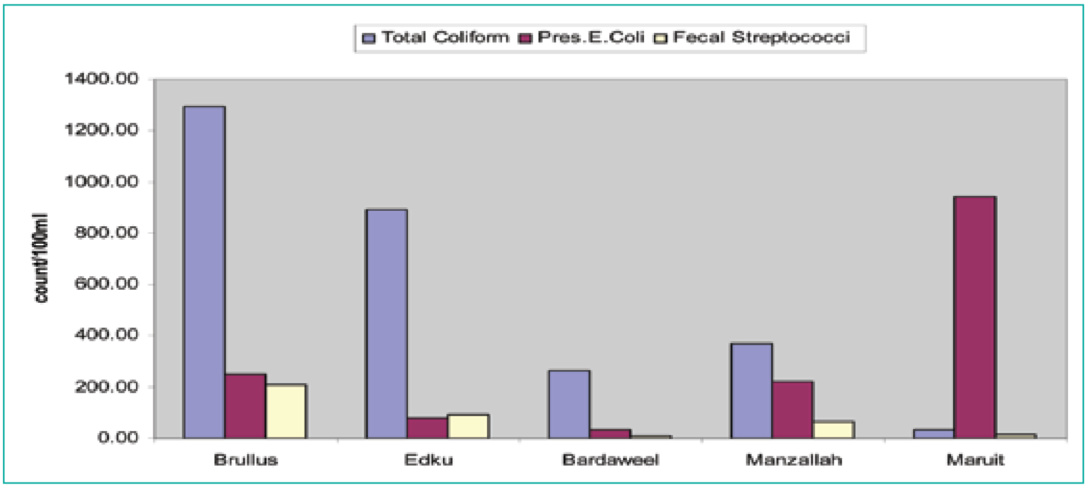


Figure (5-46) shows Bacteriological Pollutants

Second: Sediments quality in Northern Lakes

1. Monitoring results indicate that iron concentration was the highest compared with other heavy metals in the northern lakes, its values ranged between (8.03 and 25.55 mg / g) and the highest value was in El- Burullus Lake. The rest of the heavy metals in all lakes recorded were less than 1 mg/g, as shown in figure (5 – 47).

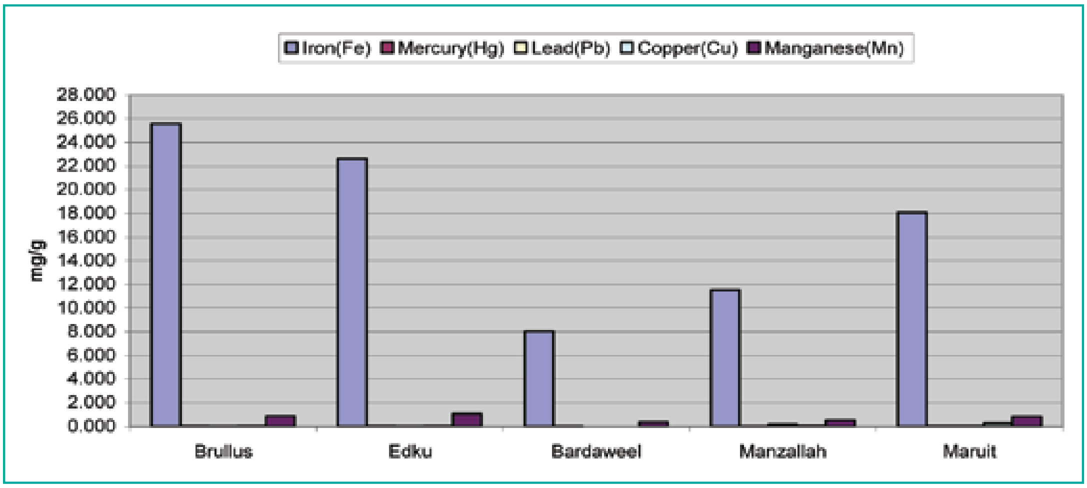


Figure (5-47) shows average concentration of heavy metals

2. Average concentration of total nitrogen ranged between (0.77 and 3.04 mg / g), and its highest value recorded in Mariut Lake; however, average concentrations of phosphate ranged between (0.15 and 1.42 mg / g) , and its highest value was recorded in Mariut Lake , as shown in figure (5-48).

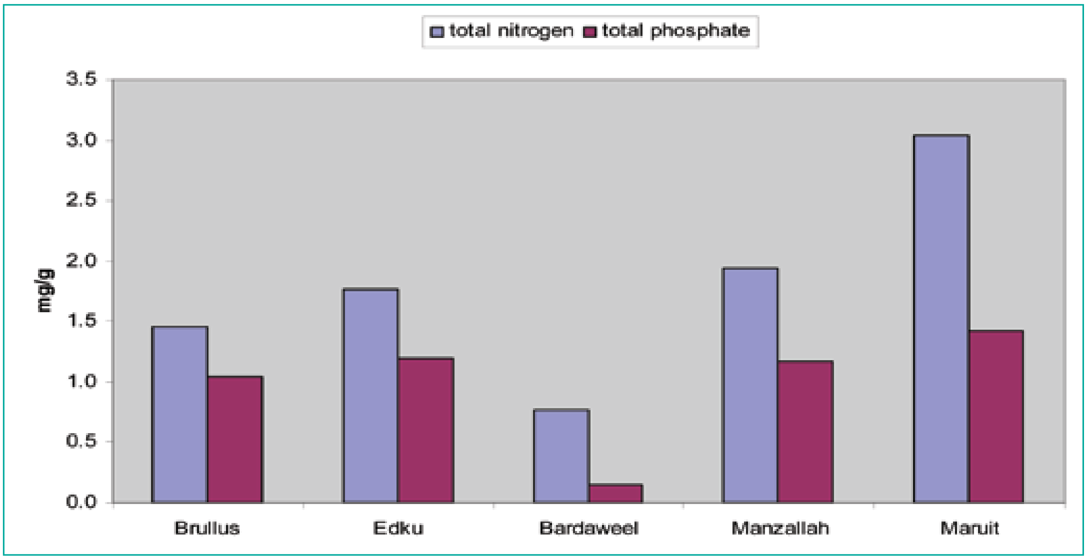


Figure (5-48) shows average concentration of total nitrogen and total phosphate

3. Monitoring results of pesticides indicate that average concentrations of Poly Chlorinated Biphenyls ranged between (11.78 and 53.212 mg / g), and the highest value was recorded in Mariut Lake. Average concentrations of total pesticides ranged between (0.27 and164.4 mg / g), with the highest value recorded in Edku Lake, as shown in figure (5-49).

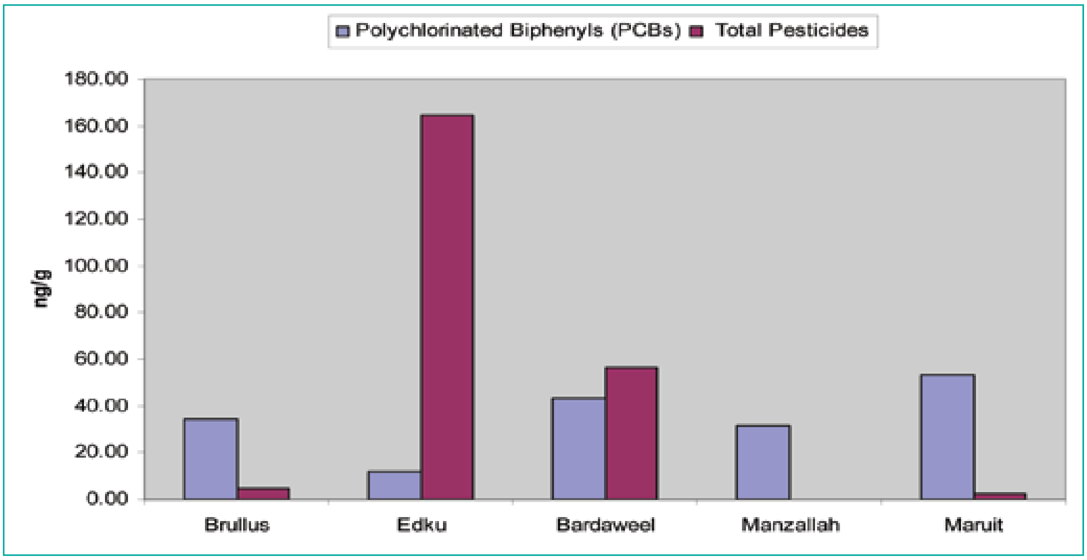


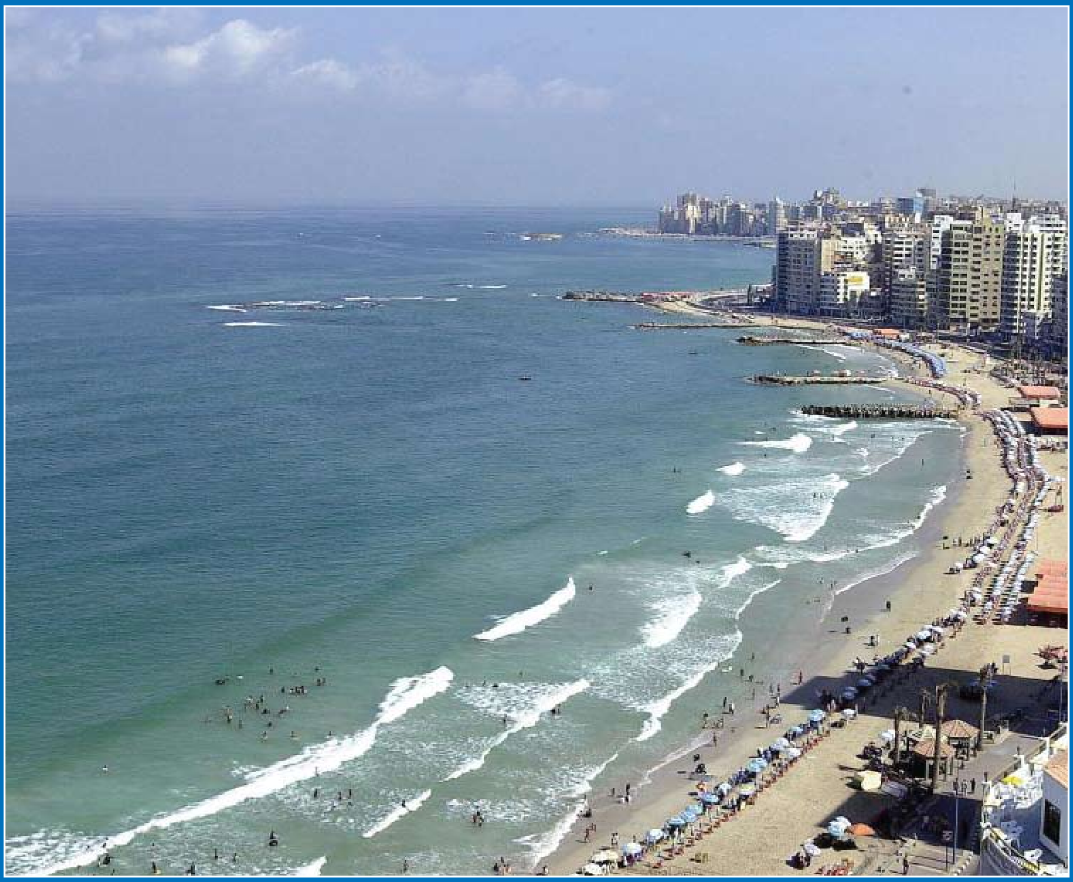
Figure (5-49) shows a comparison between average concentrations of pesticides

References:

1- Ministry of Health and Population: Annual Report, National Network's results for Monitored Pollutants in River Nile and its Branches (2004 -2009).
2- Ministry of State for Environmental Affairs: Annual Report, Nile Water Quality (2000 – 2009).
3- Ministry of Water Resources and Irrigation’s plan to conserve River Nile and its Branches from pollution.
4- National Environmental Action Plan in Egypt (2002-2017).
5- Egypt State of Environment Report (2004-2008).
6- Executive Regulation of Law No. 48 / 1982 and Law No. 9 / 2009.
7- WHO recommendations on the permissible limits for drinking water quality.
8- Higher Committee for Drinking Water’s recommendations on the permissible limits for drinking water quality (1995).
9- Statistical Book of the Central Agency for Public Mobilization and Statistics (2008).
10- Summary of the National Plan for Water Resources (water and future).
11- Report of Main Features of Water Policy towards 2017, Ministry of Water Resources and Irrigation.
12- Recommendations of the symposium entitled "Pollution Risks in Egyptian Lakes and Ways to Reduce" held by "Academy of Scientific Research and Technology, National Committee of Toxins." (May 2009).
13- Report of Environmental Monitoring of Water Resources (Status of Surface and Groundwater Quality - 2008), Ministry of Water Resources and Irrigation.
14- Report, “Has Egypt entered the age of water poverty- 2009,” Support Center and Decision-Making, Cabinet of Ministers.
15- Egypt’s Environmental Statistical Report, 2007.
16- North Lakes’ monitoring reports for the first trip (August 2009), Ministry of State for Environmental Affairs.
17- Website of the Ministry of Water Resources and Irrigation (water information “River Nile”).

Chapter Six

COASTAL AND MARINE ZONES



6-1 Introduction

Egypt enjoys a unique strategic location, with the Mediterranean Sea in the north and the Red Sea in the east. Coasts of Egypt extend to about three thousand kilometers; one thousand, one hundred and fifty kilometers on the Mediterranean Sea from Sallum in the west to Rafah in the east, one thousand two hundred kilometers on the Red Sea, and six hundred fifty kilometers on the Gulfs of Suez and Aqaba.

The strategic importance of the Mediterranean Sea returns to its intercontinental location linking between Asia, Europe and Africa continents; it is a semi closed sea because it is not connected with other seas except for its connection with the Atlantic Ocean through Strait of Gibraltar, the Red Sea through Suez Canal and the Black Sea through Bosporus Canal. Furthermore, when compared to other seas, the Mediterranean Sea is characterized by its unique marine biodiversity and various activities.

The Red Sea is considered the most important main waterway in the world, linking Africa, Asia and Europe continents. Suez Canal located in its north and represents an important navigation artery that has an international strategic importance. The environment of the Red Sea is one of the most important marine biodiversity reservoirs with its rare and unique species such as coral reefs and mangroves, which constitute a diverse eco-system.

Seaports have great importance, as they are considered one of the main routes for trade and a backbone for transport. They are one of the most important sources for national income due to their different activities that serve maritime transport sector such as shipping agencies, building and repairing ships companies, loading and unloading operations, transit operations, and others. All of these contribute effectively to the development of different sectors whether agricultural, industrial or commercial in adjacent areas to ports, and solving the problem of unemployment. Furthermore, Red Sea is famous for therapeutic and diving tourism that contributes to a significant portion of the national income that cannot be ignored.

Part III of Law No. 4/1994 for environment protection -amended by Law No. 9/2009 - and its executive regulations also has been amended, which includes four chapters covering protection of aquatic environment from pollution, whether from marine ships or land-based sources. The law specifies procedures for the prevention of oil pollution from ships and contamination that may occur from vessels carrying harmful liquid substances.

Annex No.1 of the Executive Regulations includes the criteria for discharging certain substances into marine environment; specify allowed and prohibited places for drainage. Annex No. 10 includes non-degradable polluting substances which are prohibited from being discharged into marine environment. The law specifies administrative and judicial procedures that must be taken in case of violation.

6-2 Monitoring program of coastal water

Due to the increase in development activities whether industrial, agricultural, or urban that are being conducted at the Egyptian coasts, which may lead to generating wastes that would negatively affect marine environment and organisms, the Ministry of State for Environmental Affairs developed a national program which aims at establishing accurate database for coastal water quality in Egypt, protecting marine environment from pollution and monitoring changes on coastal water quality resulting from these activities to take needed corrective actions in a timely manner.

This program monitors water quality along Egyptian coast periodically to follow-up on water quality, identify sources of pollution and to assess pollution indicators along the Egyptian Mediterranean coasts from Rafah in the east to Sallum in the west; Gulf of Suez and Red Sea from Suez in the north to Bir Shalatin in the south, and Gulf of Aqaba from Taba in the north to Ras-Mohammed in the south.

This program is implemented in collaboration with both "National Institute of Oceanography and Fisheries" to monitor coastal water quality in the Red Sea, Gulf of Suez and Aqaba; and with the Institute of Postgraduate Studies and Research at the University of Alexandria to monitor coastal water quality in the Mediterranean.

The monitoring program started in 1998 by selecting fixed stations along coasts of the Mediterranean, the Red Sea, Gulfs of Suez and Aqaba. Monitoring was conducted seasonally on a regular basis every year, through four monitoring schedules (March, May, July, and September); during which the physical, chemical and microbiological indicators are measured, as follows:

1. Physical measurements (temperature - pH - dissolved oxygen -electrical conductivity - salinity - transparency).
2. Chemical measurements (nitrate - nitrite - ammonia - total nitrogen - phosphate - total phosphorus - chlorophyll-a - silicate).
3. Bacteriological measurements (coliform bacteria -streptococcus bacteria -Escherichia coli).

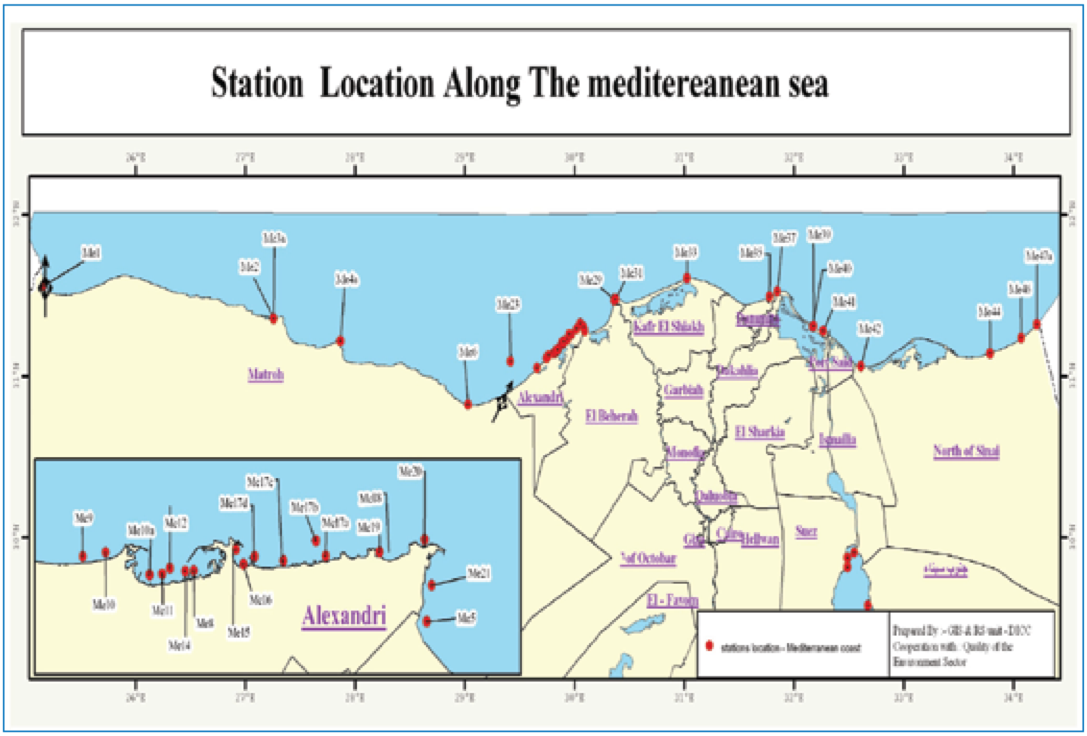
6-2-1 Monitoring water quality in the Mediterranean Sea

Thirty fixed monitoring stations have been selected along the Mediterranean coast from Sallum in the west to Rafah in the east to cover all activities affecting residential areas, ports, industrial companies and touristic villages, in addition to some reference stations. These sites have been divided into four main areas, which are: -
Western Region: extends from Salloum (Me1) to West Nubariya drain (Me8).
Alexandria Area: extends from Hanoville (Me9) to Boghas El-Maadia (Me25).
Delta Region: extends from Rashid 1 (Me29) to the East of El-Gamel (Me40).
Eastern Region: extends from Port Said (Me41) to Rafah (Me47a).

Table (6-1) shows stations' names and their symbols,

Name	Symbol	Name	Symbol
Sallum	Me1	Sidi Gaber	Me17b
Mersa Matrouh	Me2	Montaza	Me19
Bagoush	Me4a	Abou Quir W.	Me20
Marina	Me6	Abou Quir E.	Me21
Sedi Kerir	Me7a	Electric station	Me23
Nobareia	Me8	Maadia	Me25
Hanoville	Me9	Rashid -1	Me29
El Bitach	Me10	Rashid -2	Me31
El Dikhelia	Me10a	El Burg	Me33
El Mex	Me11	Demitta	Me35
Alex. E. Harbor	Me12	El -Jamil W.	Me39
NIOF outlet El-Anfoushi	Me14	El -Jamil E.	Me40
Alex. E. Harbor	Me15	Port Said	Me41
Alex. W. Harbor	Me16	El Arish	Me44
Shatby	Me17a	Rafah	Me47a

Map (6-1) shows the monitoring sites on the Mediterranean coast.



Map (6-1) shows the monitoring sites on the Mediterranean coast

6-2-2-1 Monitoring Water quality of the Mediterranean:

Through the monitoring network that exists along the Mediterranean coast, samples have been taken from coastal waters during four field trips in 2009 (March - May - July - September) and have been analyzed to take the physical, chemical and microbiological measurements. Results of analysis are as follows:

❖ Physical measurements:

Monitoring results of water quality for the Mediterranean show:

1. The concentration of dissolved oxygen (DO) is higher than the internationally permissible limits in all stations during the year with the exception of stations Me40 and Me16, which recorded the lowest values during the monitoring trip in May and July, respectively. This could be due to direct sewage disposal to those areas.

Figure (6-1) shows a comparison between the concentrations of dissolved oxygen during the four trips in 2009

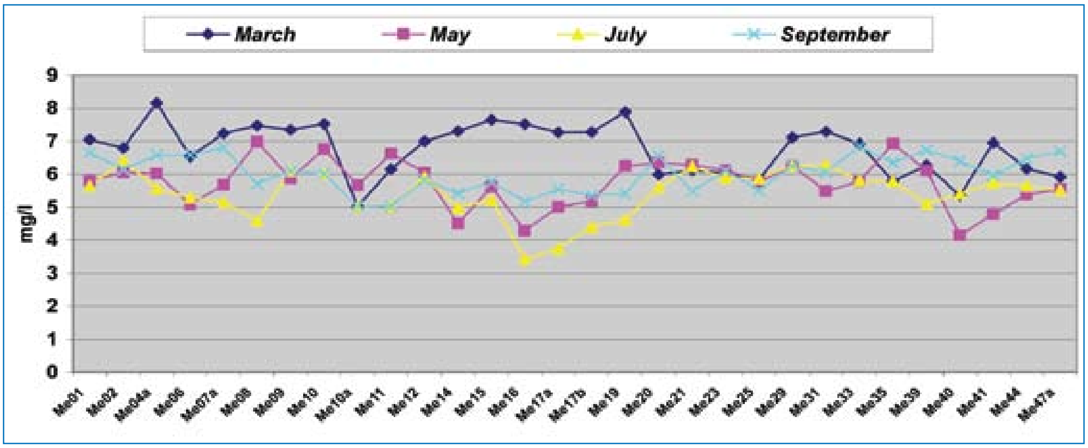


Figure (6-1) shows comparison between the concentrations of dissolved oxygen during the four trips in 2009

2. Salinity concentrations ranged, in all monitoring sites during 2009, between (28.06 -38.35 mg / L).
3. pH values and temperatures were within the natural limits of the coastal water during different periods of the year.
4. The highest transparency of water was recorded in the western sector of the coast, while it was less transparent in the delta region due to the increase of different activities at the estuaries of the river.

❖ Chemical measurements

According to monitoring the effects of nutrients on water quality of the Mediterranean during the four annual trips in 2009, they were low in most observations, as follows:

1. Concentration of total nitrogen recorded gradual decline during the four trips as shown in Figure (6-2) and recorded its highest value in Port Said station (0.29 mg / L) during March.

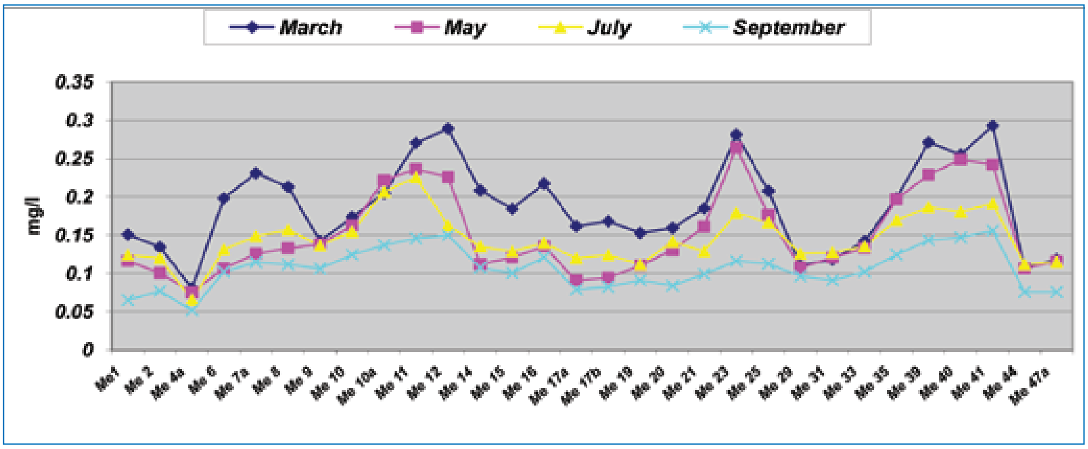


Figure (6-2) shows Comparison between the concentration of total nitrogen during the four trips in 2009

By comparing the average concentration of total nitrogen in 2009 with the average concentration during the last two years, it was noticed that there was a significant decrease in all sites if compared to 2007 values, in addition to a significant decrease in most of the monitoring sites if compared to 2008 values, as shown in figure (6-3).

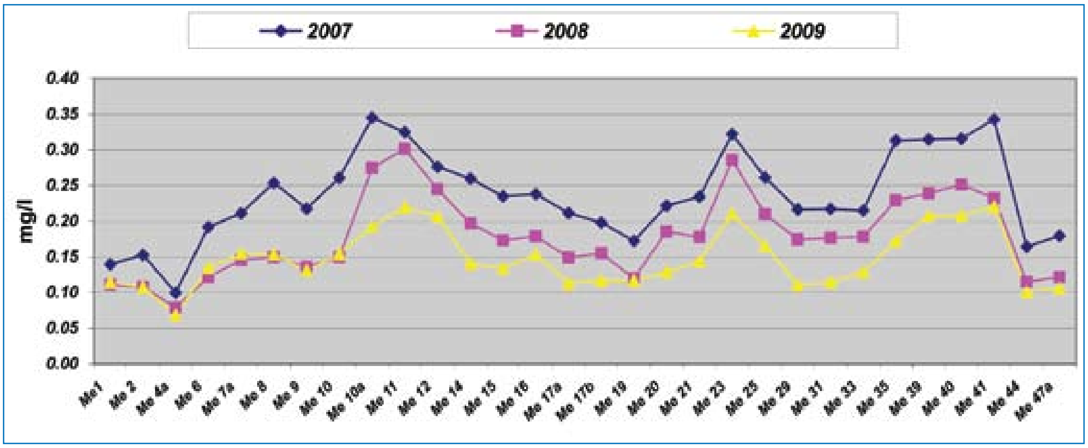


Figure (6-3) comparison between the average concentrations of total nitrogen along the Mediterranean coast between 2007 to 2009

2. There was a significant decrease in the concentration of ammonia in most of the monitoring sites, where it was within the permissible limits during all trips except for the Max and Electric stations, where the concentrations were (0.094 and 0.084 mg / L) respectively, as shown in figure (6-4).

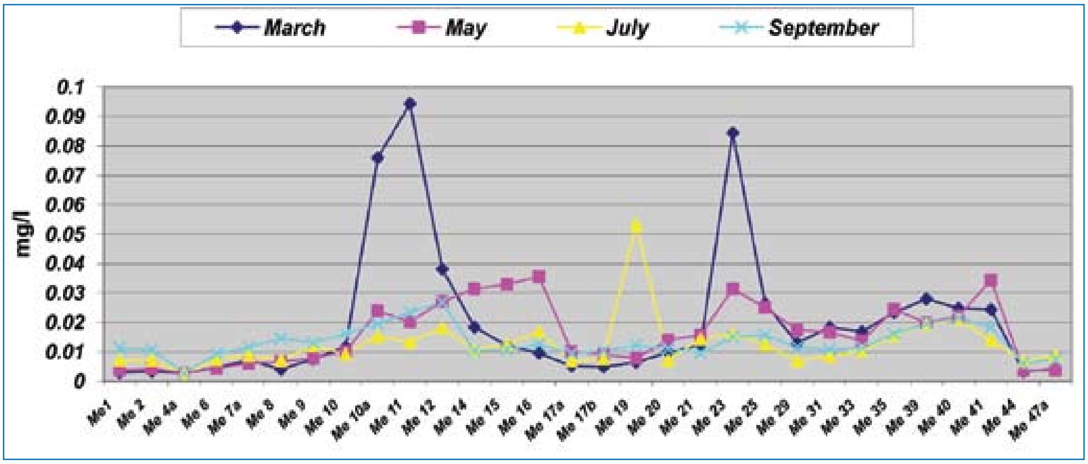


Figure (6-4) shows comparison between the concentration of ammonia in the four trips in 2009

By comparing the average concentration of ammonia in 2009 with the previous two years, it is clear that there is a decrease in concentration during 2009, as a result of some factories reconciliation of their environmental status by stopping discharge of their wastes on the Mediterranean coast. Figure (6-5) shows comparison between the average concentrations of ammonia during the previous three years.

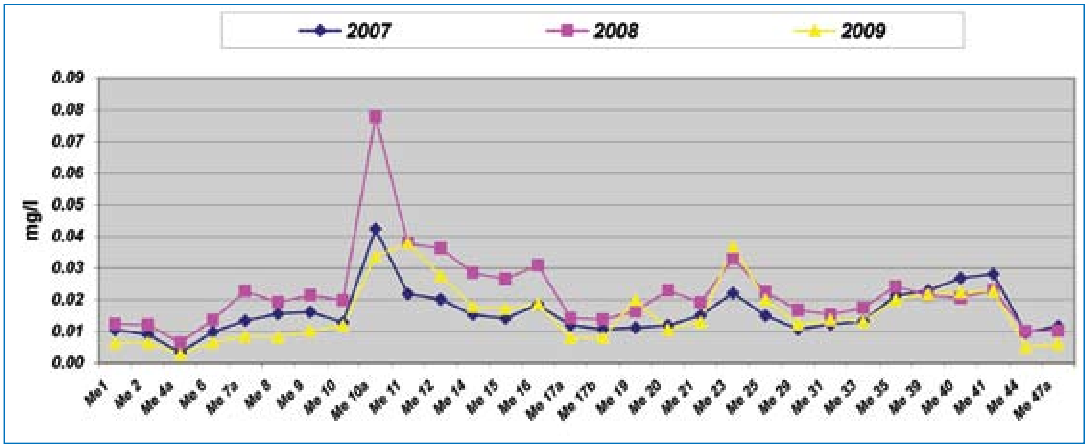


Figure (6-5) shows comparison between the average concentrations of ammonia along the Mediterranean during the years from 2007 to 2009

3. Values of chlorophyll-a varied, in which the least concentration (0.59 micrograms / L) was in the reference region (Baghoush), and the highest values were recorded in the areas of Max, Dekhila, Elborg, Maadia, Elgamel and the power station. This may be due to agricultural, sanitary and industrial discharge in those areas. Figure (6-6) shows a comparison between the four trips in 2009.

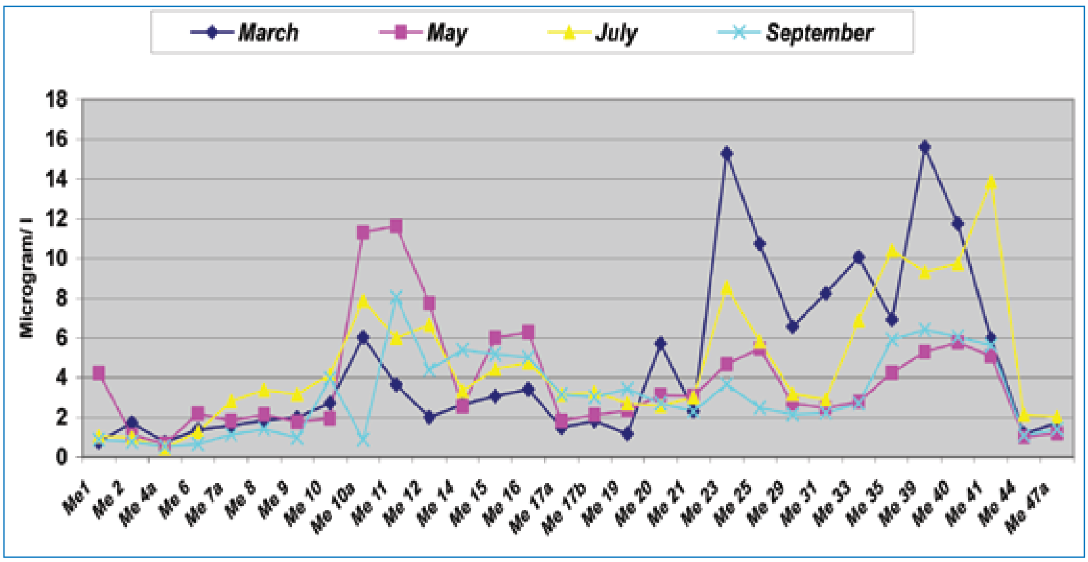


Figure (6-6) shows the results of chlorophyll - a along the Mediterranean coast

By comparing the average concentration of chlorophyll-a in the four trips in 2009 with those in the last two years, there was a decline in most of the sites compared to previous years except for Maadia station and the ELborg as a result of Edku water Lake effect. Figure (6-7) shows a comparison between the three previous years.

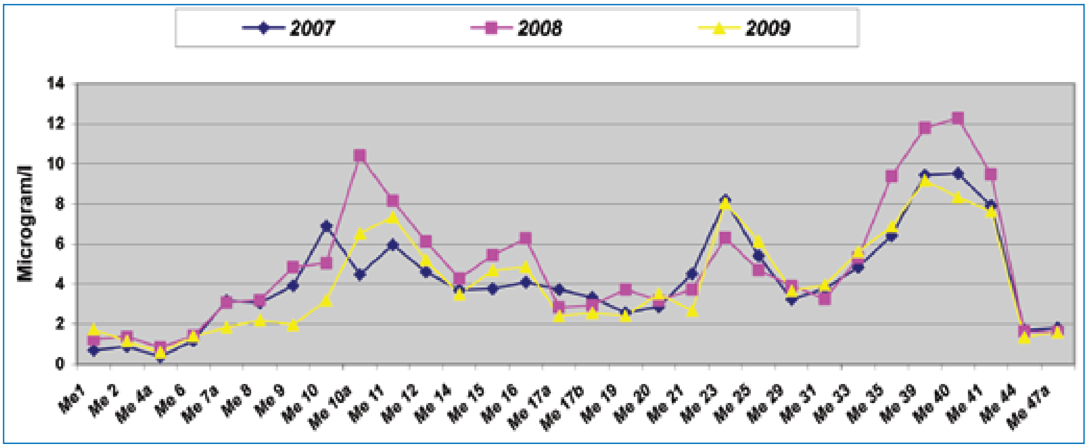


Figure (6-7) shows comparison between the average concentration of chlorophyll - a in the years from 2007 to 2009

4. Nitrite concentration was low, ranged between (0.002, 0.033 mg / L) and recorded its highest value in the Maadia area (Me25), and its lowest value in Salloum station (Me1).

5. Nitrates concentration was relatively higher than nitrite. The highest value has been recorded in the Electric station (Me23) 0.098 mg / L and the lowest value has been recorded in Marina station (Me6) 0.005 mg / l.

6. Total phosphorus concentration ranged between (0.007, 0.093 mg / L).The highest concentration was recorded in the Eastern Harbor Station (Me12) and the lowest value in the reference station Baghoush (Me4a).

❖ Bacteriological measurements

The Bacteriological measurements were made for water samples in the Mediterranean during the four field trips in 2009 for each of the total coliform bacteria, escherichia coli bacteria and fecal streptococci bacteria, living in the intestines and stomach of humans and other living organisms; their presence in water is considered an indicator of sanitation pollution. Results were compared to European standards of 1988 and Egyptian standards of 1996, as follows: -

- Total coliform bacteria 500 cells / 100 ml of water,
- Escherichia coli bacteria (E.coli) 100 cells / 100 ml of water,
- Fecal streptococci bacteria 100 cells / 100 ml of water.

Results of monitoring during 2009 were good in some monitoring sites as water quality was clean and free from fecal contamination but exceeded the limits in some monitoring sites, particularly in (Elborg, Dekhila, and Max), where the concentration of bacterial count was very high and thus may be due to wastewater sanitary discharge.

Figures (6-8) and (6-9) show the potential count for each of the total coliform bacteria and escherichia coli bacteria along the Mediterranean coast in 2009.

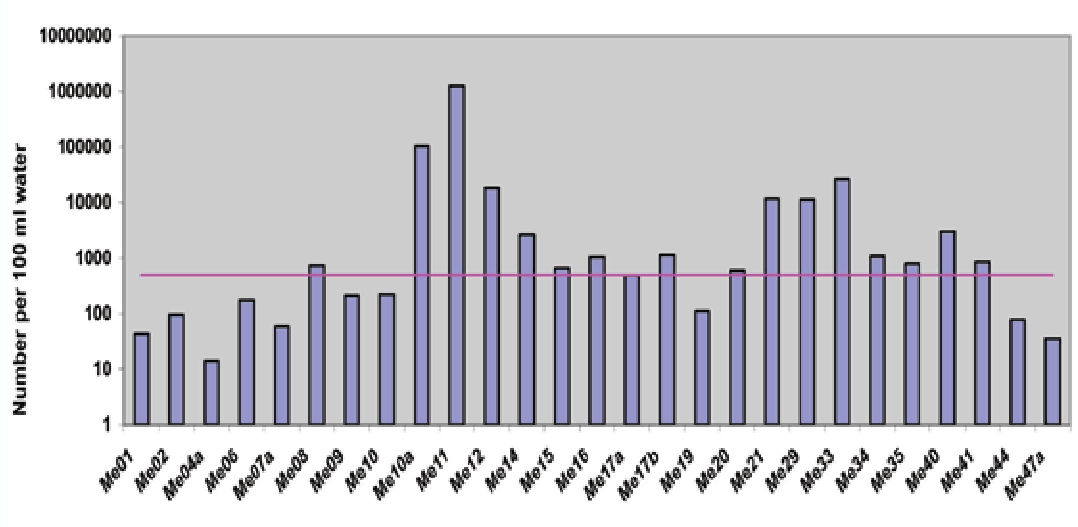


Figure (6-8) shows the average bacterial count of total coliform along the Mediterranean coast in 2009

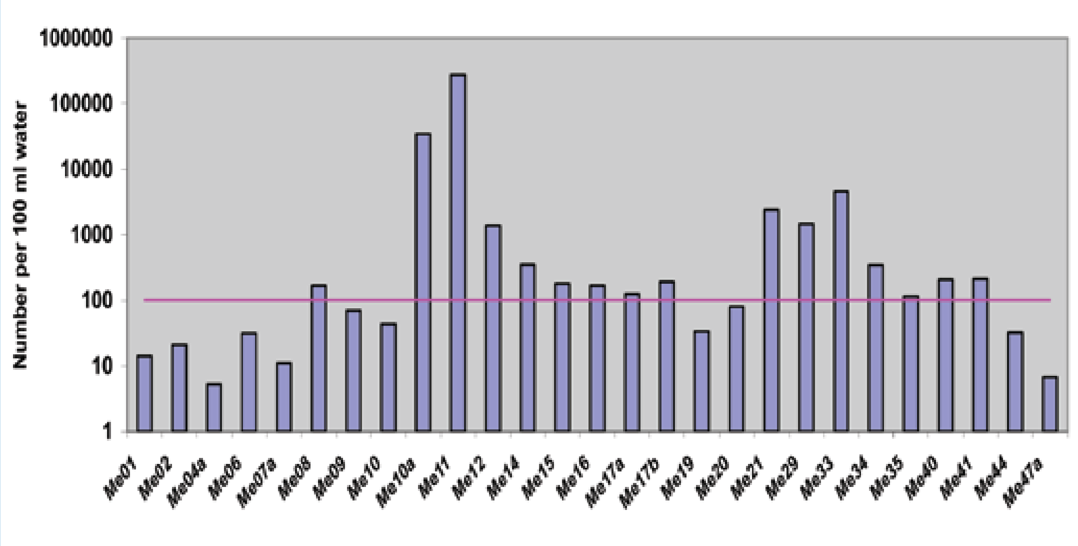


Figure (6-9) shows the average bacterial count of the bacteria escherichia coli along the coast of the Mediterranean in 2009

In general, results of different analyses show an improvement in water quality of the Mediterranean compared to previous years as a result of efforts being conducted through cooperation with stakeholders, continuous inspection of industrial and touristic resorts discharging directly or indirectly in the Mediterranean as well as factories reconciliation of their environmental standards.

6-2-2: Monitoring water quality in the Red Sea, Gulf of Suez and Aqaba

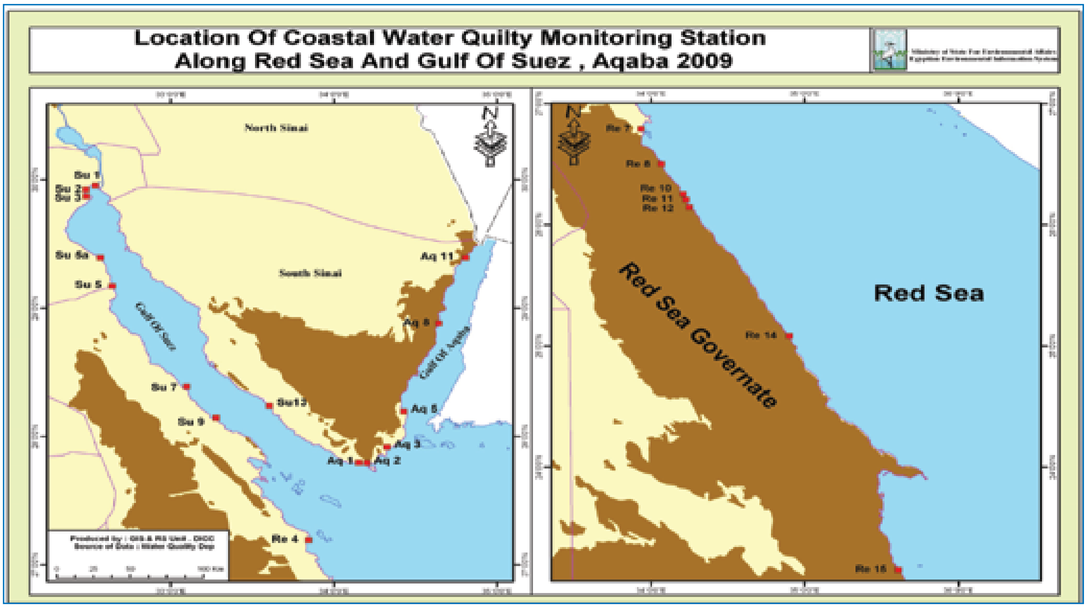
22 monitoring stations have been tested along the coast of the Red Sea, Gulf of Aqaba and Suez divided as follows: -

- 6 monitoring stations on the Gulf of Aqaba.
- 8 monitoring stations on the Gulf of Suez.
- 8 monitoring stations on the Red Sea coast.

Table (6-2) shows stations and their symbols along the coast of the Red Sea, Gulfs of Suez and Aqaba.

Name (Suze Gulf)	Symbol	Name (Red Sea)	Symbol	Name (AqabaGulf)	Symbol
Suez – South of Suez Canal (Port Tawfiq)	SU1	Hurghada-hotel sheraton	RE4	Sharm El Sheik (Ras Mohamed)	AQ1
Suez- in front of NIOF	SU2	Safaga - North Coast of the city	RE7	Entrance of Sharm El Sheik Harbor	AQ2
In the area of the fishing port Ataqa	SU3	Safaga - In front of the Red Sea Phosphate Co.	RE8	Inside Sharm El Sheik Harbor	AQ3
Ain Sukhna Harbor	SU5-a	El Hammarawein - North harbor	RE10	Nahklit Eltal - in the protected area	AQ5
Ain Sukhna	SU5	Quseir – In front of phosphate mining area	RE11	Ras Nubar - outside the intertidal zone	AQ8
Ras Gharib - South of the city (oil fields)	SU7	Quseir – In front of the phosphate harbor	RE12	Nuweiba (Miklbp Harbor) - in the protected area	AQ11
Ras Shukeir- front of harbor	SU9	Marsa Alam - In front of the harbor outside the intertidal zone	RE14		
El Tur - The public beach of the city outside the intertidal zone	SU13	Bir Shalatin – In front of the fishing port	RE15		

Map (6-2) shows sites of water quality monitoring stations in the Red Sea, Gulf of Suez and Aqaba.



Map (6-2) shows sites of water quality monitoring stations in the Red Sea, Gulf of Suez and Aqaba.

6-2-2-1 Water Quality of the Red Sea coast:

❖ **Physical measurements:**

Monitoring results of water quality for the Red Sea during 2009 four trips include:

1. Concentration of dissolved oxygen (DO) was higher than the global allowed limit and recorded its highest value (8.66 mg / L) during March in Quseir station (RE11), while its lowest value (4 mg / L) recorded during May at Bir Shalatin station in front of the fishing port (RE15) as a result of the presence of fishing activities.

Figure (6-10) shows comparison between concentrations of dissolved oxygen during 2009

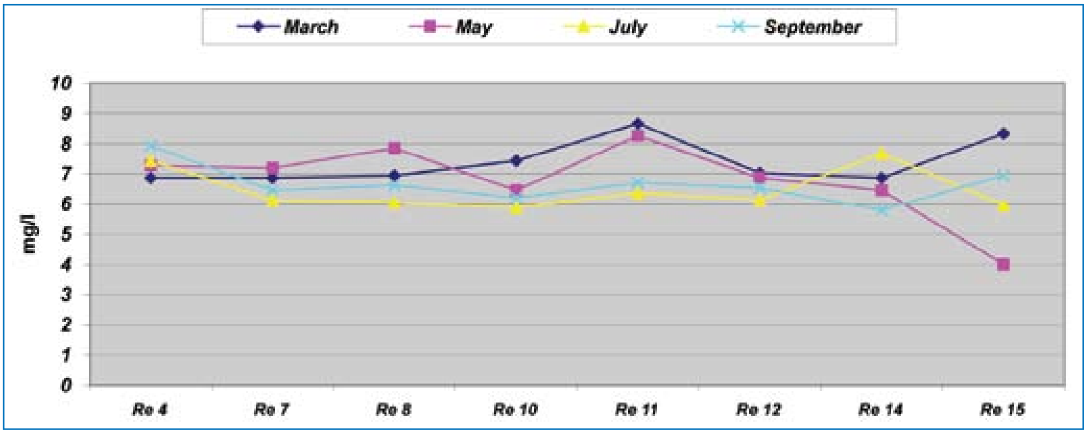


Figure (6-10) shows a comparison between concentrations of dissolved oxygen during 2009

2. Water temperature recorded its maximum rate during July and its minimum in March. The hydrographic variables showed that there are no thermal pollution or heat divisions in different coastal areas. The southern area of the Red Sea (Bir Shalatin) was characterized by a relative increase in temperature from the rest of the monitoring zones.

3. There were minor and intangible changes in salinity and pH in different monitoring areas during this year, based on the overall level of each of these areas.

It was clear from the above mentioned that various hydrographic variables were within their normal levels and the impact of outer discharge or human activity is still limited.

❖ Chemical Measurements

Levels of chemical measurements were studied to check the status and quality of coastal waters and the impact of different conditions, such as quantities and quality of discharge and human activity in different places and times. 2009 monitoring results were as follows:

1. General average of total nitrogen was (0.73 mg / L), where the concentration was generally low. Figure (6-11) shows a significant decrease in total nitrogen concentration between the beginning and end of the year as a result of decreasing ports' activities along the coast during summer months.

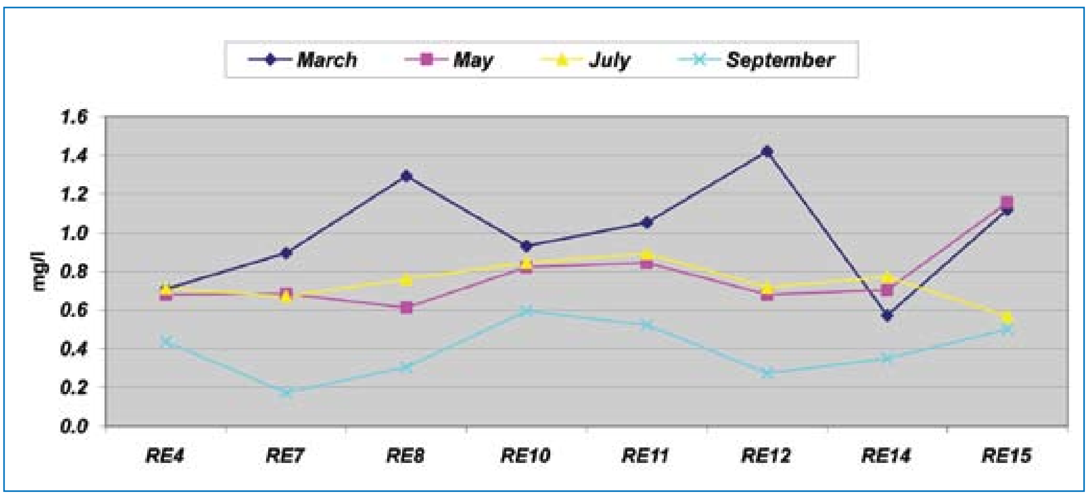


Figure (6-11) shows comparison between the concentrations of total nitrogen along the Red Sea coast during the four trips in 2009

2. Ammonia concentrations along the Red Sea coast were very low, as values ranged between (0.004 - 0.026 mg / L) as a result of the lack of discharge from land-based sources. Figure (6-12) shows a comparison between ammonia values during different months along the coast.

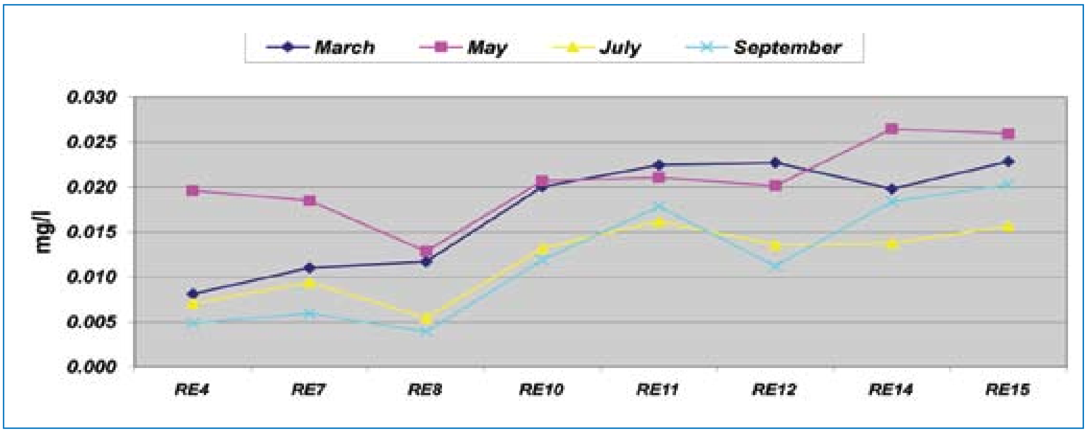


Figure (6-12) shows comparison of ammonia concentration along the Red Sea coast during the four trips in 2009

3. Chlorophyll-a concentrations, which is a basic dye in phytoplankton, are low in all monitoring points of the Red Sea, where its values ranged between (0.1 - 0.83 mg / L).

4. There were very simple ratios of suspended materials in water, as well as an increase in the transparency of water that extended to include the entire water column in most of the points. Figure (6-13) shows a comparison between concentrations of chlorophyll-a during the different months along the coast of the Red Sea.

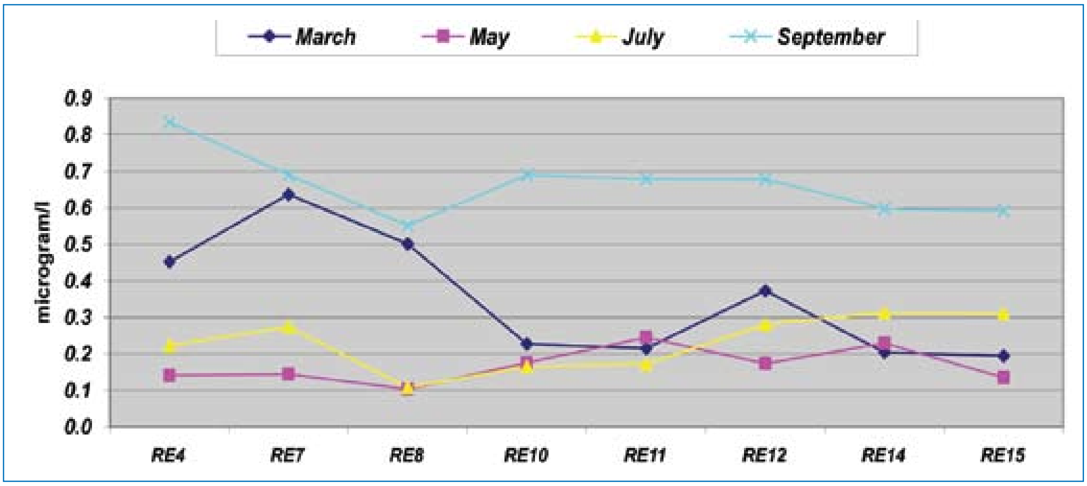


Figure (6-13) shows comparison between the concentrations of chlorophyll - a coast along the Red Sea during four trips in 2009

There was variation in total phosphate concentration from station to another, as it recorded its highest value in EL-Hamarawein (Re10) and Quseir (Re12) (0.137 - 0.084 mg / L) respectively during March. Figure (6-14) shows concentrations of total phosphorus along the Red Sea coast.

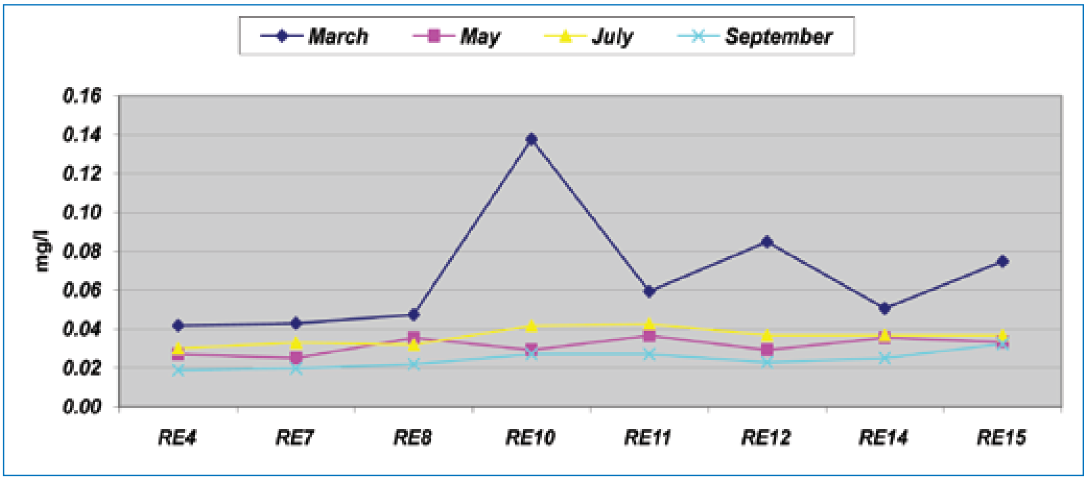


Figure (6-14) shows comparison of concentration of total phosphorus along the Red Sea coast during the four trips in 2009

❖ Bacteriological measurements

Numbers of bacteria, which are indicators of contamination with human fecal, were monitored. Results were acceptable and within the permissible limit along the Egyptian coast of the Red Sea, most of the year, in seven monitoring stations out of eight stations; while Bir Shalatin (Re15) recorded a relatively simple increase during most of the year for escherichia coli bacteria, which may be due to random hunting and presence of a large number of primitive fishing boats. Figure (6-15) shows the bacterial count of total coliform along the Red Sea coast.

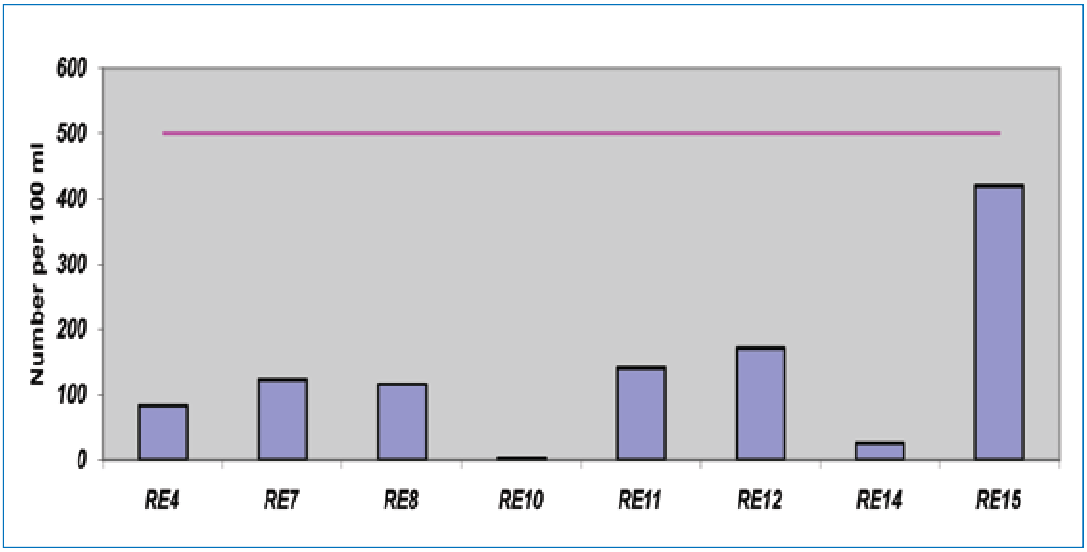


Figure (6-15) shows a count of total coliform along the coast of the Red Sea in 2009

6-2-2-2 Water quality in Gulf of Suez coast:

Monitoring results of water quality in Gulf of Suez coast, during the four annual trips of 2009, show:

❖ **Physical measurements:**

1. Dissolved Oxygen (DO) concentration was within global allowed limits which represent water quality and vitality; its highest value was 9.81 mg / L during May at Suez station (SU2), while its lowest value was 6.05 mg / L during September at Ataqa fishing port station (SU3), which is still higher than the allowed minimum.

Figure (6-16) shows a comparison between concentrations of dissolved oxygen during different months of 2009.

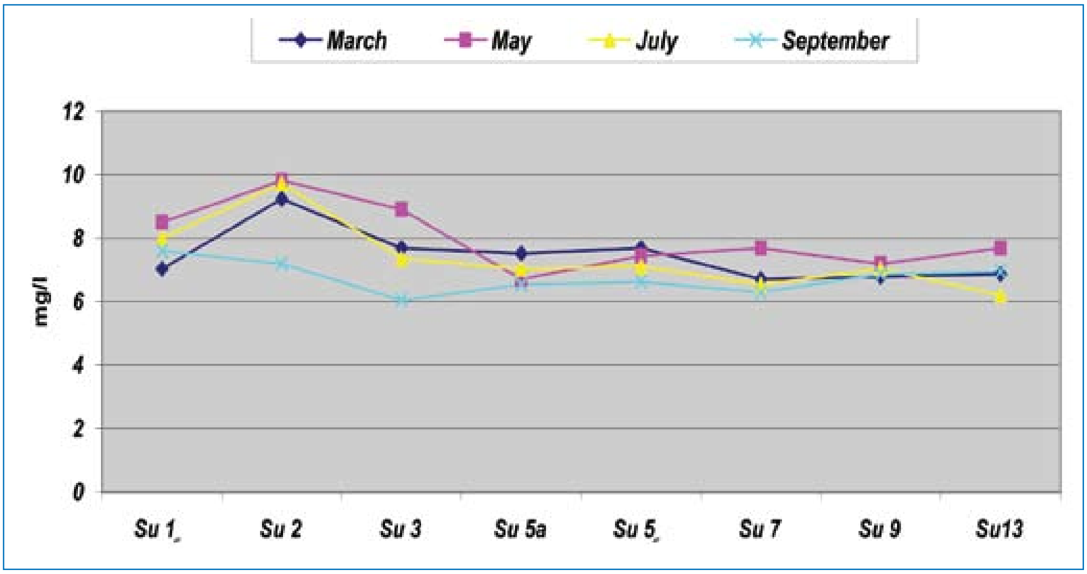


Figure (6-16) shows comparison between the concentration of dissolved oxygen along the coast of the Gulf of Suez during the four trips in 2009

2. Temperature was within the normal rate of the year in the Gulf of Suez.
3. Salinity concentrations were also within the natural level of coastal water as values ranged between (42.86 - 39.12 mg / L).

❖ **Chemical Measurements**

1. Total nitrogen concentration was low in monitoring points of the Gulf of Suez, except in its northern part, which includes stations from Su1 to Su3 that recorded a relatively high concentration. This was connected with the direct effect of

different types of industrial waste and sewage discharged on the northern region of the Gulf of Suez. The highest recorded value was 3.46 mg/L in Ras Gharib (SU7) and the lowest value 0.24 mg /L in Ras Shukheir (SU9).

Figure (6-17) shows a comparison between total nitrogen concentrations along the Gulf of Suez coast, during 2009.

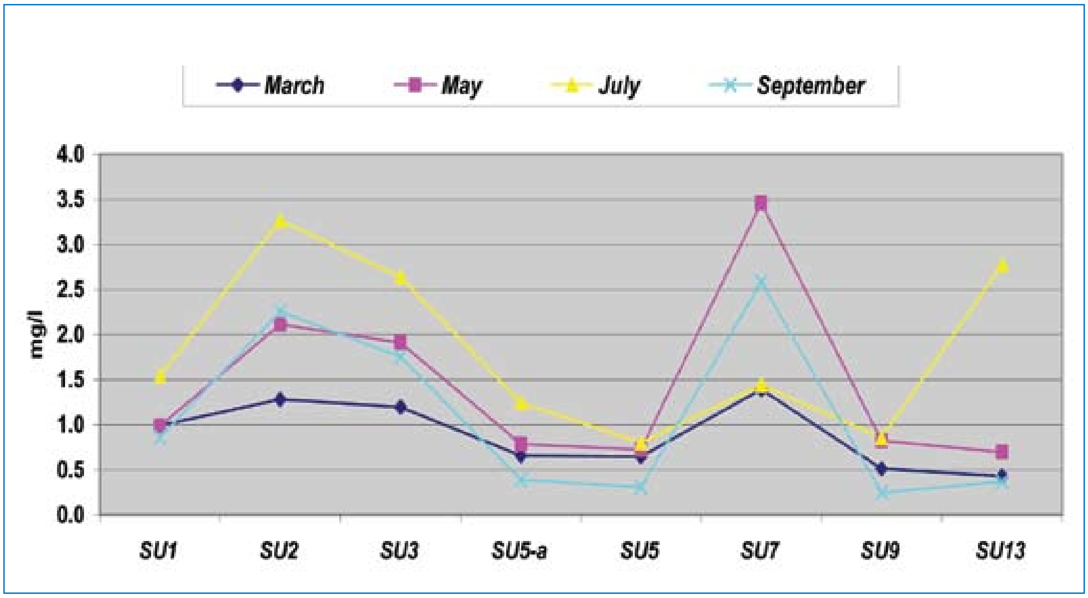


Figure (6-17) shows comparison between the total nitrogen concentration along the coast of the Gulf of Suez during the four trips in 2009

2. General average of Nitrate was (0.06 mg / L); its highest concentration was recorded in the northern part of the Gulf of Suez.

3. General average concentration of Nitrite was (0.01 mg /L) which is very low compared to the rest of the monitoring sites.

According to these results, northern region of the Gulf of Suez located between Port Tawfiq and Adabiah fishing port (Su1 & Su3) can be considered one of the rich areas with nutrients according to the global estimates of these elements. The rest of the areas of the Gulf of Suez, with the exception of Ras Gharib, recorded low concentrations of these elements.

4. Results showed an increase in ammonia concentrations compared to the rest of nutrient salts, which indicates an increase rate of produced ammonia than the consumed by phytoplankton as it is the primary source of nitrogen necessary for building protein for these organisms. The highest recorded value was (0.66 mg / L) in Ras Gharib (SU7) and the lowest value was (0.004 mg / L) in Ras shukheir (SU9). Figure (6-18) shows concentration of ammonia along the coast of Gulf of Suez.

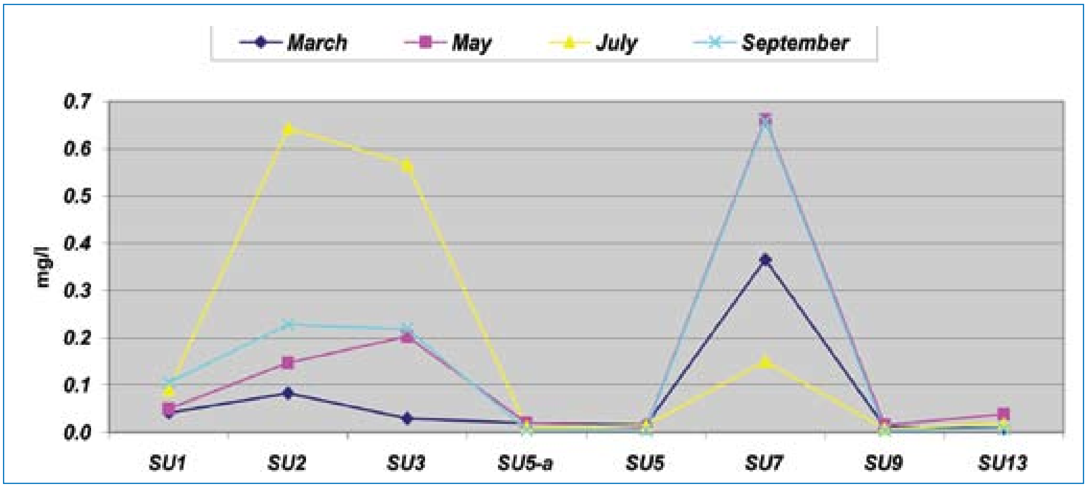


Figure (6-18) shows comparison of ammonia concentration along the coast of the Gulf of Suez during the four trips in 2009

5. Values of chlorophyll a were low in most of the monitoring areas on the coast of the Gulf of Suez, while they were relatively high in its northern part, which includes stations of (Suez "Bor Tawfiq" Su1–Ataka fishing port Su3) due to being affected by all kinds of direct drainage. Values ranged between (0.14 - 5.3 micrograms / L). Figure (6-19) shows a comparison between concentrations of chlorophyll a along the coast of the Gulf of Suez in 2009.

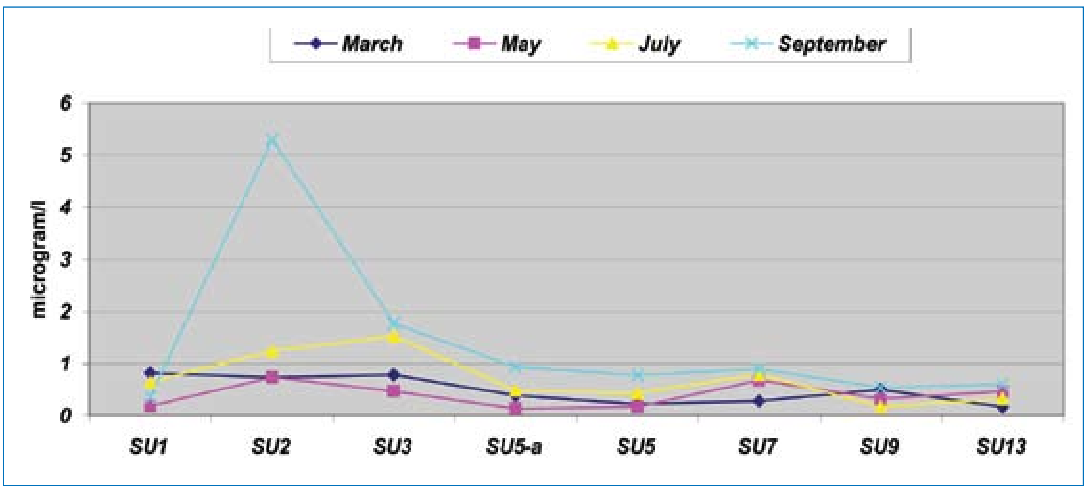
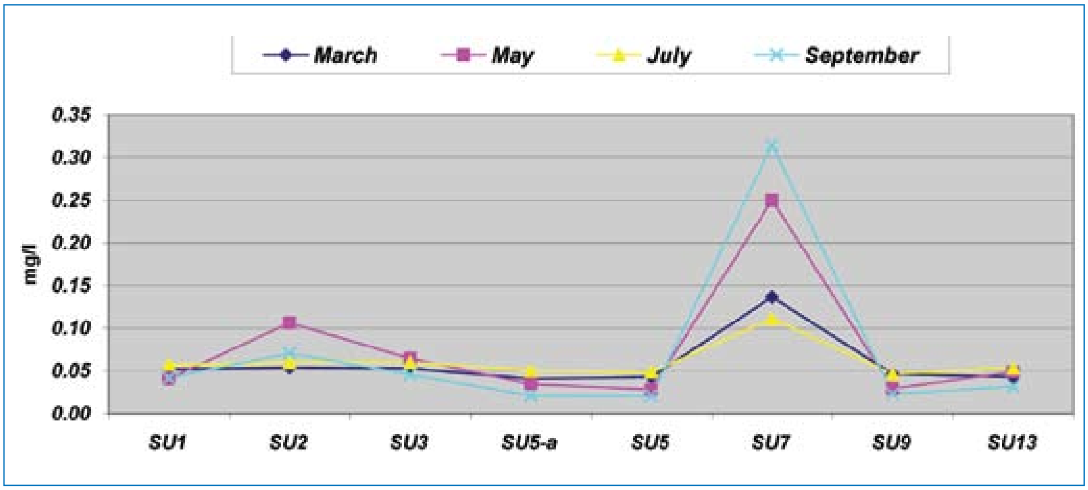


Figure (6-19) shows comparison between the concentration of chlorophyll - a along the coast of the Gulf of Suez during the four trips in 2009

6. Results of total phosphate varied from station to another and from time to time at the monitoring points in Gulf of Suez. Annual average was (0.066 mg / L), while the highest value was (0.315 mg / L) in Ras Gharib station (Su7) during September. Figure (6-20) shows total phosphate concentration along the coast of the Gulf of Suez.



Figure(6-20) shows comparison between the concentration of total phosphorus along the coast of the Gulf of Suez during the four trips in 2009

Monitoring results show relative increase in concentration of active phosphate during all times of 2009, in Ras Gharib station (Su7) (0.028, 0.052, 0.014, 0.065 mg / L). This can be explained by the relative increase of human activity in this region, particularly that this increase was accompanied by a relative increase in the concentration of all other elements.

❖ Bacteriological measurements

Monitoring results of 2009 show that the average numbers of bacteria levels were less than the permissible limits in all stations of the Gulf of Suez; additionally there were significant improvements compared to 2008 and previous years. Figure (6-21) shows a comparison between average bacterial counts of total coliform bacteria along the coast of the Gulf of Suez.

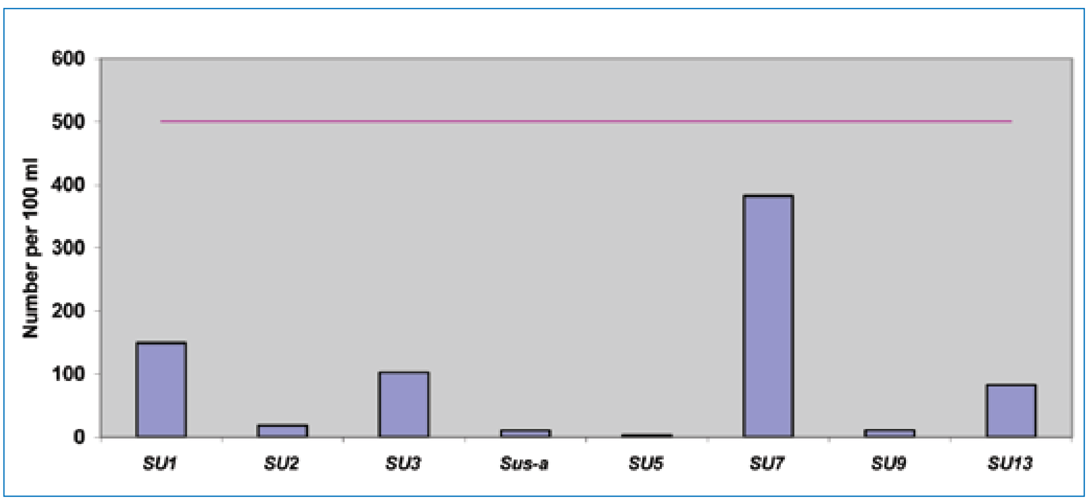


Figure (6-21) shows count of total coliform along the Gulf of Suez in 2009

Comparing monitoring results of 2009 with previous years clarifies an environmental improvement in the status of water quality in the Gulf of Suez, as shown in Figure (6-22).

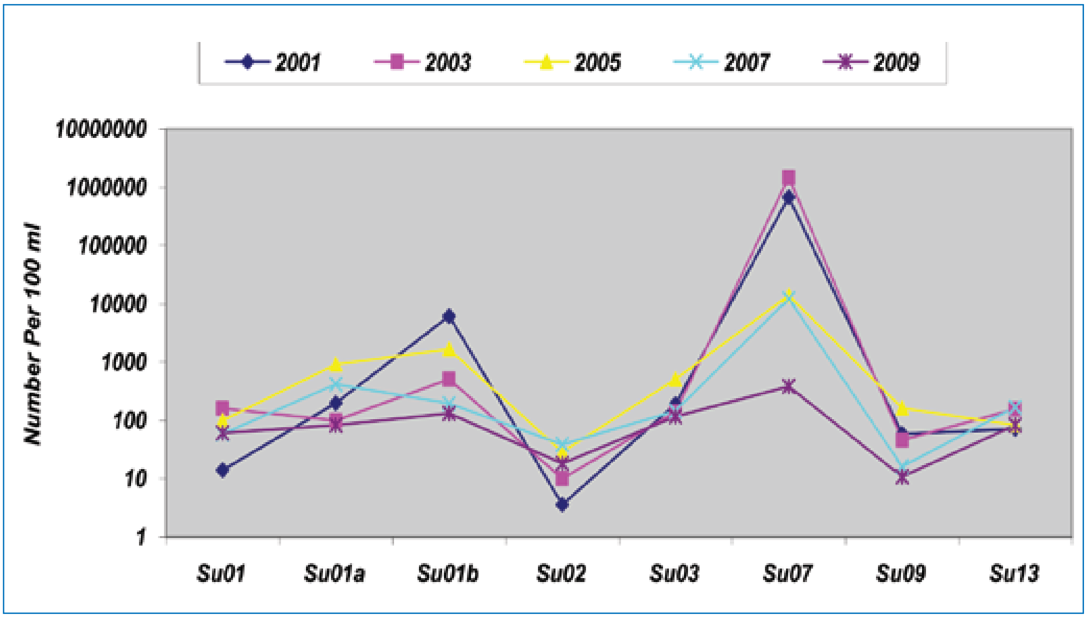


Figure (6-22) shows the average number of colon model during the 2001-2009

6-2-2-3 Water quality of the Gulf of Aqaba coast:

Monitoring network of the Gulf of Aqaba coast shows the following analyzing results:

❖ **Physical measurements:**

The monitoring results of water quality of the Gulf of Aqaba coast during the four trips of 2009 show:

1. Dissolved oxygen (DO) concentration was higher than the minimum permissible global limit, and recorded its highest value (10.13 mg / L) during July in Nakhlet El-Tall station in the protected area (Aq5), while recorded its lowest value (6.13 mg / L) during May in Sharm El-Sheikh Port Station (Aq2). Figure (6-23) shows a comparison of the concentration of the dissolved oxygen in 2009.

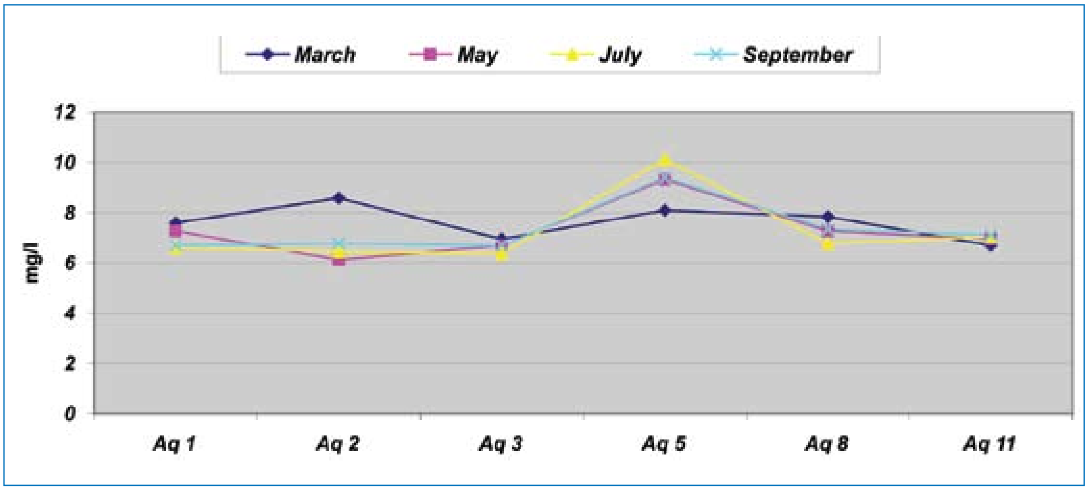


Figure (6-23) shows comparison between the concentration of dissolved oxygen along the coast of the Gulf of Aqaba during the four trips in 2009

2. Temperature of water reached its maximum rate during July and its minimum in March and there is no thermal pollution in the coastal area of the Gulf of Aqaba.

3. There was a simple change in the salinity concentration at different monitoring areas during this year, values ranged between (39.57 - 41.5 mg / L).

4. The pH was in the normal range during the year.

It is clear from these indicators that the various hydrographic variables were within the normal levels.

❖ Chemical Measurements

Chemical measurements of water quality in the Gulf of Aqaba coast during 2009 show the following:

Concentration of total nitrogen ranged between (0.22 and 3.82 mg / L), where the highest value was recorded during July in AQ2 (within Sharm El Sheikh Port) as well as the lowest value in AQ1 (Sharm El Sheikh - Ras Mohamed). The average concentration of inorganic nitrogen (ammonia + nitrite + nitrate) was 0.031mg/L. Figure (6-24) shows a comparison of the total nitrogen concentration along the coast of the Gulf of Aqaba, during 2009.

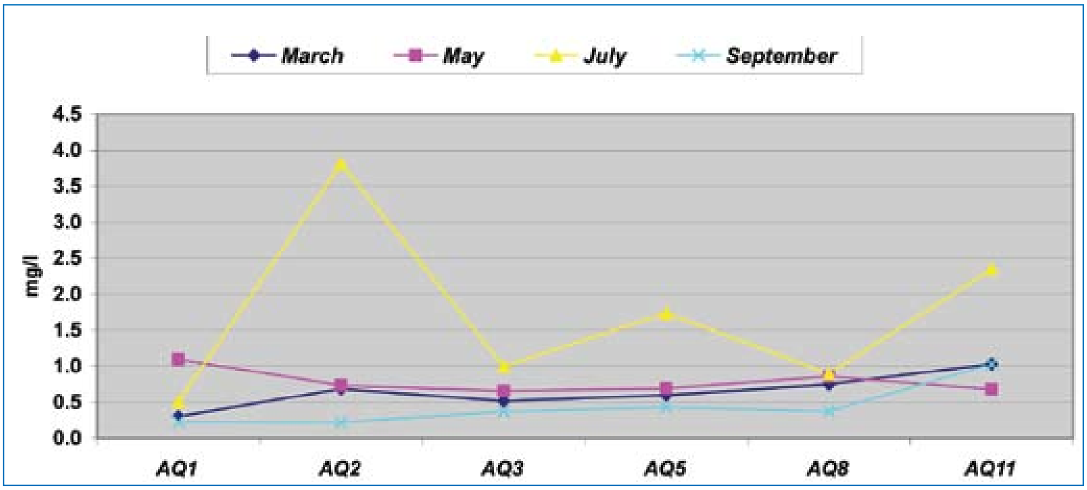


Figure (6-24) shows comparison between the total nitrogen concentrations along the coast of the Gulf of Aqaba during the four trips for 2009

1. Ammonia concentrations along the Red Sea coast were very low, where the values ranged between (0.004 - 0.029 mg / L) due to lack of external influencing activities. Figure (6-25) shows a comparison between values of ammonia along the coast during different months.

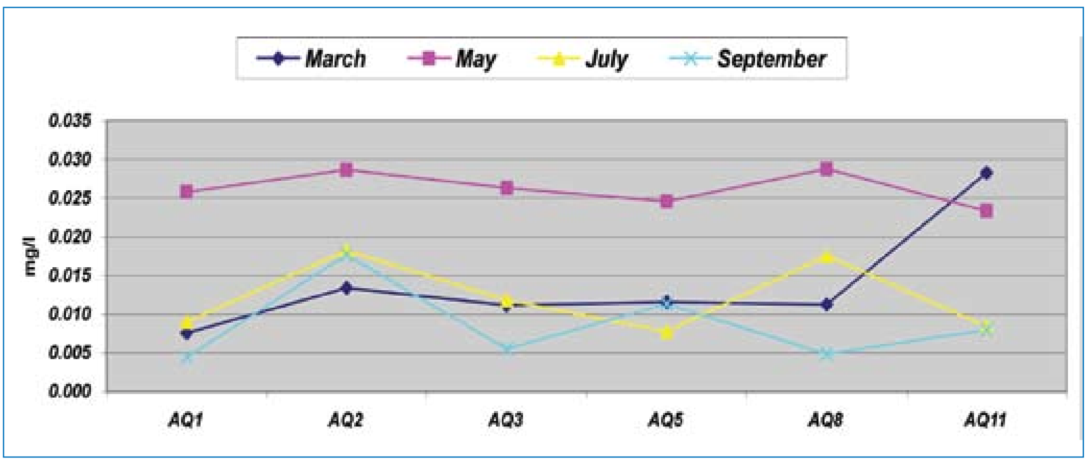


Figure (6-25) comparison of ammonia concentration along the coast of the Gulf of Aqaba during the four trips in 2009

2. Values of chlorophyll-a concentrations at all monitoring points along the coast of the Gulf of Aqaba were very low, as the annual average was (0.24 mg / L). This is due to lack of external influence on the water of the Gulf of Aqaba, which is associated with low percentage of suspended solids (16.05 mg / L) and increase in the transparency of water column (7.96 m). Figure (6-26) shows a comparison between concentrations of chlorophyll-a during different months along the coast of the Gulf of Aqaba.

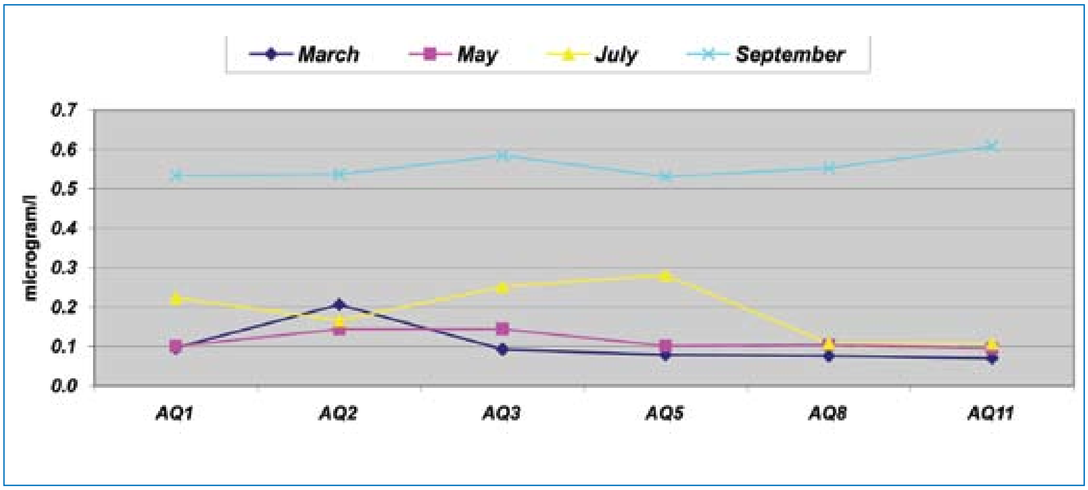


Figure (6-26) shows comparison between the concentration of chlorophyll - a along the coast of the Gulf of Aqaba during the four trips in 2009

3. The annual average concentration of total phosphate was 0.031 mg / L, where a relative increase was observed in Nakhlet El-Tall station (Aq5) (0.062 mg / L) during July. Figure (6-27) shows the total phosphate concentration along the coast of the Gulf of Suez.

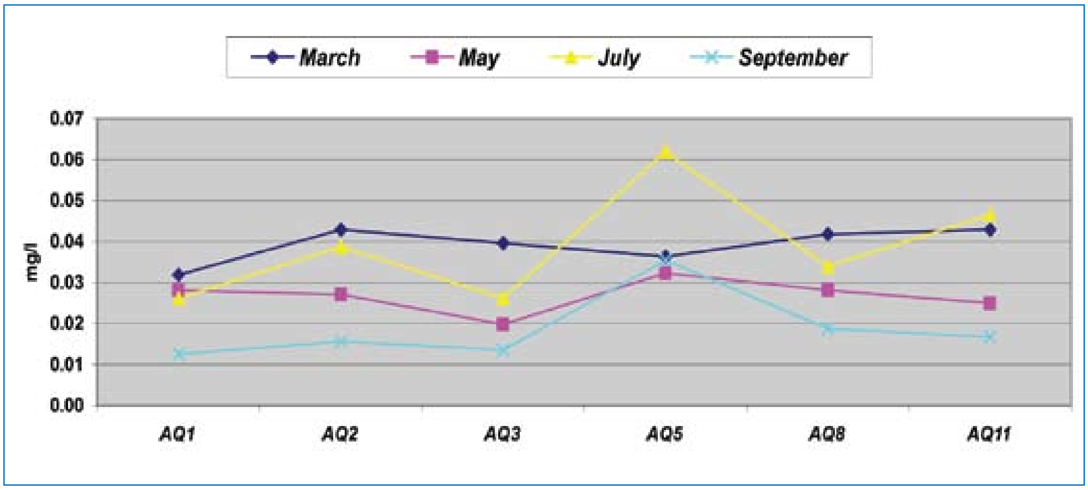


Figure (6-27) shows comparison between the concentration of total phosphorus along the coast of the Gulf of Aqaba during the four trips in 2009

❖ Bacteriological measurements

The results of the bacterial count along the Egyptian coast of the Gulf of Aqaba was less than the allowable limit, explaining the absence of bacterial contamination in all monitoring points (i.e. protected natural areas), except for station Aq2 (Sharm el-Sheikh - Marina Sharm) and station Aq3 (Sharm El Sheikh – Na'ama Bay), where recorded numbers of bacteria were more than the allowable limit during most of the year because of the touristic activity and increasing numbers of diving boats. Figure (6-28) shows count for Escherichia coli bacteria along the coast of the Gulf of Aqaba during 2009.

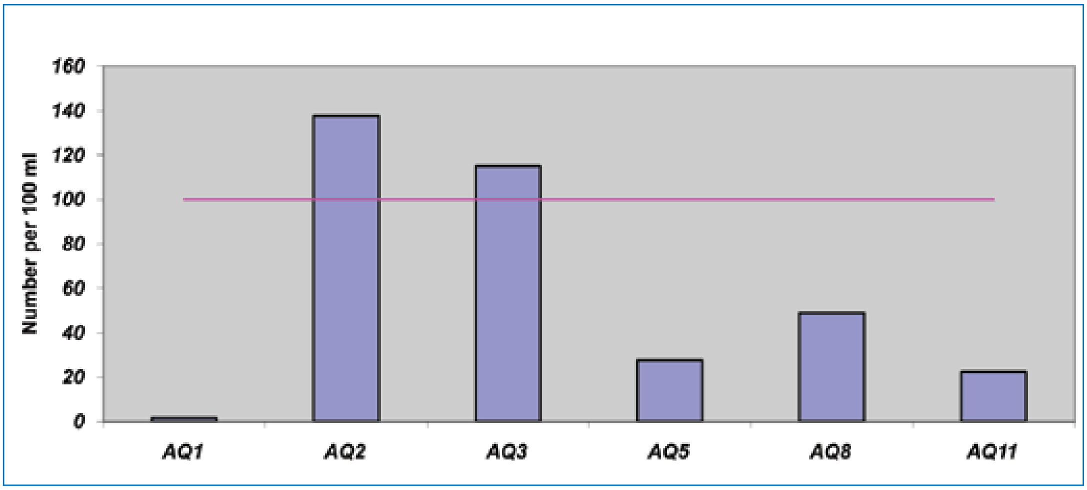


Figure (6-28) shows the average count Escherichia coli bacteria along the coast of the Gulf of Aqaba in 2009

In general, and after comparing the annual averages for the different variables for different monitoring areas from 1998-2009 on the coast of the Red Sea, Gulfs of Suez and Aqaba ,the following can be deduced :

- There were no significant differences in the levels of various hydrographic variables in monitoring areas, except for a marked increase in the concentration of suspended solids.
- There were improvements in the concentrations of nitrite and total nitrogen, but a slight increase was noticed in the northern region of the Gulf of Suez compared to the rest of the monitoring areas; however, when compared to others during previous periods, there was an indication of a relative increase in the amount of outflow that reaches to all sites during this year.
- Ventilation of water column was good in coastal water of the Red Sea, Gulf of Suez and Aqaba. There was no severe shortage of oxygen in any of the monitoring areas.
- There was a significant improvement of bacterial count levels on the Egyptian shores of the Red Sea, Gulf of Suez and Aqaba, compared to 2008 and previous years as it is observed that only in four stations (Su7 Aq2, Aq3, and Re15) out of 22 monitoring stations, numbers of above mentioned bacteria exceeded the allowable limit in one or more trips throughout the year as well as in one or more types of the listed bacteria. Figure (6-29) shows a comparison of the percentage of the annual average of the numbers of bacteria in monitoring stations during the years from 1998 to 2009.

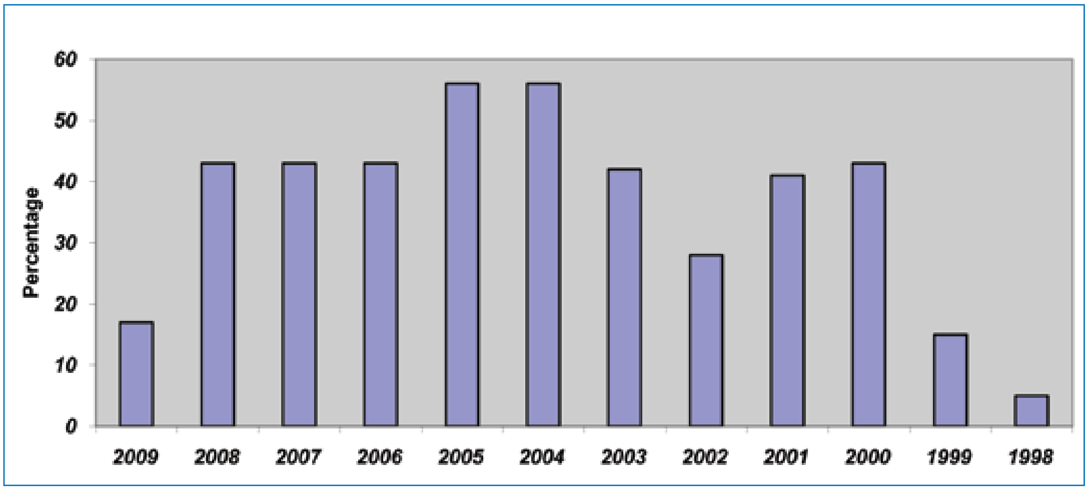


Figure (6-29) shows the percentage of the annual average of the numbers of bacteria at monitoring stations during 1998-2009

6-3 Marine Pollution Control and Follow up Ports Affairs:

6-3-1 Sources of marine pollution:

Many pollution sources affect the marine environment, as it receives many pollutants from land-based activities such as industrial and sewage water through estuaries and banks. Seaports are considered as one of the most important sources of marine pollution in addition to pollutants from ships such as sewage water, garbage, oily residues and contaminated ballast water, as well as pollutants resulting from accidents of oil tankers, leakage of fuel from ships and emissions resulting from their operation.

6-4-2 Efforts to Reduce Negative Impacts:

1. Ministry of State for Environmental Affairs identified and analyzed data collected from accidental pollution (35 accidents) that cause damage to the marine environment , which indicated the following:

    a. Analyzed data of pollutants causing damage to the marine environment, indicated that refined petroleum products represent the highest percentage (54%) of pollutants resulting from accidents (19 accidents), followed by crude oil as 26%, and oily residues as 14% and dry bulk goods were 6%. Figure (6-30) represents the number and percentage of pollutants resulting from marine environmental pollution accidents, according to their type.

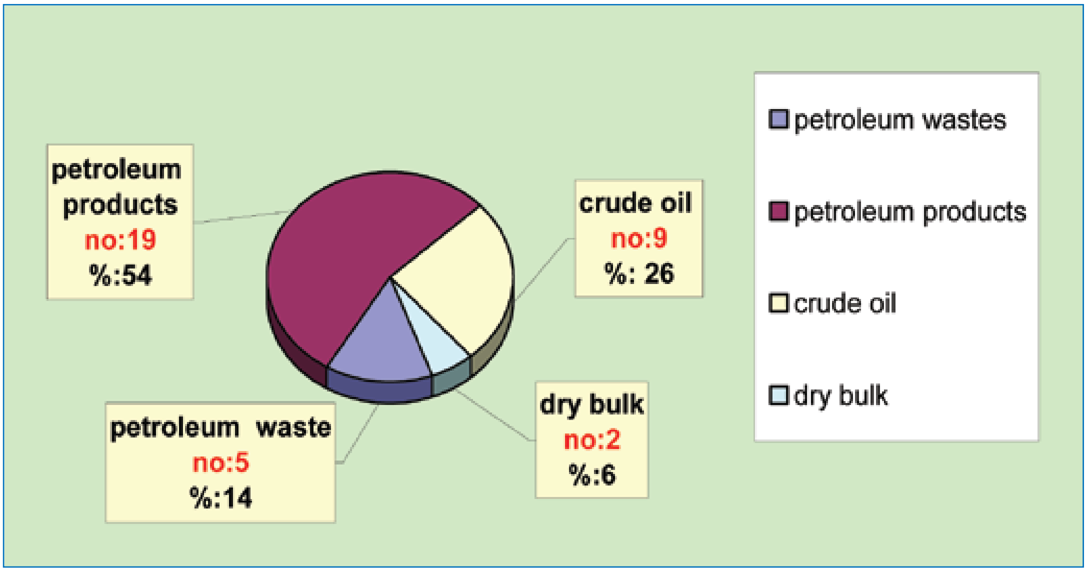


figure (6-30): No. and percentage of pollutants resulting from accidents

b. Seaports recorded the highest percentage of areas affected by pollution accidents (16 accidents representing 45% of the total accidents); including 12 accidents at Alexandria and Dekheila ports.

c. Eleven accidents occurred in the marine environment, including 10 in the Red Sea, and only two in protected areas (Red Sea and South Sinai Protectorates). Figure (6-31) illustrates the number and percentage of marine pollution accidents according to their areas of occurrence.

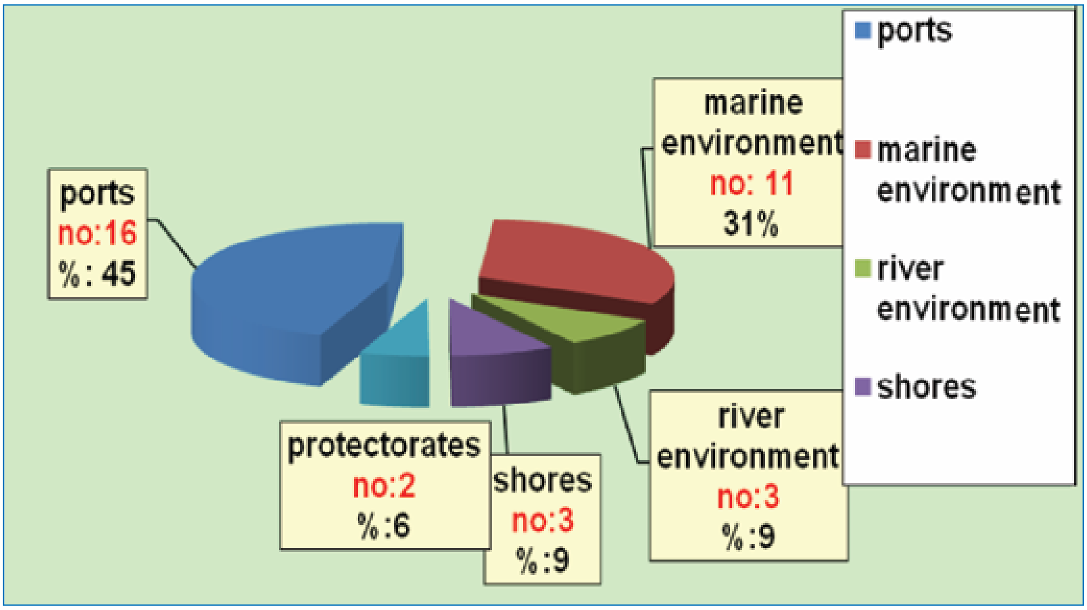


Figure (6-31): No. and percentage of accidents according to occurred areas

d. Causes of accidents were identified and summarized as follows:
   - Failure to take required precautions for either human factors or the lack of maintenance of equipment in ports, and marine units.
   - Poor storage of liquid wastes.
   - Leakage during refueling.
   - Dumping of oily residues during loading and unloading is considered as one of the most important reasons that led to 24 accidents representing 69% of total number of accidents.
   - Seven accidents representing 20% of total accidents were resulting from collisions, drowning, ships grounding, and bad weather or due to leakage from oil pipelines.
   - Leakage of wastes or liquid materials from marine docks (11% of the total accidents).

Figure (6-32) illustrates number and percentage for causes of marine accidents.

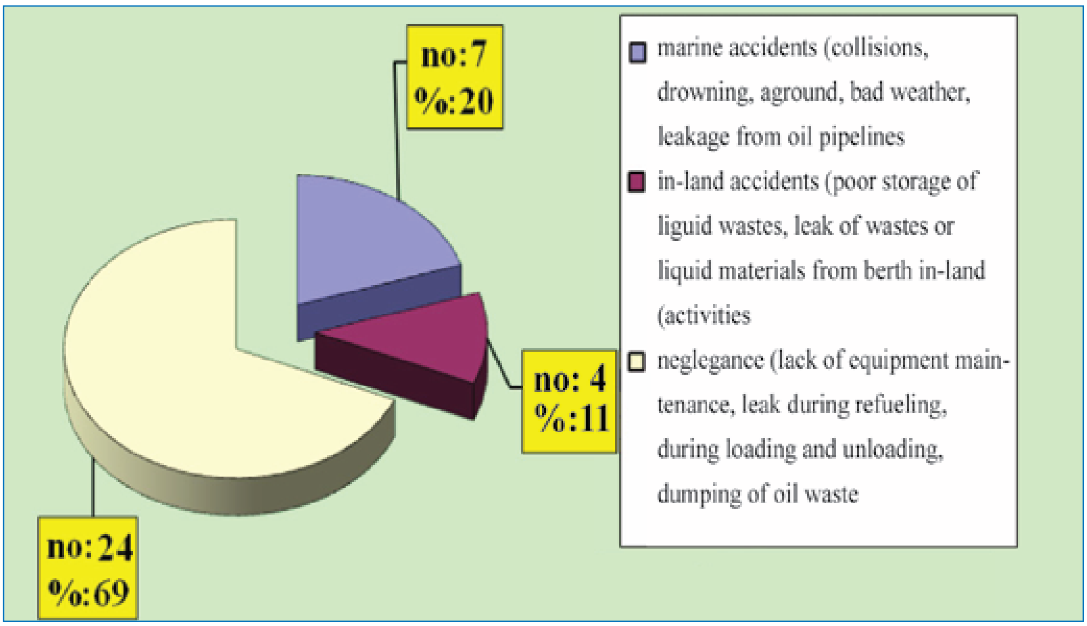


Figure (6-32): No. and percentage of accidents as causes

2. Ministry of State for Environmental Affairs prepared guidelines for ports environmental management system based on environmentally sound principles to reduce environmental impacts arising from activities of maritime transport and ports .The strategy of this system was based on addressing environmental issues as water and air quality, noise pollution …. etc, developing appropriate solutions and executive plans to mitigate environmental impacts that may occur ,in addition to continuous monitoring to ensure compatibility with environmental conventions and legislation, as follows:

a. Set up guidelines to apply the integrated environmental management system for seaports in coordination with concerned authorities (Maritime Transport Sector, Egyptian Authority for Maritime Safety, and General Authority for Fish recourses, Egyptian General Petroleum Corporation, General Authority for Industrial and Mining Projects, Ministry of Industry). Guidelines contain procedures for preventing environmental pollution according to the activity, guided by the international standard for environmental management (ISO 14001). It also includes guidelines for the application of integrated system for environmental management of waste (solid, liquid, oily wastes, oily mixture), hazardous substances and wastes in ports; as well as environmental monitoring system for water and air quality, and noise within port area; and to monitor air and water quality and strategies to reduce noise. This is in addition to environmental management of ports processes and activities, considering that ports include (plants, warehouses, packing equipments, incinerators, sewage and industrial wastewater, shipping and unloading, passenger ships, environmental services, etc.). Also, dealing with terms of contingency plans necessary for each port according to its specifications and models of required environmental records.

b. Set up guidelines manuals to reduce pollution from ships (including recreational ships) according to both Law No 4/1994, MARPOL Convention 73/78 and Law No. 48 / 1982, to reduce pollution resulting from oil, sanitation, solid waste and pollution with harmful liquid substances. It also covers records and certifications required to be kept by ships and tankers as provided for under both Law No. 4 /1994 and MARPOL Convention.

3. Due to the occurrence of many collisions, delinquency or grounding of various marine units, a standard form was designed for the required data needed for environmental study and environmental approval of salvaging and floating ships and marine units to ensure no harm to marine environment. The standard form includes administrative and technical data of the marine unit and salvaging location as well as the type of debris in case of accidents; in addition to required documents to be submitted to EEAA to ensure that the marine unit is free from fuel, all types of oil, remains of hazardous substances, and flammable gases, to ensure the integrity of environmental actions and protection of the environment around salvaging site.

4. Initiate setting comprehensive database covering general information about ports, their maps and locations.

6-3-3 Future Vision:

1. Application of environmental management system in ports and follow-up its implementation.
2. Set up the foundations for the application of environmental management system for workshops specialized in building and repairing ships and marine units.
3. Preparation of environmental maps for the environmental status for each port, as well as map of Egypt, clarifying ports' classification according to their pollution loads by using Geographical Information Systems (GIS).
4. Preparation of integrated records for all seaports and river anchors to classify the existing environmental status and the plans to reconcile their environmental conditions.
5. Update the fundamentals of environmental damage assessment occurring to the marine environment according to internationally recognized scientific methods.

Secondly: Sediment & Biota in the Red Sea

6-4 Introduction

A program was implemented to monitor organic pollutants and heavy metals in sediment & biota in the Red Sea, Gulfs of Suez and Aqaba in the framework of a cooperation protocol between Ministry of State for Environmental Affairs "MSEA"-Egyptian Environmental Affairs Agency "EEAA" and the Regional Organization for the Conservation of Environment of the Red Sea and Gulf of Aden "PERSGA". The 2008 – 2009 program in Egypt focused on the monitoring of organic (hydrocarbons) and inorganic pollutants (heavy metals) in sediments and biota along the Egyptian coast of the Red Sea. The monitoring covered the entire Red Sea coast of Egypt including the Gulfs of Suez and Aqaba.

Main objectives of the program were:

- Capacity building for Regional Branches specialists in (Suez and Red Sea) and Natural Protectorates of (South Sinai and Red Sea) in monitoring hydrocarbons and heavy metals through training on sampling, preservation and processing as well as performing the required analysis, and then include these analysis within the program of sustainable monitoring.
- Identify baseline concentrations of hydrocarbons and heavy metals on the Egyptian coast of the Red Sea. This will serve identifying any change that may happen in these concentrations in the future.
- Establish a systematic approach for the assessment of organic and inorganic pollutants on Egyptian coast of the Red Sea including Gulfs of Suez and Aqaba, while taking into account the environmental diversity of monitoring places and human activities.
- Assess the efficiency of environmental management practices to identify pollutant sources & control its effects.

6-5 monitoring sites

The program endeavors to map the distribution of organic and inorganic pollutants on the Egyptian coasts of the Red Sea based on analyzing the concentrations of these pollutants in sediments and selected biota. Samples have been collected and analyzed under the supervision of a national expert working with specialists from Regional Branch offices (RBOs) and natural protectorates in the Red Sea area. This provided “hands on” training to EEAA specialists while doing the work. This aimed at qualifying participating EEAA's specialists to conduct this type of monitoring in the future independently.

Samples have been collected from 17 sites distributed along the coasts of the Red Sea, Gulfs of Suez and Aqaba as follows: six sites on the Red Sea, five sites on the Gulf of Suez and six sites on the Gulf of Aqaba. (Map 6-3)

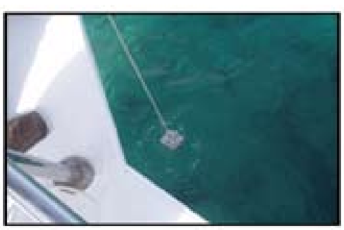
6-5-1 Sampling sites on the Red Sea

- **Hurghada:** Samples have been collected from two sites; the first was the Public Beach near Sheraton and the second was at the National Institute of Oceanography and Fisheries
- **Safaga:** Samples have been collected from Abu Tartor area.
- **Al Quesir:** Samples have been collected from Al Hamrawein Port.
- **Marsa Alam:** Samples have been collected from the area of Fishing Club, previously used as a tin factory.
- **Shalatein:** Samples have been collected from the area of primitive fishing boats.
- **Al Rahba:** A remote area located north of Bir Shalatein and characterized by pristine water , as it is far from human activities and pollution sources ; so it has been utilized as a reference area.

Bir Shalatein

Al Quesir

Marsa Alam



Sheraton Hurghada

Al Rahba

Safaga

Picture (6-1) Sampling Sites on the Red Sea

6-5-2. Sampling sites on the Gulf of Suez

- **Ras Ghareb:** Samples have been collected in front of Al Nasr Club for Engineers
- **Al Sukhnah Portrait:** Samples have been collected in front of Al Sukhnah Portrait Beach
- **Gonat Al Suez:** Biota samples have been collected in front of the Marine Sports Club at Al Zaiteyat area in Suez.
- **Ras Sudr:** Sediment samples have been collected from the scaffold of the General Oil Company and no biota samples were found in the region.
- **Tour Sinai:** Samples have been collected from the anchorage of fishing boats located near the center of Coast Guards at Al Tour city.

Tour Sinai

Al Sukhnah

Suez

Ras Ghareb

Ras Sudr

Picture (6-2) Sampling Sites on the Gulf of Suez

6-5-3 Sampling sites on the Gulf of Aqaba

- **Ras Mohammad Protectorate:** Samples have been collected from the floating scaffold of South Sinai protectorates.
- **Sharm El-Sheikh:** Samples have been collected from Sharm El-Mayah area.
- **Ne'ma Bay :** Samples have been collected from tourist boats scaffold.
- **Dahab:** Samples have been collected from Al-Medbat tourist area.
- **Nuwaibe:** Samples have been collected at about 2 km distance from Nuwaibe International Port.
- **Taba:** Samples have been collected at about 2 km before Taba Check Point.

Ras Mohammad

Sharm El-Mayah

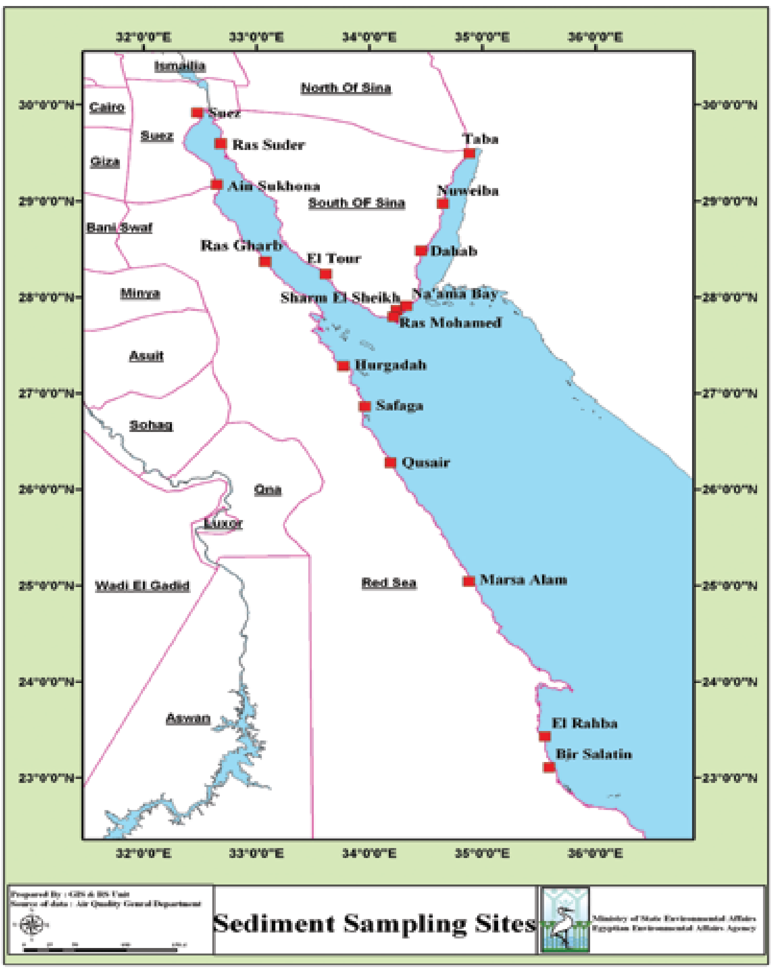
Dahab

Ne'ma Bay

Nuwaibe

Taba

Picture (6-3) Sampling Sites on the Gulf of Aqaba



Map (6-3) Sampling sites of sediment & biota in the Red Sea & Gulfs of Suez and Aqaba in 2009

6-6 Measurements conducted on sediments and biota

- **Biota:** Measurements conducted on biota included water content, total lipid, heavy metals (Aluminum, Cadmium, Copper, Lead, Mercury, Nickel, Vanadium and Zink), hydrocarbons (total hydrocarbons and PAH "Poly-Aromatic Hydrocarbons") and pesticides.

- **Sediments:** Measurements conducted on sediments included water content, grain size, total organic carbon, total organic matter, heavy metals (Aluminum, Cadmium, Copper, Lead, Mercury, Nickel, Vanadium and Zink), hydrocarbons (total hydrocarbons and PAH "Poly-Aromatic Hydrocarbons") and pesticides.

6-6-1 Results of heavy metal measurements in biota

- Record of heavy metal concentrations in biological indicators, mainly molluscs is considered as one of the essential indicators of inorganic pollution in the marine environment. These are species that are capable of accumulating biologically available concentrations of contaminants in their tissues with relatively high tolerance and survival rate. These biologically available concentrations of contaminants may ascend in the food chain until they reach human beings. Several heavy metals such as mercury, lead, cadmium and copper are well known with their toxicity. Several other metals are known for being associated with specific diseases. However, some heavy metals are essential, but whenever their concentrations exceed critical levels, they can pose serious risks to the ecosystem and human health.
- **Aluminum** concentrations varied between (14.7 Ppm) at Al-Quesir to (less than 6.00 Ppm). Figure (6-33).
- Monitoring of **cadmium** has a special importance because the long term exposure to cadmium causes damage in bones and kidneys. Cadmium Concentrations in the monitoring sites have been fluctuated and less than the permission limits in The American Standards for Food & Medicine . Figure (6-33).
- **Copper** is one of the essential metals, however, over exposure may cause problems in the digestive system. In general, all recorded concentrations in all monitoring stations were lower than the internationally allowed standards. Figure (6-33).
- **Lead** may have effects on the liver and kidneys depending on the percentage of exposure. All recorded concentrations in the monitoring stations have been within the allowed limits of international standards . Figure(6-33).

- The American Authority for Food and Medicine indicated that the maximum allowed limit for **Nickel** exposure ranges between 70-80 mg / kg. All recorded nickel concentrations in biota along the Egyptian coasts of the Red Sea were much below the critical values (30 Ppm) of the American standards for food and medicine. Figure (6-33)
- **Vanadium** concentrations in biota ranged between (24.9 Ppm) in Safaga and (0.1 Ppm) in Suez. (Figure 6-33).
- **Mercury** concentration in biota along the Red Sea was less than the internationally allowed standards. This indicates that Mercury has no biological impact in most of the monitoring areas. (Figure 6-34).

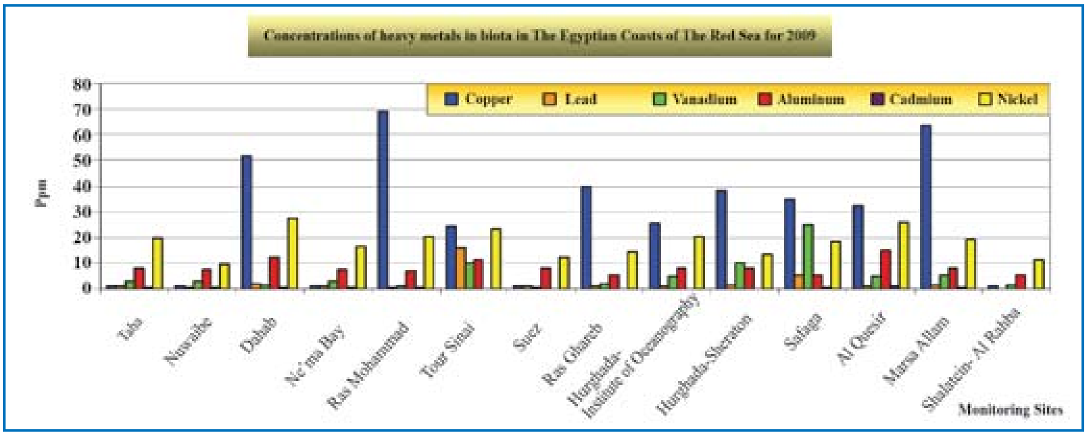


Figure (6- 33) Concentrations of heavy metals in biota in the Red Sea and Gulfs of Suez and Aqaba for 2009

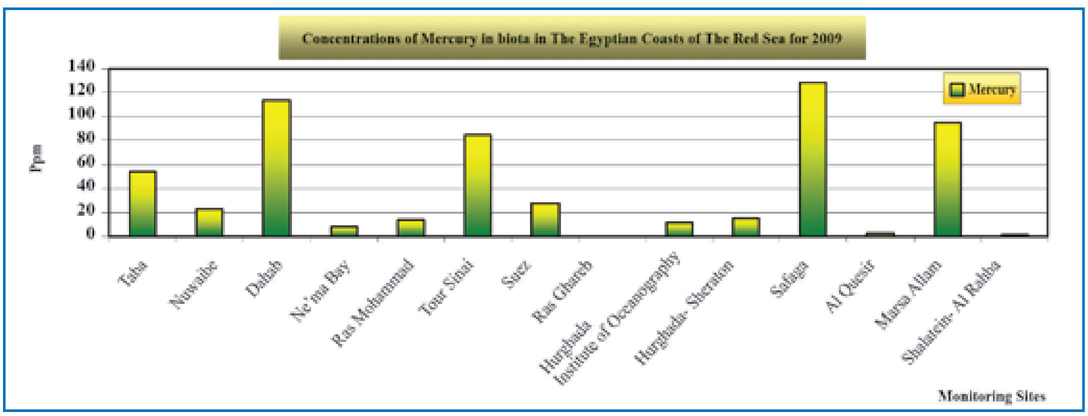


Figure (6 - 34) Concentrations of Mercury in biota in the Red Sea, Gulfs of Suez and Aqaba for 2009

6-6-2 Results of Heavy metals measurements in sediments:

- **Aluminum** is considered one of the natural components of the Earth crust and its concentration is ranked as the third after Oxygen and Silicon (Mason and Moore, 1991). Aluminum concentrations in sediments ranged between (6699 Ppm) in Dahab and (478 Ppm) in Ras Sudr.

- **Cadmium** concentrations in sediments ranged between (0.362 Ppm) in Safaga and (0.039 Ppm) in Bir Shalatein-Al Rahba. However, all concentrations were lower than the internationaly allowed standards (less than 1.2 Ppm). Figure (6-35).
- **Copper** concentrations in sediments ranged between (0.05 Ppm) in Bir Shalatein-Al Rahba and (2.064 Ppm) in Ne'ma Bay. However, all recorded concentrations were lower than the internationally allowed standards. Figure (6-35).
- **Lead** concentrations in sediments ranged between (0.308 Ppm) in Ras Sudr and (5.539 Ppm) in Al-Quesir. However, all recorded concentrations were lower than the internationally permissible standards (less than 46.7 Ppm). Figure (6-35).
- **Nickel** concentrations in sediments ranged between (3.26 Ppm) in Ras Mohammad and (58.41 Ppm) in Marsa Alam. But in general, all recorded concentrations were lower than the internationally allowed standards. Figure (6-35).
- **Vanadium** concentrations in sediments ranged between (11.7 Ppm) in Marsa Alam and (0.15 Ppm) in Bir Shalatein-Al Rahba. Figure (6-35).
- **Zinc** Concentrations in sediments ranged between (119.89 Ppm) in Tour Sinai and (2.16 Ppm) in Bir Shalatein-Al Rahba. But in general, all recorded concentrations were lower than the internationally permissible standards (150 Ppm)
- **Mercury** concentrations were lower than the internationally permissible limits except for Bir Shalatein-primitive fishing port which slightly exceeded the limits. Figure(6-36)

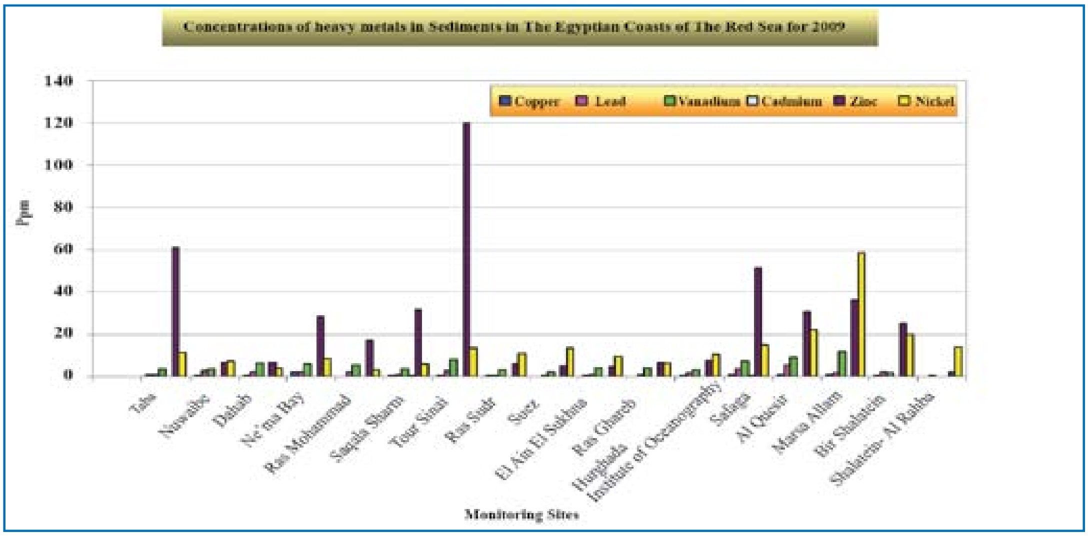


Figure (6 -35) Concentrations of heavy metals in Sediments in the Red Sea for 2009

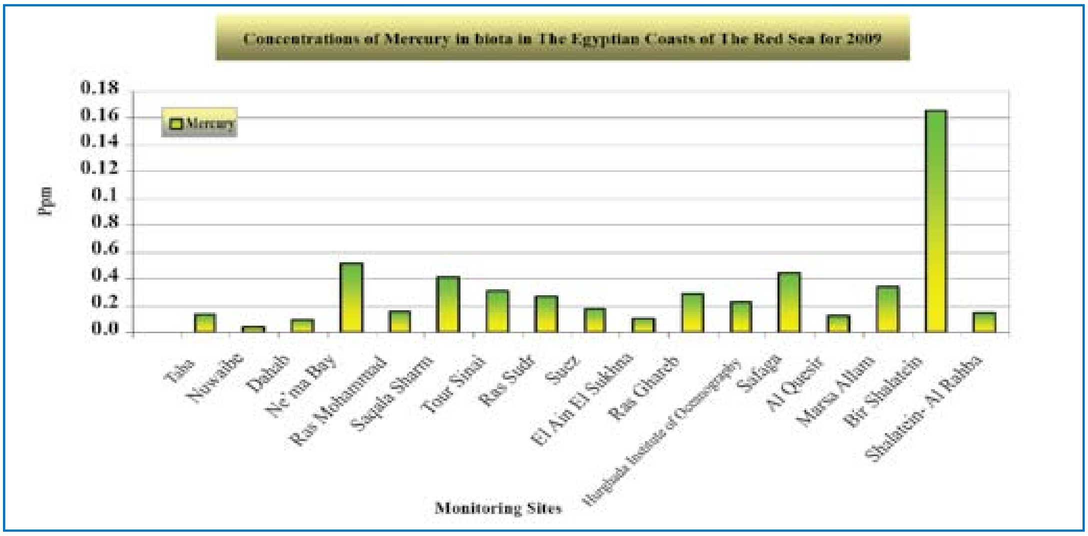


Figure (6 -36) Concentrations of Mercury in Sediments in the Red Sea, Gulfs of Suez and Aqaba for 2009

6-6-3 Total Hydrocarbons

1. Biota:

Most of analyzed biota contained the group of Carbon 17 and Carbon 32. Marsa Alam recorded the highest concentration (701.13 Ppm), whereas Bir Shalatein-Al Rahba recorded the lowest concentration (71.01 Ppm). Figure (6-37).

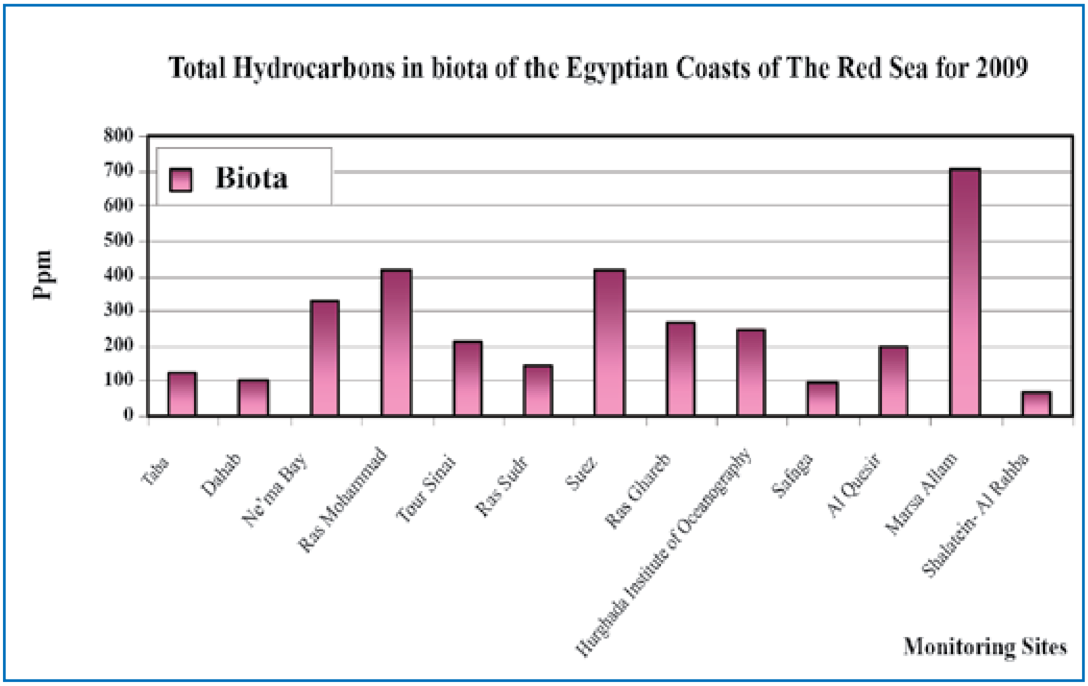


Figure (6 -37) Total Hydrocarbons in biota in the Red Sea, Gulfs of Suez and Aqaba for 2009

2. **Sediments:**

Like biota, the group of Carbon 17 and Carbon 32 were monitored in sediments. Total Hydrocarbon Concentrations ranged between (75.83 Ppm) in Sharm El-Mayah-Saqala Sharm and (0.65 Ppm) in Bir Shalatein-Al Rahba. Figure (6-38).

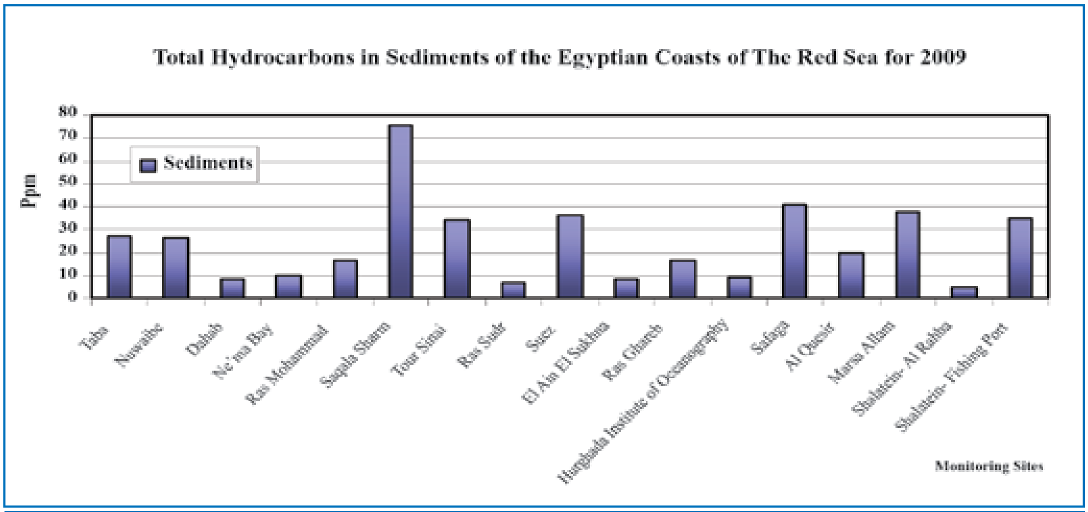


Figure (6 -38) Total Hydrocarbons in Sediments in the Red Sea, Gulfs of Suez and Aqaba for 2009

6-6-4. Poly aromatic hydrocarbons and total hydrocarbons

1. **Biota:**

Concentrations ranged between (160.2 Ppm) in Ras Sudr and (1.26 Ppm) in Bir Shalatein-Al Rahba. Figure (6-39)

2. **Sediments:**

Concentrations ranged between (5.2 Ppm) in Ras Sudr and (0.18 Ppm) in Bir Shalatein-Al Rahba. Figure (6-40).

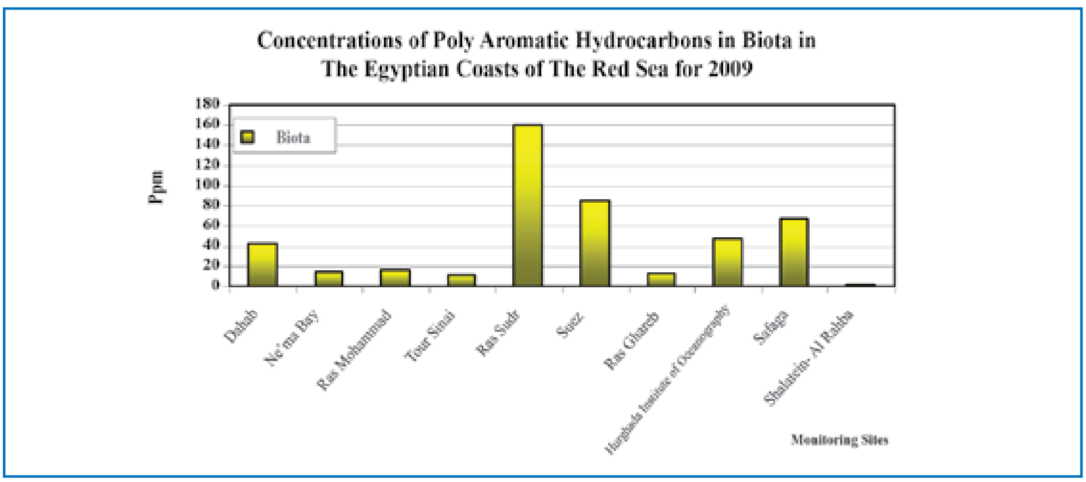


Figure (6 - 39) Total Concentrations of Poly Aromatic Hydrocarbons in Biota in the Red Sea, Gulfs of Suez and Aqaba for 2009

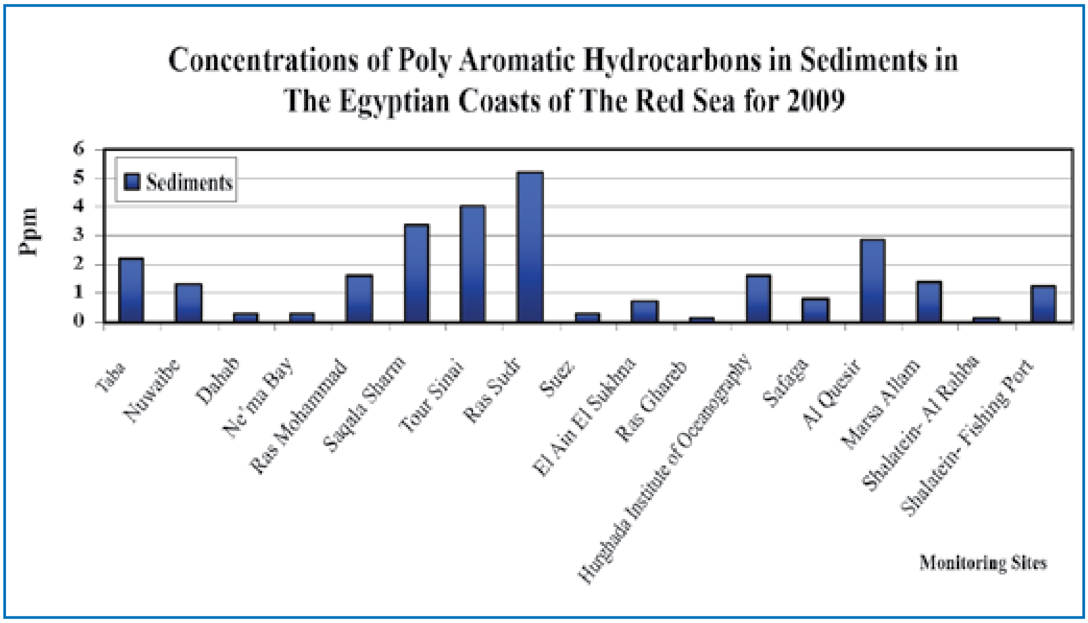


Figure (6- 40) Total Concentrations of Poly Aromatic Hydrocarbons in Sediments in the Red Sea, Gulfs of Suez and Aqaba for 2009

6-7 Conclusion:

- Monitoring results show that concentrations of heavy metals and hydrocarbons in sediments and biota on the Egyptian coasts of the Red Sea were generally within the acceptable international standards. However, the effect of human activities was clear at some monitoring sites, such as ports, which recorded higher concentrations compared to other areas but still within the allowed standards. Such sites may require more specific management actions.
- Concentrations of heavy metals and hydrocarbons were generally higher in biota than in sediments. This is due to being known for bio-accumulating pollutants in their tissues and thus acting as biological indicators. However, the concentrations were lower than the permitted international standards.
- In the framework of monitoring Concentrations of both inorganic and organic pollutants in sediment and biota at the remote site from human activities, Al-Rahba has been minimum for most of the measured variables, reflecting less effects of human activities and limited spread of pollutants in the area.

References

- CCME. Canadian Council of Ministers of the Environment (1999). Canadian sediment quality guidelines for the protection of aquatic life. Summary Tables. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.
- EC (2001). Commission Regulation No. 466/2001 of 8 March 2001, Official journal of European communities 1.77/1.
- Eco toxicology and other issues for the Mediterranean Sea 2002 Milagros Vega, ERA
- EIMP/NIOF (2000). Final Report on sediments and benthos data from coastal areas of the Mediterranean Sea and the Mediterranean Sea during 1999 NIOF report to EIMP June 2000.
- FAD, 2001. Fishes and Fisheries Products Hazards Controls Guidance, third ed. Center for Food Safety and Applied Nutrition, US Food and Drug Administration.
- FAO (1983). Compilation of legal limits for hazardous substance in fish and fishery products (Food and Agricultural Organization). FAO fishery circular, No. 464, pp. 5–100.
- U.S Environmental Protection Agency, Water Science, Contaminated Sediment News, Issue 33 January 2003.
- Underwood, E. J. (1977). Trace Elements in Human and Animal Nutrition (4th ed.). New York: Academic.
- USEPA (1985). Carcinogen Assessment Group: Ambient Water Quality Criteria for Arsenic and Asbestos Environmental Protection Agency. Washington DC: Off. Drinking Water, USEPA.
- USFDA (1993a). Food and Drug Administration. Guidance Document for Chromium in Shellfish. HHS/PHS/FDA/CFSAN/Office of Seafood, Washington, DC.
- USFDA (1993c). Food and Drug Administration. Guidance Document for Nickel in Shellfish. DHHS/PHS/FDA/CFSAN/

PART THREE

LAND

Chapter Seven

BIODIVERSITY

7.1 Introduction

During 2009 , MSEA and its affiliated Nature Conservation Sector ‘NCS’ undertook great efforts to achieve required conservation activities, including evaluation of biodiversity throughout monitoring and applying necessary procedures to support biodiversity conservation , such as institutional development, capacity building, partnership, raising public awareness, marketing and insuring projects’ sustainability.

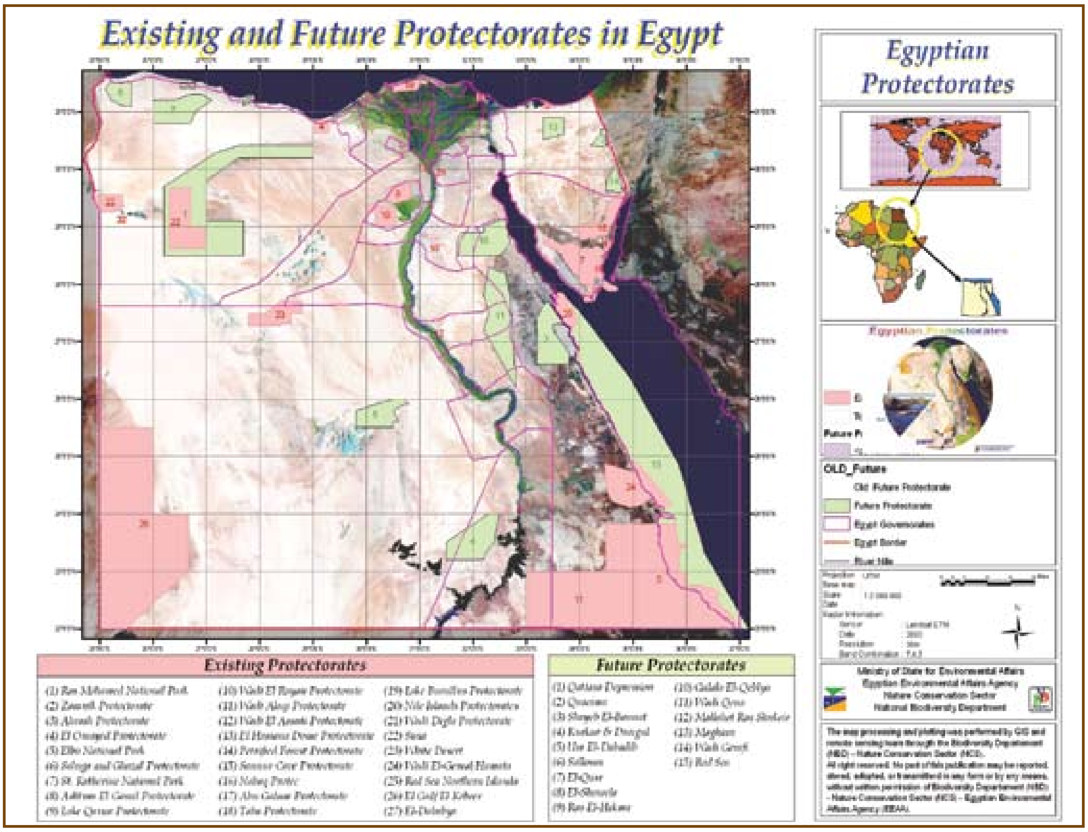
Issuing (4th National Report on Convention of Biodiversity) during 2009 was considered a great challenge to NCS employees, concerning the collection and preparation of its data in the required form. This report is a valuable product as it highlights CBD realized outcomes and its contribution in developing 10 indicators identified by NCS distinguished experts, that can be used in measuring achieved progress in CBD provisions, in addition to regulating monitoring, control and management activities on both short and long terms.
Achieving CBD 2010 goal was one of the challenges that NCS managed to mainstream within current five-year action plan since its inception to reduce loss of species and control invasive species.

NCS initiates third year of the current five-year action plan (2007-2012) , to realize nature protection through the following three major programs:

a) Develop Protected Areas:

The 27 declared protected areas in Egypt cover 15% of Egypt’s total area. The target is to increase this number to reach 40 protectorates, covering approximately 20% by 2017. Protected areas are still the essential means to achieve conservation efforts rationally, which achieve many financial, social and environmental benefits within and beyond their geographical boundaries.

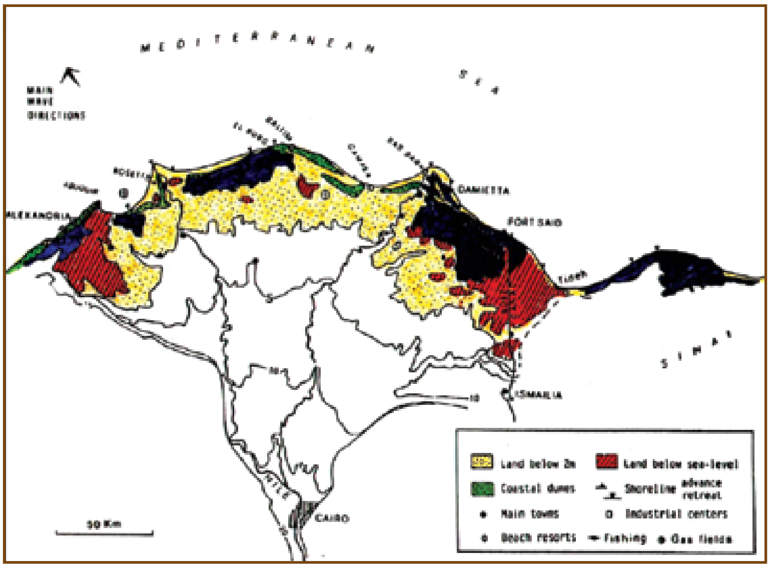
Map (7 - 1) shows the current and future natural protectorates all over the republic:



Map (7-1) The current and future natural protectorates

b) <u>Procedures Supporting Protected Areas</u>

Ongoing projects during 2009 are represented in «Medicinal Plants Project», «Bio-Safety Project», «Soaring Birds Project» and «Development of Dahshur Project». In addition to this, there were necessary procedures taken for funding other projects during 2009 -2010, such as GEF project for sustaining financial national resources for Protected Areas, European Union projects for Rural and Biodiversity Development in Mediterranean Basin, and Italian cooperation projects for developing protected areas and biodiversity in Egypt.



Map (7-2) Topography of the Egyptian Delta, shows contour lines of various regions of high and low Delta. Red areas show delta areas located beneath sea surface, where sea water is prevented from reaching it by barriers of sand dunes or constructed fences.

c) Biodiversity Information, Monitoring and Evaluation :

Biodiversity information, monitoring and evaluation program is considered the most important of these programs. Major activities of biodiversity evaluation included monitoring of endangered species, evaluation of remedy and restoration programs , participating in combating Bird Flu in addition to environmental monitoring activities of protected areas, protecting habitats with environmental sensitivity which are not represented in the current network of protected areas (as Marsa Alam area), identifying gaps in habitats protection systems and availability of rare and endangered species, monitoring and measurement of national indicators at the level of protected areas and finalizing components of reference group for biological diversity in Egypt .

Biodiversity in Egypt encounters many challenges. The most important of these challenges are degradation of agriculture lands, which is represented in salinity, alkalinity and rise of water levels; in addition to scooping of farmlands and expanding of urbanization in cities and villages. Intergovernmental Panel on Climate Change's report issued during 2001 expected that sea level will rise around Africa with about 15-95 cm by 2100. This rise will negatively affect as follows:

- Reduce annual production of coastal fisheries.
- Coral bleaching.
- Immigration of coastal communities.
- Increase of soil salinity in agricultural lands.
- Loss of coastal recreational facilities which will negatively affect tourism

development.

- Loss of coastal infrastructure such as ports, where more than 25% of Africa's population live on about 100 km from the coast.

Report issued by DFID during 2003, estimated that number of endangered people as a result of coastal flooding will increase from one million during 1990 to seventy million during 2080.

Map (7-2) clarifies Topography of the Egyptian Delta, shows contour lines of various regions of high and low Delta

7-2 Biodiversity efficiency indicators:

These indicators reflect the extent of success realized in sustainable development. They mainly evaluate status of biodiversity through numerical criteria that could be calculated and compared with other countries, in addition to tracing changes and trends in the progress or decline of these indicators, which clarify the correctness of countries' policies towards achieving sustainable development. The permanent and renewable existence of such numerical indicators contribute in providing a clear image on the status of sustainable development in the country, and thus providing the necessary accurate information to decision makers to reach the most correct and accurate decision for public interest.

7-2-1 Vitality of ecosystems:

The National Environmental Action Plan (2002-2017) includes preservation of ecosystems' capacities, provision of goods and services, and support citizens' livelihoods. More information is currently available about eco-systems of River Nile and wetlands in terms of the importance of water as a source for drinking water, agriculture, fisheries, tourism, and transport. Work is going on by NCS to finalize similar studies about marine and coastal ecosystem, with focus on coral reefs, mangroves, fisheries and tourism importance in addition to preparing a study about arid and semi-arid areas. NCS is hoping that these studies provide information on the abilities of ecosystems in Egypt to provide goods and services, to implement the programs of the public awareness raising.

Picture (7-1) Shows green pastures vitality of the ecosystem in Elba Mountain

7-2-2 Status of habitats

1 Marine ecosystem (Mediterranean and Red Seas)

Marine ecosystem includes various habitats and endangered species particularly all species of marine mammals (17 species), marine turtles (4 species), sharks (more than 20 species), mangrove trees and a lot of birds such as ospreys, spoonbills, gulls and falcons. In addition to the high marine biodiversity (more than 5000 species) represented in 800 species of marine algae, 209 species of corals, molluscs more than 800 species, crustaceans 600 species and 1750 species of marine invertebrates, and perhaps hundreds of other species that have not yet been discovered, particularly in the exclusive economic deep zone of the Mediterranean and Red Seas. More than 20% of Egypt's population concentrated on coasts due to the availability of food and raw materials, and more than 40% of the industrial development activities are constructed on the Egyptian coastline (such as ports, touristic cities and petroleum activities).

1. Status of Coral Reefs:

Coral reefs in Egypt have been monitored since 2001-2009 in more than 120 sites in the Red Sea and Gulf of Aqaba by using environmental indicators: percentage of living coral reefs, fishes and vertebrates. Studies indicated that status of coral reefs inside protected areas is better than elsewhere. In addition, remote areas from human activities have recorded increase in coral reefs (14%) compared with area with human activities (5-7%) where rate of soft corals increase is more than that of hard ones. Capacity of coral reefs ecosystem has been assessed, particularly in diving areas through studying patterns of annual and monthly distribution of recreational activities in more than 60 diving sites.

Picture (7-2) Coral reef at the Red Sea

Numbers of visitors to diving areas have increased to more than 70 thousand dives/year which exceeded the international average (15 thousand dives / year). An analytical study for violations in coral reefs during the past ten years has been conducted and concluded that more than 600 violations have been recorded for hotels, tourism establishments, Marine scaffolds and individuals, which led to the destruction of large areas of coral reefs. Financial cost of coral reefs loss has been estimated with several billions of pounds. Field surveys conducted in areas of ornamental fish (more than 50 species) recorded environmental deterioration of coral reefs if compared with similar nearby areas in addition to a significant decrease in the types and numbers of fish, so that measures had been taken to ban fishing and export of ornamental fish.

2. Mangrove Trees:

Studies conducted by remote sensing and field-testing proved that total area of mangrove trees had increased to more than 700 hectares by the end of 2009 compared to 525 hectares in 2002. This is due to stopping infringements, protection of mangrove trees, rehabilitation and forestation activities in several locations during the last few years. A biological study was conducted on mangrove trees in terms of their size, height, density, productivity, and flowering periods. The study indicated that mangrove habitat is characterized by high density of biodiversity index including the following different species: 36 algae, 40 insects, 82 crustaceans, 65 molluscs, 17 echinoderms and 22 fish. Most recorded species of fish are of economic importance as the mangrove habitat provides incubation for numerous juvenile fish.

Picture (7-3) Mangrove trees at the Red Sea

2- Wetlands

The ecological and biological functions performed by wetlands in maintaining ecological balance are considered very important as they provide permanent and appropriate living place for distinct groups of fauna and flora , particularly migratory waterfowls which totally depend upon these habitats for access of necessary rest and food to complete their annual migration to central Africa.

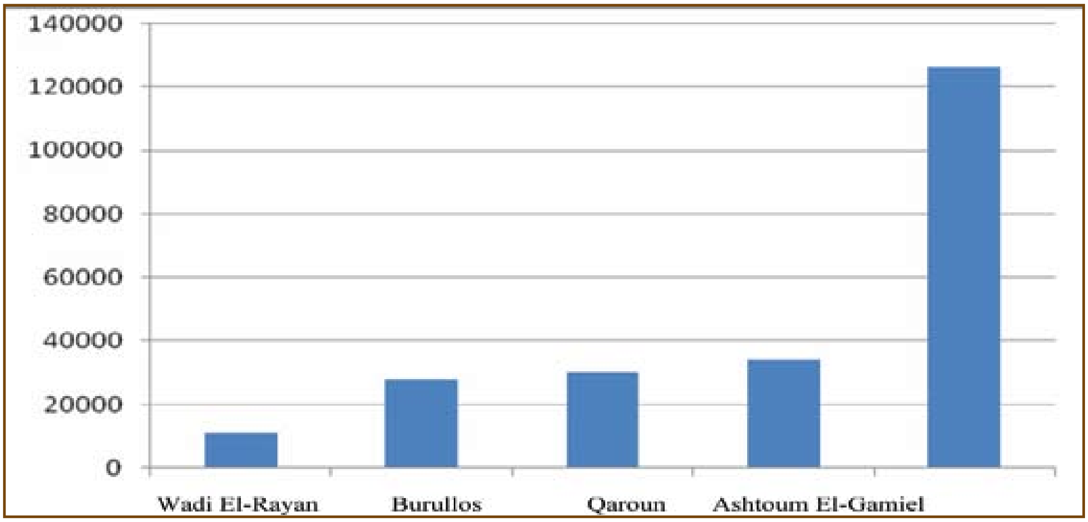


Figure (7-1) Comparison between numbers of birds in different PAs in 2009

To record numbers of birds in wetlands' protected areas; 2009 witnessed regular monitoring of biological diversity in (Zaranik, Borollus, Quaroun, Wadi Rayan, Siwa, Salluga & Ghazal, Ashtoum El-Gamil and Wadi Allaqi). Recorded birds were as follows: Zaranik reached to 126.000 individuals, Astom El-Gamil 34.000, Qaroun 30.000, Borollus 28036 and Wadi Rayan 11.ooo. Previous records clarified that Zaranik protected area receives the largest number of birds during seasonal migration due to its geographical location along their migration route from Asia and northern Europe.

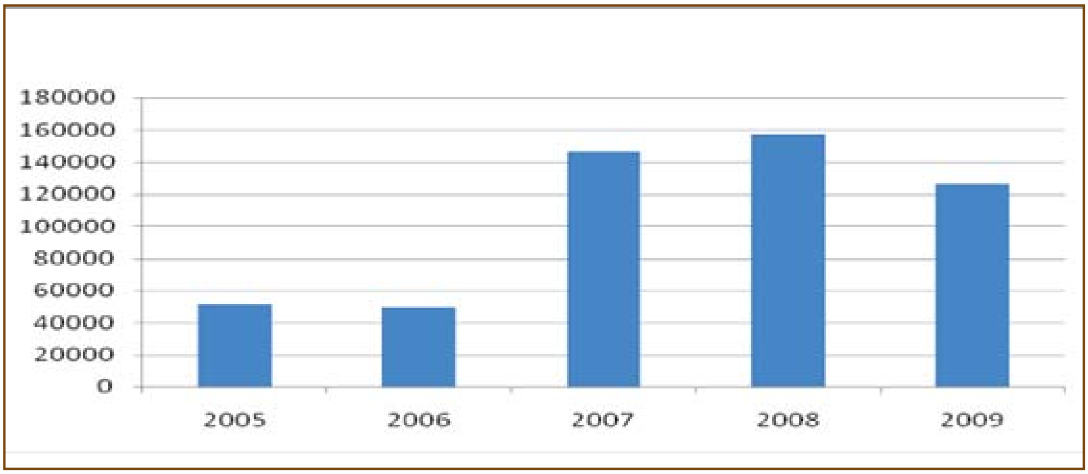


Fig (7-2) Comparison of the total number of birds monitored in Zaranik Protectorate from (2005-2009)

Picture (7-4) White Stork (Ciconia ciconia)

Figure (7-2) shows the development in monitoring migratory birds in Zaranik protected area; they were monitored at 4 locations since 2005 - 2009 with recorded constant and steady increase in some migratory species since 2005 to 2008. The above mentioned recorded results may be due to several factors among which is the accuracy in monitoring and prohibiting their hunting since 2006 until now. On the other hand, their numbers during 2009 were less than those of 2008 due to the decrease in numbers of the soaring birds, particularly White Stork, picture (7-4), which is due to the unusual non-occurrence of sirocco (khamasin) winds during April of this year.

3 - Agro-environment

Agricultural resources in Egypt are restricted in old lands, valley and delta, with an approximate area of 1350 square kilometers, figure (7-3). Valley and delta lands are estimated with approximately 80% of the total agricultural lands in Egypt where total area of agricultural lands in 2009 were about 8.7 million feddans with cropping area of 16.3 million feddans with density rate of 18.7% . 80% of agricultural lands' ownership is in small areas (less than 5 feddans). Per capita share has decreased from one feddan during 1800 to 0.4% feddan during 1900, 0.3 feddan during 1950 and less than 0.12% during early 21st century. Area of organic agriculture had been estimated until 2008 with about 30 thousand feddans, medicinal and aromatic plants with about 63,500 feddans.

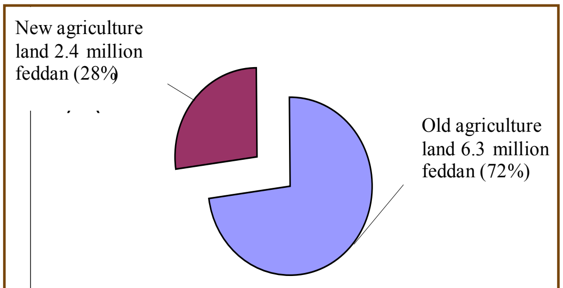


Figure (7-3) Percentage of old agriculture lands to new agriculture lands

Figure (7-3) Percentage of old agriculture lands to new agriculture lands

Egypt relies on only 14 types of mammals and birds for acquiring 90% of animal food supply, in addition to 4 types only of crops (wheat, rice, corn, potatoes), which provide half of Egypt's needs from plants along with a number of other species. Modern agricultural methods encouraged many farmers to adopt species or brands of high-yield in the production of crops, livestock and fish which lead producers to abstain usage of local brands and strains.

Use of surface flood irrigation resulted in deterioration and saltiness of lands and lack of their productivity. Pollution of groundwater with pesticides and chemicals in addition to air pollution led to pollution of agriculture crops due to their containment of proportions of these pesticides and pollution.

Overgrazing of natural pastures and their conversion to agricultural lands has resulted in the loss of natural environment required for fauna and flora habitats. The most dangerous impact that agricultural lands are exposed to is urban encroachment on these lands. Despite imposing restrict legislations to combat violations on agricultural lands, violations do not stop, and agricultural land is decreasing with an annual average of 47.7 thousand feddans.

Problems of agricultural land's fragmentation, rural poverty, increasing rate of tenants, marketing problems and lack of good quality of agricultural products have led to increase migration from rural to urban areas. Thus, they intensify the burden on natural resources.

Application of sustainable agriculture (integrated pest management and organic agriculture) is one of the most important methods of conserving agro biodiversity. This would stimulate biological cycles in agricultural habitat, protecting the environment and duplicating soil productivity as a result of maintaining soil components from loss and desertification. Establishment of Gene Banks or off site conservation of agricultural plant of genetic origins would protect indigenous plants and crops from extinction and protect them for future generations (Table 1).

Table (7-1) total plant species compiled for Genes National Bank 2007		
Plants	**Species**	**Type**
Field Crops	48	111
Vegetables	45	56
Medicinal Plants	133	173
Wild	141	227
Trees and Shrubs	45	63
Total	**412**	**630**

Agricultural production consumes the greater portion of water , estimated with 59.3 billion m^3 including 71.9% of Egypt's total quota from Nile water which is 55.5 billion m ^{3}, 6.1 billion m ^{3} from groundwater, about 1.3 billion m^3 from rain, 5.7 billion m ^{3} from agricultural drainage and 2.5 billion m ^{3} from treated sewage per year . Leakage and evaporation of water estimated with about 35% of the total water discharged from the High Dam, or about 19.4 billion m ^{3} /year. Lost water from irrigation canals estimated with 2.3 billion m^3, where grasses and aquatic plants (water hyacinth) consumes about 750 million m ^{3}/year. This requires firm policy to rationalize water, as the state is targeting to reclaim 3.4 million feddan by 2017 to meet the growing nutritional needs of population; therefore there is a need for providing additional resources of water.

Agricultural seasons in Egypt are characterized by their diversity. Winter crop plants almost overwhelm 94% of the total crop area while summer crops 46% and Nile crops did not exceed 5%. Productivity of barley increased by 39.4% during 2004 compared to 1997, and wheat increased by 17.1 during the same period. Productivity of most crops had increased as a result of the expansion in using advanced agricultural technologies, and use of improved brands resistant to agriculture diseases and pests, thus agricultural growth increased from 2.6 in the eighties to 3.4 % in nineties and reach 3.97% in the current decade.

7-2-3 Fauna status and trends:

1- Monitoring:

Within the framework of monitoring programs of national species:

a. Marine turtles monitoring program

Marine turtles monitoring program in both Mediterranean and Red Seas is considered one of the most successful monitoring programs as it includes qualified specialists working in that field since 5 years. 4 species of marine turtles had been identified as follows: green, loggerhead, hawksbill and leatherback. In addition to monitoring more than 15 nesting sites of turtles in general on the coast and islands and particularly green turtles in Zabargad island (5336 nest during 2009 compared to 438 nests during 2001). This is due to the relative remoteness of Zabargad Island from any human activities and the experience of monitoring team.

Picture (7-5) Marine turtle nesting sites

Picture (7-6) Marine Turtle

Giftun Island is one of the most important nesting sites for hawksbill turtles, their number had increased from 21 nests during 2001 to 255 nests during 2009. However, on the shoreline, the number of coastal tourism activities had increased and accordingly numbers of suitable nesting sites have sharply decreased as recorded in Ras Hankourab, Umm El-Abs and El-Quollaan. Hatching rate ranged from 40% in small Giftun Island, 60% in big Giftun Island and 70% in Zabargad Island.

b. Whale shark monitoring

From May 2003 to February 2008, thirty five adult individuals were recorded in Dahab, Sharm El-Sheikh, Hurghada, Koseir, Marsa Alam, Port Ghalib and Sayyal islands. The largest numbers were recorded during spring and end of summer.

Picture (7-7) Whale Shark

c. Sea cucumber monitoring

Field surveys of sea cucumber included 34 sites along the Gulf of Aqaba and 82 sites along the Red Sea. Identified species included 22 species in addition to the previously recorded 49 species. Also, sharp decline was monitored (10 individuals/10 m^2) particularly in illegally fishing sites, compared to (35 individuals / 10m^2) in protected areas where law is enforced by prohibiting fishing.

d. Marine mammals monitoring

A total of 50 adult dugongs (more than 2m length) have been recorded in their natural habitats characterized with richness of sea grass beds in 15 sites. The largest recorded number was 17 individuals during the summer of 2002 (figure 7-4). Further, a juvenile dugong (1m long) was recorded with his mother during February 2009. Other various marine mammals were recorded especially the spinner dolphins and the humpback whale.

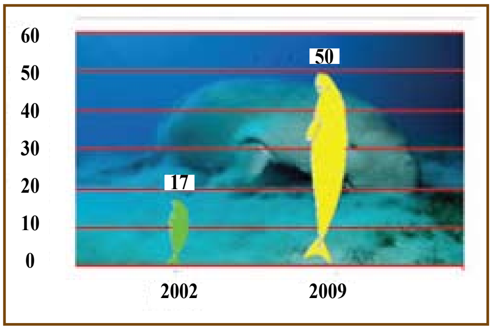


Figure (7-4) recorded dugongs during 2009 compared to 2002

e. Large Mammals Survey Program

Environmental Monitoring of Nubian Ibex in the Red Sea by using Trap Camera.

Local Name: Teital or Albadan (for male) and Alwahsheya (for female) (*Capra nubiana)*

Wadi El-Gemal Protected Area includes many places where Nubian Ibex exists. Nubian Ibex is one of the large mammals facing risk of extinction in Egypt. Water is a very vital and important factor to Ibex, as they need to drink regularly; nevertheless, there is insufficient information about Ibex usage of water due to the scarcity of water

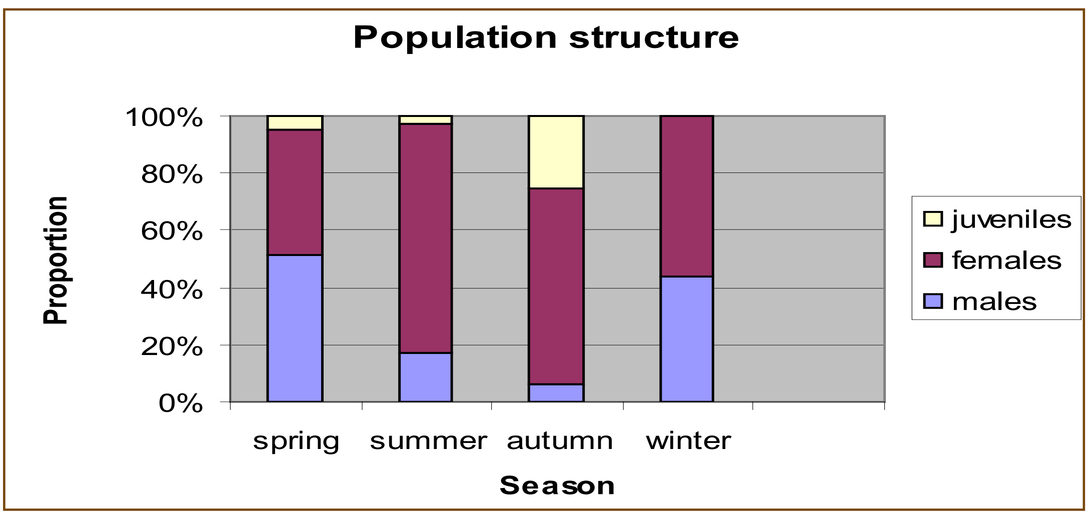


Figure (7-5): Numbers of males, females and newly born Ibex throughout the four seasons of the year in Wadi El-Gemal PA springs within the Protected Area. Since water is important to the Ibex, it was necessary to develop a monitoring program to monitor Ibex communities in the protected areas to determine the status of these communities and their distribution, figure (7 - 5).

picture (7-8) Water spring

Rangers were involved in monitoring water springs and trained on how to use GPS devices to record coordinates of water springs and how to take their measurements. They were also trained on how to install and use Trap camera.

Additionally, a seasonal study of water springs was implemented within surveying areas; picture (7-8). The conducted study covered measuring depth, size and degree of water salinity of each water spring, recording existence of Ibex around them, impact of human existence and some other animals. By observing water status it was noted that some springs drained during some seasons while in some others water is available throughout the year. Non drained springs represent 77% of the total available water in the area, figure (7-6).

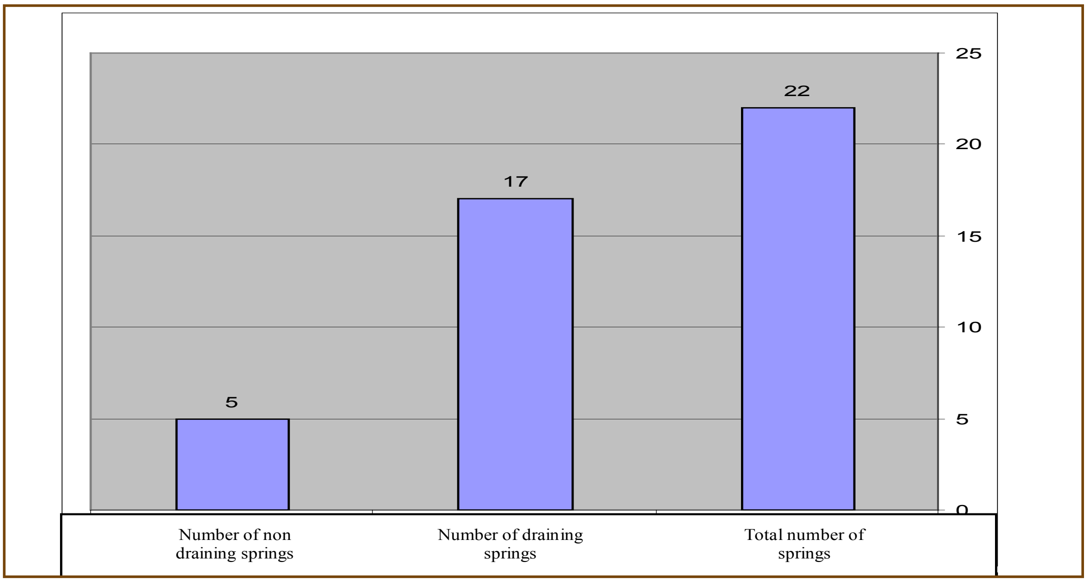


Figure (7-6) Monitored springs

Several actions were taken to protect Nubian Ibex, including:

1. Maintain water springs from being dumped as a result of floods and wild animals themselves.
2. Reduce disturbances resulting from (humans - donkeys - dogs) in adjacent areas to water springs.

3. Increase control over springs within the protected area during summer to ensure water supply for Ibex and protect them from hunters.
4. Provide number of trappers within the protected area to trap dogs, particularly those coming to water spring, to ensure keeping them away.
5. Cultivate some areas within the protected area with the same endemic species which have great ability to resist drought and scarcity of rainfall, which wild animals depend upon for feeding, such as Acacia species and some other species, especially after the region had been exposed to drought period (last rainfall was since 5 years ago). Considering the remaining plants in the Protected Area, they are not sufficient for the needs of wild and domestic animals such as camels and goats, which resulted in the reduction of wild animals' number that travel for large distances searching for pasture.

Picture (7-9) Shows male Ibex drinking from a water spring in Wadi El-Gemal

Picture (7-10) rare picture showing 3 Ibexes, where 2 young Ibexes aged about 7-14 days are standing next to their mother.

❖ Monitoring program of Egyptian Gazelle

A significant increase of the Egyptian Gazelle (Figure 7-7) was recorded in many places in South Sinai, Elba Wadi Al-Gemal and Wadi El-Assuity. This is due to rangers/researchers of the Protected Areas commitment to conduct regular patrols during the last periods, which led to the decline in various industrial activities and reduction of logging activities. In addition , Bedouins were also committed to environmental regulations, as in South Sinai Protected Areas where Protectorate's management had made an agreement with Bedouin community to protect the area of mountain valley of Algelt Al-Azrak as it is considered a rich area with flora and fauna, and important for tourism and achieve great benefits for the whole tribe. This agreement was signed by sheikhs representing 10 tribes which is considered a great success in involving local communities in the conservation of natural resources.

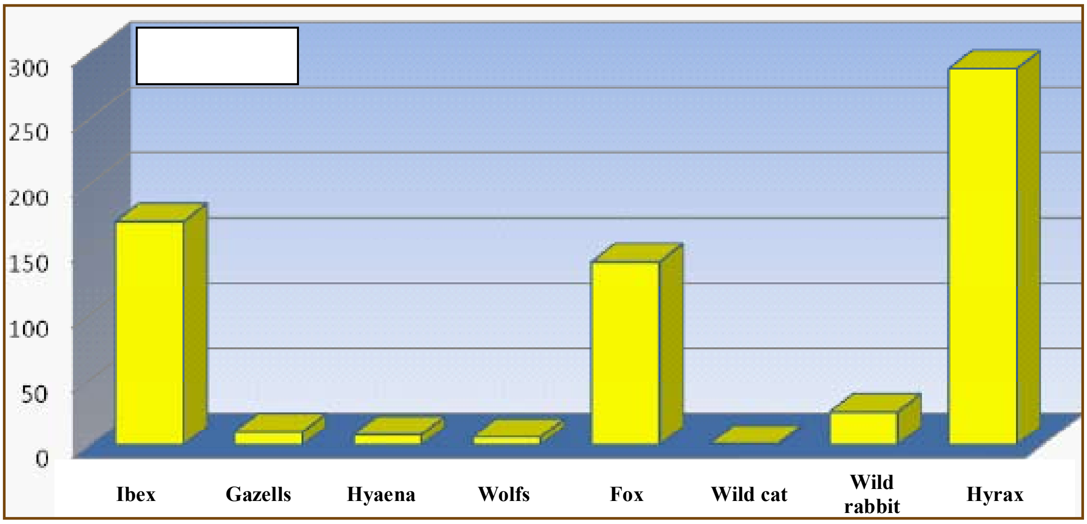


Figure (7-7) Total number of big mammals recorded from July 2008 – May 2009 in South Sinai

f. Monitoring and surveying program of Sinai Baton Blue Butterfly (Pseudophilotes sinaicus)

Sinai Baton Blue Butterfly is one of the two endemic butterflies of St.Catherine Protectorate. It is considered the smallest butterfly in the world. It feeds on flowers of various plants, while its larva feeds on the flowering buds of the Al-Zeiteran plant (Thymus decussates), a medicinal plant endemic to St. Katherine Protectorate and grows only at high altitudes (2000 meters above sea level).

Picture (7-11) Sinai Baton Blue (Pseudophilotes sinaicus)

Monitoring and surveying program of Sinai Baton Blue Butterfly (Pseudophilotes sinaicus) aims to protect this rare butterfly and its habitat by providing the appropriate environment to increase its number as a means of conservation within the natural environment. This program began during 2004 to follow up and maintain both the butterfly and the Thymus plant as each of them are rare, endangered species and endemic to St. Catherine Protectorate. Its greatest number was recorded in Farsh Shuaibi area on the Peak of Sefsafa Mountain. Results of these studies have shown a relative increase in numbers of Sinai Baton Blue Butterfly during 2009 compared to previous years and is expected to increase during 2010, due to increased rainfall.

2. Breeding and reproduction

a- Rehabilitation program of some flora species

Efforts have been undertaken to rehabilitate some endemic flora species in St.Catherine Protectorate to increase their numbers in their natural habitats to protect them from extinction. Cultivation of some species were conducted such as Arfeja (Anarrhinum pubscens), Zayteia (Septemcrenata nepeta), Alloseeg (Silene shimperiana), Alghasah (Ballota kaiseri), and St.Catherine Thyme (Origanum syriacum), within fenced areas to protect them from random grazing and threats. Number of fenced cultivated areas reached 52 distributed in 18 sites.

b- reproduction of Acacia Tree (Acacia Raddiana)

In Wadi Al-Gemal Protected Area, 632 seedlings of Acacia (*Acacia raddiana*) were planted, irrigated with desalinated water (taken from the constructed desalination station in this area) without applying any chemical treatment to increase percentage of seeds' germination in special bags prepared to plant seedlings. Then these seedlings transferred to larger bags to provide them better chance for growing well. This method provides more control over the amount of used water and prevents waste of water due to water scarcity in these desert regions. Seeds of these plants needed a period which ranged between 10-15 days to grow, and have successfully grown by 62.02%.

Picture (7-12) Acacia Tree (Acacia raddiana)

c- reproduction of Haglig Tree (Balanites aegptiaca)

Al- Haglig is one of the plants indicating the existence of underground water, 200 seedlings were planted and irrigated with desalinated water without adding any chemical treatments. Special bags were used for seedlings cultivation. The experiment has succeeded in cultivation by 76.75%.

Picture (7-13) Haglig seedlings (Balanites aegptiac)

d- The Sarh Plant (*Maerua crassifolia*)

The Sarh is one of the perennials and distinct plants of Wadi Al-Gemal Protected Area; it is characterized by its environmental, pastoral and feeding values. Wild animals like gazelle, hyrax, hares and al-teatel in addition to animals

Picture (7-14)Sarh Plant)Maerua crassifolia) of indigenous people are pasturing over seeds, flowers and leaves of this plant. It also provides shade for wild animals during hot days of summer. The Sarh grows on mountain valleys where underground water is available. 100 seeds of Sarh were planted and irrigated with desalinated water without any chemical treatment within special bags for seedlings plantation; however, success rate of these seeds plantation did not exceed 15%.

e- Nabq Plant (Zizyphus spina - Christi)

The Nabq is one of the perennials trees with height that may reach 20 meters and diameter up to 60 cm. It is one of the rare trees in the Protected Area. Two trees only of this kind can be found in Wadi Halous, this may be due to over-grazing of such trees. The Nabq is considered a blessed tree producing sweet fruits with a size the same as that of olive fruit .It is called the apple of desert. 150 seeds of Nabq were planted in a greenhouse to identify its growth rate which succeeded by 66%.

Picture (7-15) Seedling of Zizyphus trees

Picture (7-16) Nabq plant (Zizyphus spina- Christi)

f- Rehabilitation programs of Wild Turtles' areas (Testudo kleinmanni) within Zaranik Protected Area

A new zone containing large numbers of wild turtles was discovered recently outside Zaranik Protected Area in an island called Al-Safyah located within Sadat area. Environmental monitoring was conducted within the region to identify density of wild turtles. Along one day 14 turtles were monitored, identified as 6 males and 4 females while the remaining 4 turtles were not identified due to being still young. It is known that

Picture (7-17) Egyptian Wild Turtle (Testudo kleinmanni) it is not possible to determine the sex of a turtle unless its age is more than 4 years. A group of dead turtles were also found.

Breeding program depended upon addressing dangers turtles are exposed to, and is represented in overgrazing and destroying of their habitats. The program included raising public awareness, with the importance of conserving biodiversity, among residents of local communities within the scope of the Protected Area. This had a positive impact among residents regarding conservation processes. Additionally, the program encourages residents to use turtles' images on their handicrafts' products. El-Retm plant was also cultivated within locations of turtles. This plant is considered one of the best plants preferred by wild turtles as it helps them to hide from their enemies and protect them from sun's heat during summer. Fences were used along all areas of turtles' existence to maintain vegetation coverage, prevent logging and overgrazing.

7-2-4 Red List:

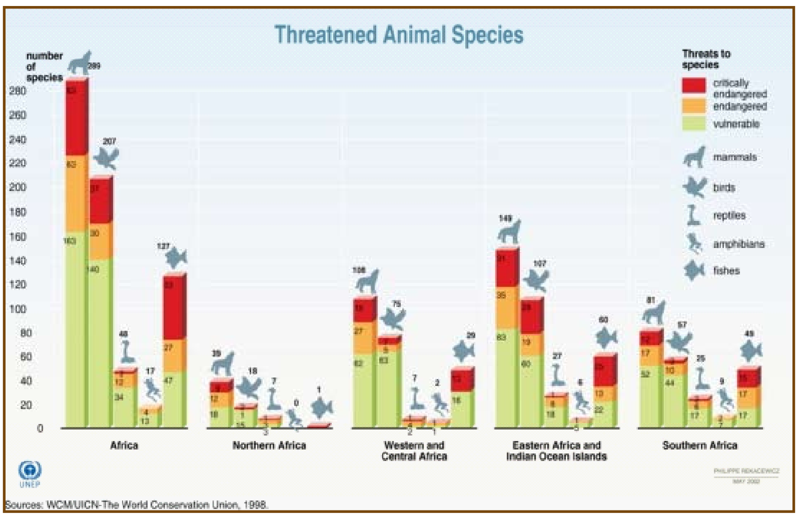


Figure (7-8) Africa Red List

North Africa is not rich in biodiversity and exposed to the adverse impacts of climate change. Figure (7-8) illustrates a comparison between biodiversity richness in different regions of Africa and the great amount of threatened species among different groups of animals in North Africa

Monitoring and evaluation of endangered species is conducted through monitoring programs implemented in Protected Areas. These programs reported improvement in some large mammal species such as the Egyptian Gazelle and Nubian Ibex.
Approximately, fifteen years have passed since issuance of Law 4 / 1994 during which methods of hunting, transport, research, protection and all forms of dealing

with the environment in general and biodiversity in particular have changed. In addition, practical human knowledge in identifying problems resulting from different human practices that have negative impacts on the environment and biodiversity has increased. Ministry of state for Environmental Affairs played a leading role by amending Environment Law No. 4 / 1994 and its article no. 28 concerned with biodiversity; to Law 9 / 2009 in addition to amending its Executive Regulation to be harmonized with new changes in ways dealing with biodiversity, reducing extinction of species resulting from dangerous and violating activities;

the following are the most important of these threats:

1- Hunting

Monitoring and hunting methods were developed enabling hunters to get their requirements in such a way that led to the deterioration of natural habitats and decline in many species, creating an imbalance in the ecological balance needed to sustain life on Earth. This necessitates setting regulations that keep pace with these developments. Studies and different indicators have recorded decline in many species of biodiversity collected for commercial, scientific, economic or medical reasons, which led to deterioration their habitats. This required revision of Environment Law and its Executive Regulation by amending them to cope with these changes and limit current deterioration of species ; provided that this law must be revised regularly according to results of indicators either by decreasing or increasing numbers of allowed numbers of biodiversity to be collected , methods of collection and their locations.

2- Over collection

Over consumption of some common types of frogs, for example by universities and scientific research centers led to great decline in their numbers and natural habitats. Also, the random and over collection methods and exposing animals to negative and inappropriate conditions of living, whether in zoos or in circus, led to replace them with new ones. Therefore, CITES convention has stressed upon not exposing animals, plants and their natural habitats to changes that lead to their extinction or change their habitats, and insist on the importance of issuing export permit from the exporting country for each traded animal or plant and ensure that it is not being listed as an endangered species.

3- Invasive species

Introducing invasive species of plants and animals to other habitats rather than their original ones, led to the extinction of some native species, causing significant environmental loss due to stopping their role in creating biological balance in the environment and sovereignty of other species. The amended Law No. 9/2009 has taken into account putting a list of endangered species of mammals, reptiles and amphibians recorded in the Egyptian red list. Applications for registering other species are investigated for each one separately. The law has designated Egyptian Environmental Affairs Agency (EEAA) to issue export or import permits for any living animal, wild plant or any parts of them. Also, EEAA is authorized through Nature Conservation Sector (NCS)to regulate hunting and collection of living wild animals and plants from determined places and areas according to Egypt's commitment with international conventions ; in addition to identify species , numbers and quantities allowed to be hunted or collected ,and determine allowed periods , tools and methods of hunting . Without prejudice to the provisions of Biological Diversity Convention with respect to benefit sharing resulting from exploiting any components or elements of biodiversity in the Egyptian environment ;the amendment imposes the necessity of holding an agreement concerning transfer of these wild fauna and flora or their derivatives , with the recipient entity of this organism. On the other hand, an initiative had been launched to conserve genetic components and fingerprint of a group of important plants, where 880 samples of 160 species of medicinal plants were preserved in the National Gene Bank and registered as Egyptian medical plants; in addition to their related information concerning specifications and treatment .Work is going on to register the remaining Egyptian medicinal plants. Training is provided for local communities on methods of how to rehabilitate some important plants, which represent economic value for them, such as lotus leaf, acacia, and other different important plants.

7-2-5 Invasive alien species

Available information about invasive alien species are still not sufficient; especially while evaluating economic value of their adverse impact whether on biodiversity and its habitats, human health or properties. There is still an urgent need for harmonizing and imposing laws, legislation and related ministerial decrees to limit their existence and spread. This requires provision of financial, technical and human capacities in addition to unifying efforts of different concerned entities.

1- Preparing National Strategy for Alien and Invasive Species:

The final draft of the proposed national strategy and action plan for invasive species in Egypt had been prepared. It aims to maintain or restore original status of ecosystems, including biological survey to habitats, alien species and their impacts. This will help in determining the starting point of implementing strategic objectives, as well as provide strategic legal and institutional frameworks required to identify availability of preventing and managing alien and invasive species. This strategy is guided by targeted goals set for the National Action Plan for management of invasive alien species.

2- Biological monitoring and survey program of Red Sea Ports:

Within the framework of Egypt's implementation of International Convention for Controlling and Managing Ballast Water in Egyptian ports and territorial waters, which aims to take appropriate measures that lead to marine environment protection and preventing risks arising from the transfer of harmful and invasive marine pathogenic organisms through ballast water carried by ships , and through implementation of National Action Plan programs for invasive alien species for the Egyptian environment, the Nature Conservation Sector affiliated to EEAA in coordination with General Authority of Red Sea Ports, implemented a project for studying invasive micro-organisms in Red Sea Ports.

3- Raising public awareness program on alien and invasive species:

In the framework of raising public awareness on alien invasive species, a booklet was prepared, including a summary of fundamental information about the process of biological invasion and examples of its occurrence in Egyptian environment. It also includes a summary of the proposed national strategy for alien and invasive species.

7-2-6 Ecosystem resilience ability :

Restoring environmental balance requires monitoring of climatic phenomena such as rainfall and its relation with vegetation coverage , climate change and human activities which help to restore or lose ecological balance or moving plants and animals' habitats to other more appropriate places ; plants are moved from lower areas to more elevated areas with different densities ,in both Gabal Elba and South Sinai mountains , due to very harsh climatic conditions in lower areas.

7-2-7 Socio- economic status of biodiversity

1. **Supporting Local Community:**

a. In the framework of supporting local communities to perform their duties and reduce their burdens, protectorate's physician examines local inhabitants and provides them with appropriate treatment. Conducted statistics revealed that 77 Bedouin settlements distributed along 25 valleys located within South Sinai area, where 3697 cases were examined during 2009. Figure (7-9) shows the most common diseases and cases' number. This figure mentioned only the diseases exceeded 50 cases, which are mostly concentrated in the respiratory and digestive systems that are often exposed to external and severe environmental conditions. The protected area collaborated with concerned authorities with health and population in the governorate to vaccinate Bedouin children against polio, measles and rubella through using protectorate's cars to reach remote mountainous valleys which Ministry of Health's cars cannot reach.

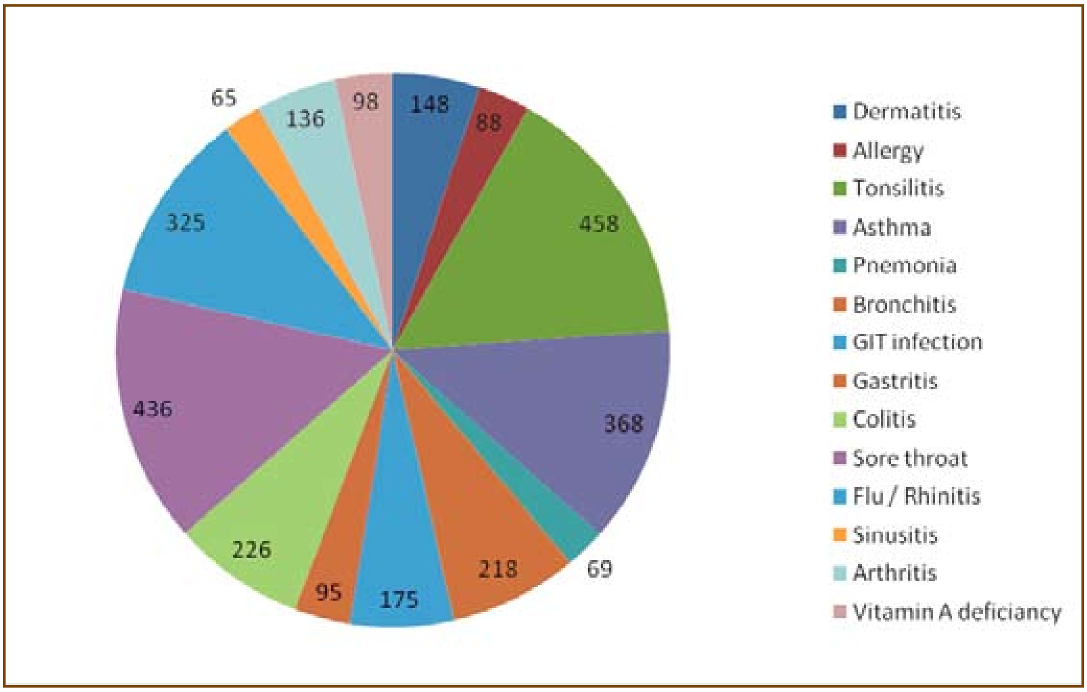


Figure (7-9) Common diseases in South Sinai and cases' number (more than 50 cases)

b. Within the framework of veterinary program to support local community as responsible management about protectorates realize the importance of livestock to Bedouins. Vets examine domestic animals (camels, sheep, goats and chickens) through regular visits to their settlements. A comprehensive survey of Bedouin domestic animals were conducted in the southern sector of South Sinai. Data were collected and analyzed to identify Bedouins' property of camels, sheep and goats, figure (7-10).

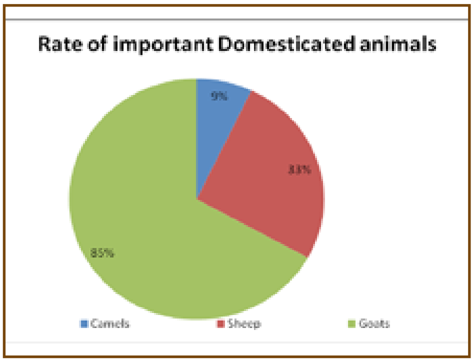


Figure (7-10) percentage of each type of herds of domesticated animals

Examinations of livestock showed the spread of some diseases, which may destroy Beduins' property of camels. Therefore, a treatment program was settled to control the spread of scabies within the protectorate. Total 392 cases were examined, where 22% from the total cases were infected with camel smallpox and exposed to treatment course which helped in curing 63% cases, figure (7-11).

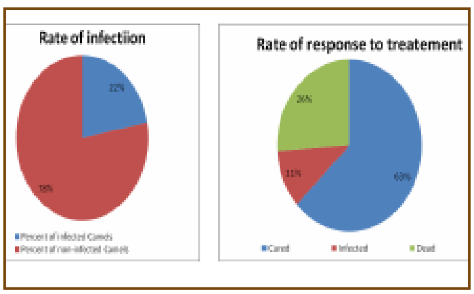


Figure (7-11) percentage of each type of herds of domesticated animals

c. Supporting and enhancing handicrafts products within the western Protected Areas (Siwa, White Desert and Gulf Kebir). This includes pottery products, wicker and palm trees products to safely get rid of palms' waste in addition to carpets and Kileems. Female trainees from the local community reached 250 women.

2. **Equitable Benefit Sharing :**
   Biological Diversity Convention stated the necessity of respecting the knowledge, innovations and practices of indigenous and local communities which embodies traditional lifestyles relevant to the conservation of biodiversity and its sustainable use. Using indigenous knowledge is subject to the approval and involvement of their owners. Access and equitable sharing should be encouraged so that benefits arising from the use of such knowledge, innovations and practices are equally shared.

7-2-8 Threats

Addressing threats facing biodiversity (over-grazing, over-collection, invasive species, illegal fishing and hunting, etc.) is one of the most difficult issues. Maintaining natural habitats is one of the main challenges facing Egypt, since protecting natural habitats lies under responsibilities of many entities, which need exerting considerable efforts during the next phase. Establishment of the National Center for State Lands' Use, provides help in reducing pressure resulting from habitat loss, changing land use and their deterioration, and unsustainable use of water. Efforts are going on to coordinate with all concerned entities to mainstream biodiversity locating outside Protected Areas within their programs. This also includes implementation of several water initiatives (Nile Basin Initiative) , strategies which have been prepared during the last period, and national plan for protecting River Nile (12 programs).
Successful programs were implemented such as rehabilitation of habitats (Acacia trees, mangroves, coral reefs), and threatened species (breeding programs of medicinal plants and endangered animals such as Gazelles). Also, public awareness increased with the importance of reducing pressure arising from loss of important habitats and species, represented in the increasing numbers of reporting about any violations. This reflects the positive cooperation from public, local community and also tourists who send their complaints by emails. In spite of all exerted efforts, important habitats and rare species are still exposed to more pressures threatening ecosystems and endangered species, which require providing more efforts, capacities and broad national participation.

7-2-9 Protected Areas Management Efficiency:

1. **Program of evaluating management efficiency**
   Management effectiveness of both network and sites of Protected Areas had been evaluated during 2006-2007. Evaluation was conducted according to international

standards set by the International Union for Nature Conservation and World Wildlife Fund, in cooperation with projects undertaken by Nature Conservation Sector and participation of Protected Areas' staff. The evaluation resulted in the following:

a. Current Protected Areas' network provides good system to conserve several factors of biodiversity, particularly good representation, important species of biodiversity, large groups of living organisms, ... etc.
b. Protected Areas' system is with highly socio-economic value, however, there are lots of benefits that were not recognized, and must be identified.
c. Egyptian Protected Areas suffer from insufficient funding , reaching to a very low standard if compared with general standard of Protected Areas in developing or even African countries . Total average expenditure on Protected Areas in Egypt estimated with 108 Egyptian pounds (19 U.S. dollars) / km2 /year, including labor costs. This represents 25% of developing countries' expenditure on Protected Areas , so that Protected Areas require funds ranged between 7.4 and 15.7 million dollars annually or about 4 to 9 times of current expenditures.
d. Employing capacity and allocated budgets for Protected Areas are not sufficient for needs of these Protected Areas and their biological, geological, cultural or tourist values.
e. Changes identified in the uses of lands; recreational activities (especially tourism) and hunting are negatively affecting Protected Areas. They require national strategies to address these problems in the future .Despite of the good relationships between Protected Areas and local communities, however local communities often do not effectively participate in conserving elements and components of nature or in formulating administrative decisions of protected Areas.
f. Protected Areas face many shortcomings, represented in lack of knowledge, among many executive authorities , with Environment and Protected Areas' laws ; in addition to the insufficiency of funds, staff for control and safety on Protected Areas. More than 27 years have been passed since the issuance of Law No 102 / 1983, during which international and national concepts were changed. This necessitates reconsidering terms of current law to satisfy new variations, accelerate issuance of law for biodiversity to fill gaps and inconsistencies among different laws that deal with biodiversity and natural habitats. It must cope with international conventions signed by Egypt but till now not activated in domestic laws that will help in their implementation.
g. Planning processes in Protected Areas are limited and only half of the Protected Areas have documented management plans.
h. Positive results of implementing current action plans for Protected Areas, which had been generalized among all Protected Areas, had begun to appear. Currently and to some extent, it is possible to conduct an accurate assessment for programs and activities' implementation within Protected Areas.

i. Data management in Nature Conservation Sector is facing a problem; as it is difficult to extract updated and accurate data about Protected Areas and their administrative status (their size, staff, and budget). There is no reliable official source for gaining this type of data.

During 2007, 2008, and 2009, Nature Conservation Sector set and authorized appropriate methods, standards, criteria and indicators for evaluating management effectiveness of Protected Areas, under auspices of the International Council for Protected Areas affiliated to the International Union for Conservation of Nature IUCN. These criteria have been developed and revised to be appropriate with Egyptian conditions. As a result, Planning Unit affiliated to Nature Conservation Sector issued a guiding manual for Protected Areas' staff including steps and results of management effectiveness evaluation. Due to the effective role Nature Conservation Sector plays in developing management effectiveness of Protected Areas' measures, this manual has been used in some Arab countries such as Saudi Arabia, Libya, etc.

During 2009 NCS applied a new method to evaluate management effectiveness of Protected Areas (trace evaluation); which is considered a new, easier and appropriate method to the current situation which will help in implementing the currently used method by Nature Conservation Sector to evaluate management effectiveness (verify evaluation) . Trace evaluation had been conducted for 7 Protected Areas (Wadi Degla - St.Catherine - Nabq - Ras Mohammed -Northern Red Sea Islands - Wadi Al Gemal - White Desert). This means that Egypt has conducted evaluation of management effectiveness for 11 Protected Areas since 2007 estimated with 39% of the current Protected Areas. This percentage exceeds the required percentage by the Secretariat of Biological Diversity Convention, which obligates parties to carry out this evaluation for at least 30% of the protected areas by 2010.

2. Control and Law Enforcement

Control and law enforcement is one of the most important indicators of realized success in conserving biodiversity. In this field, 15 marine units had been provided, including one boat for undertaking marine researches and studies on Red Sea coast, 6 fast yachts for addressing needs of three Protected Areas and following diving activities in Aqaba Gulf (Ras Mohammed, Nabq and Obu-Galoum); in addition to 8 fast yachts to cover the three Protected Areas in the Red Sea (Elba, Wadi El-Gemal and Northern Islands). In cooperation with security authorities in Aswan governorate, controlling and law enforcement had resulted in arresting 23 endangered reptile species while being offered for sale, combat attempts of

Pic (7-18) Seizing trade violation

Pic. (7-19) seizing export violation

hunting falcons from Elba Protected Area, birds hunting from Wadi Al-Gemal and attempts of smuggling about 240 of Dabb lizard from Sharm El-Sheikh Airport, preventing three attempts of trading in wildlife and stopping wildlife shows in tourist villages in Hurghada.

Picture (7-20) Combat Wildlife Shows

Despite the achieved successes in controlling illegal trade and wildlife abuse, great efforts are still needed to raise capacity building of employees responsible for monitoring wildlife on Egypt's entrances and departure gates, particularly on how to identify wildlife species subjected to smuggling and provided with information about related rules and laws.

3. **Environmental Impact Assessment (EIA) for Investment Activities:**
   Environmental impact assessment studies (EIA) for different activities aims at conserving environment , natural resources and human health from the impact of unsustainable development , for which EIA studies propose recommendations to mitigate their negative impacts. Therefore, it is important to provide full accurate information about proposed project.

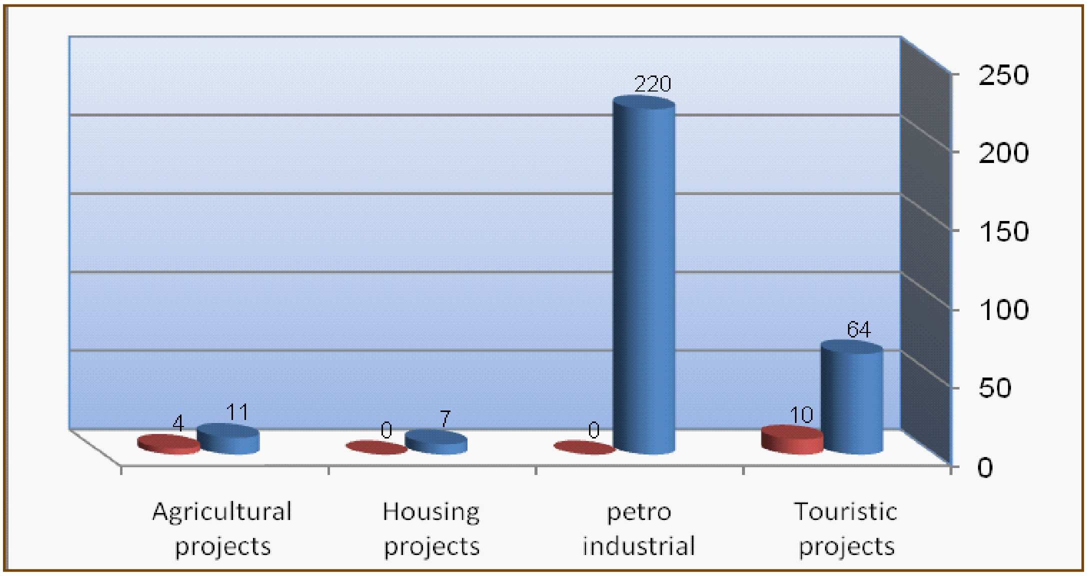


Figure (7-12)Accepted to non-accepted projects during 2009

On the long run, EIA studies aim at ensuring that this development meets and preserves needs of current and future generations. EIA is the effective tool to apply integrated environmental management that provides necessary information for taking appropriate decision either by endorsing, rejecting or modifying the project by taking necessary precautions.

According to provisions of Law No. 4 /1994 amended by Law 9/2009, establishment of a new project, expansion or renovation of existing project is subject to EIA. EIA studies require precise determination of cost, environmental benefits and emphasis on the quality and efficiency of the assessment and not on the quantity of data and information.

Field investigations for projects reaffirm their commitment with environmental rules and laws mentioned in the environmental approval. Successful coordination between Environmental Management Sector represented in the Central Department for Environmental Impact Assessment and Nature Conservation Sector to achieve the best conservation and control against any negative impacts may result from projects on natural environment.

EIA documents of various projects were divided into tourist, industrial or agricultural projects, figure (7-12). Figure (7-13) shows total conducted studies during 2009, where 316 studies were conducted exceeding 2008 with 36 studies; they were mainly on oil and tourist activities.

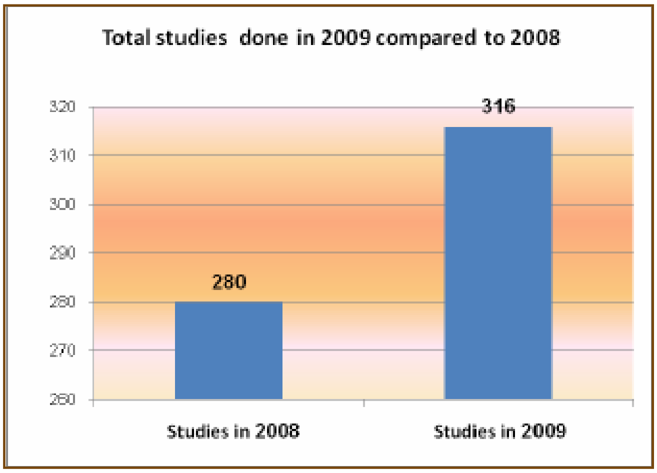


Figure (7-13) Total studies done in 2009 compared to 2008

Challenges facing Environmental Impact Assessment

EIA faces some challenges including:

- Insufficient environmental studies and funds for their execution;
- Proposed studies do not state all facts about the project;
- No-sustainability of monitoring and evaluations after project execution to identify the validity of taken decision or correct negative impacts that may result ;
- Many projects are not subject to civil society inspection.

7-2-10 Special Measures and procedures for biodiversity conservation outside Protected Areas

Encouraging biodiversity systems and habitats conservation is considered one of MSEA targeted aims to cope with international target which is achieving at least 10% of the effective protection to each ecosystem in Egypt. In fact, more than 10% protection has been achieved so far. According to the national strategy and action plan of biodiversity conservation, 27 Protected Areas have been declared representing about 15% of Egypt total area which will reach 20% by 2017. Representing the most important ecosystems in the system of Protected Areas is considered one of the significant principles governing planning and management of the protected areas network in Egypt. This aims to conserve sustainable groups of these ecosystems. The current and future Protected Areas have been recorded on the map of country's land uses, representing different environments in Egypt. The other Protected Areas will be declared consecutively according to the national strategy of biodiversity. National objectives have been developed for specific programs (agro-biodiversity, inland water, marine and coastal water, arid areas and semi-wetland and mountains) .They were included in the national environmental action plan (20022017-) and the related national strategy (wetlands, ecotourism, medicinal plants).


Pic (7-21) Sooty Falcon (Falco concolor)

As for conserving areas with great importance to biodiversity, focus was given to marine areas, wetlands, mountains (Elba, St.Catherine) , arid areas and semi-wetlands as they assure complete protection to important areas such as (fish breeding areas, coral reefs, mangroves), also areas where endangered species exist (turtles, gazelle, dolphins). The coming phase will focus on fresh water and agro-biodiversity.

With regard to strengthening conservation of diversity species, focus was directed to most vulnerable species, especially large mammals , marine and land turtles in addition to medicinal plants especially endemic species. An initial list with endangered species in Egypt according to criteria that have been identified by the IUCN was prepared. National plans for identified species (dolphin, marine turtle, mangrove trees, coral reefs, Acacia, medicinal plants, sooty falcons) were developed. Action plans have been prepared to a number of groups of birds and marine turtles. Additionally, private sector was encouraged to contribute in breeding endangered species outside their natural environment. As well as conserving genetic origins of medicinal plants in the National Genetic Bank. These plans were included in the national action programs; where many projects were targeting to conserve biodiversity in wetland, and arid lands. These projects led to the enhancement of current status of biodiversity and considering achievement of 2010 target.

Exerted efforts:

MSEA, have exerted great efforts to enhance biodiversity and environmentally sensitive sites. The following are some examples of exerted activities:

1. Study status of Nile Crocodile in Nasser Lake and evaluate its environmental status.
2. Conduct survey programs on large mammals such as: Gazelle, Nubian Ibex, and Bighorn Ibex. Studies proved their increasing number.
3. Prepare studies to declare new Protected Areas particularly in Saloum and the Baharia Oasis which includes evidence for the existence of dinosaurs' remains.
4. Develop natural and cultural world heritage sites (Wadi Hitan, St.Catherine).

5. MSEA amended Environment Law 4 / 1994 with Law 9 / 2009 to cope with current concepts dealing with biodiversity.
6. Breed medicinal plants in St.Catherine and involve local community to benefit from their benefits.
7. Breed timber trees, such as: Sedr, Haglig, Acacia and Medemia palm trees.
8. Rehabilitate turtles areas in Zaranik and Omayed Protected Areas.
9. Monitor and follow up programs of marine hunting activities, diving activities and other activities in Red Sea area; in addition to monitor invasive species resulting from ballast water.
10. Follow migratory birds and take samples to identify cases with Avian Flu.
11. Intensify patrols campaigns on pets and birds stores, fish markets to monitor violations and take necessary legal actions against them.
12. Revise investment projects and their EIA studies to insure no negative impacts on biodiversity.
13. Study various sites and select the best to be declared as Protected Areas.
14. Conduct monitoring programs for soaring birds and butterflies.
15. Conduct workshops and forums for environmental awareness.

7-4 Future Vision

Desert represents 95% of Egypt's total area and despite that, available information about desert ecosystems, sustainability, economic perspective of its management and supporting studies on breeding wild species are not sufficient .Accordingly, MSEA adopted future vision summarized in the following points:

1. Activate scientific research system within Nature Conservation Sector to support breeding of some wild plants which will positively reflect on environmental, economic and social status of local community. The medicinal plants project in St. Catherine is considered as a good example to be replicated.
2. Conduct surveys and studies on breeding methods of some wild animal's species such as: gazelle, ostrich, sea cucumber, crocodile, green turtles, etc.
3. Pay great interest to medical conditions of wild plants and animals, and develop a system to manage these cases to reduce degradation of biological species.
4. Give due consideration to wetlands in Egypt which was identified by international convention on Wetlands (RAMSAR) , as being sites that need special concern due to their suffering from environmental degradation particularly they are prone to drowning, as a result of climate change and sea level rise .
5. Concentrate on ecosystem services, economic benefits resulting from biodiversity, which can contribute in facing socio-economic challenges, particularly food provision and eco-tourism fields.
6. Activate provisions of bio-safety agreement of biological species, imported and exported to Egypt.

References:

- Human Development Report for Egypt (2008) " Social Contract in Egypt: role of civil society" - United Nations Development Program and the Institute of Planning in Egypt.
- Annual Report (2006) by the Central Agency for Public Mobilization and Statistics.
- Strategy of the Ministry of Agriculture and Land Reclamation, till 2017.
- The official website of the International Center for Agricultural Research in Dry Areas (ICARDA).
- The Nile is in Danger - Dr. Mohamed Abd El-Fattah El-Kasas 2006.
- The official website of the General Authority for Information (Yearbook for Egypt - 2008).
- The official website of Pesticides Commission, Ministry of Agriculture www.abc.gov.eg , (May 2009).
- Egyptian Ministry of Agriculture (Agricultural Magazine -October 2008).
- Information Report on the evolution of Egyptian Agriculture, Center for Information and Decision Support, Cabinet of Ministers.
- American Chamber of Commerce in Egypt 2008 .
- Book of the annual celebration with Biodiversity and Agriculture Year – 2008.
- The fourth national report for Biological Diversity - March 2009 .
- Discovery of a new zone containing large numbers of tortoises - Researcher / Basem Ahmad Rabia .
- Francis Gilbert, Sabreen Rashad, Mohamed Kamel, Alaa El Din Ismail, Mike James1, Samy Zalat. Monitoring of the endemic Sinai Baton Blue butterfly Pseudophilotes sinaicus in the St Katherine Protectorate, South Sinai. Egyptian Journal of Biology, 2010, Vol. 12, pp 18-26.

Chapter Eight

AFFORESTATION, FORESTS, GREEN BELTS AND LANDSCAPES

8-1 Introduction

Trees and Forests are considered necessary elements of renewable natural resources that insure the availability of a healthy environment as they provide good protection, shade, save ecological balance and play an important role in protecting natural environment where they exist .They interact with various environmental components including climate, land, water and ecology to protect all elements of environment . Many conventions and conferences proved that human life without trees would not be sustainable, so that perseverance of forests, cultivation of more trees and green belts for the sake of our planet is a necessity.

8-2 Exerted efforts

Depending on vegetation coverage as a method to mitigate Carbon Dioxide emissions, Ministry of State for Environmental Affairs executes many activities to reduce negative impacts of environmental pollution as follows:

8-2-1 Green belt around Greater Cairo

This project aims at planting condense tree belt around the Ring Road of Greater Cairo by planting 500 thousand trees with length of 100 km ,to benefit from treated waste water instead of being uselessly discharged in desert or unsafely used, in addition to providing job opportunities and achieving economical revenue.

During 2009, this belt was exposed to daily follow-up for irrigation and pruning works with priority to the first 14 km, in addition to maintaining drip irrigation networks and adding 10 thousand trees of yellow Acacia geluka to the first row, picture (8-1) shows flowering of Acacia saljna. Along the second phase of the project, construction of 2 main tanks for treated waste water and installation of 160 mm diameter pipes for drip irrigation for the effluent line , had been finalized .Work is going on to prepare land for planting 50 thousand trees, which will be irrigated by drip irrigation using treated waste water to preserve the environment.

Pic. (8-1) Acacia saligna flowering trees planted during 2005

8-2-2 Planting forest timber trees by using treated waste water:

This year a cooperation between the Holding Company for Potable Water and Sanitation – Ministry of Housing , Central Department for Afforestation and Environment - Ministry of Agriculture and Land Reclamation ,Egyptian Environmental Affairs Agency-Ministry of State for Environmental Affairs , MSEA has been conducted to specify spaces of lands devoted for timber forests cultivation in 18 governorates, it resulted in finding 88 thousand feddans and treatment plants with capacities amounted to 2075 thousand m3 / day while their actual capacity is 910 thousand m3 / day.

Mubark/ Kaul initiative is aiming at providing practically and scientifically qualified technicians in production and technology methods coping with labor market needs. Due to MSEA expansion in planting forests by using treated sewage water, particularly in Upper Egypt, and scarcity of qualified technicians in this field , MSEA inaugurated a third class in Luxor forest irrigated with treated sewage water.

During 2010 a Memorandum of Understanding was signed between Luxor governorate and an Egyptian German company, for planting 8000 feddans with Jatropha and setting a factory for producing bio fuels in Al-Hubail area in Luxor. This action was implemented within activating Egyptian code, issued in 2005, concerning use of treated wastewater, and potentials of cultivating species of plants producing bio fuels.

8-2-3 Afforestation and cultivation of green spaces and parks:

a. In the framework of joint cooperation between Heliopolis Development Association, chaired by H.E Mrs. Suzanne Mubarak and Ministry of State for Environmental Affairs to develop and landscape schools, 124 schools had been planted and cultivated with trees, shrubs, hedges , annuals and indoor plants in 4 educational areas: El-Salam -El-Nahda (9 schools), El-Salam(52 schools), El-Zatoun (36 schools) and El-Marg (27 schools).The following table indicates this exerted effort :

Educational area	Number of schools	Number of classes	Number of pupils		Green areas (m^2)	Average green spaces (m^2 / school)	Trees , shrubs, hedges and annuals	Average trees , shrubs (m^2 / school)
			boys	girls				
El-Salam El-Nahda	9	238	6944	3692	4240	471	5665	629
El-Salam	52	1616	29389	31564	16225	312	25921	498
El-Zatoun	36	938	20353	18684	7350	204	38678	1074
El-Marg	27	732	2930 6	20325	3915	145	6339	235
Total	124	3524	8599 2	74265	31730	255	76603	618
			160257					

These schools include kindergarten, secondary, commercial, industrial and professional schools. Pictures (8-2), (8-3) show model for this activity.

After Development

Before Development

Pic. (8-2) Dar El-Saaada Primary School

After Development

Before Development

Pic. (8-3) Hamza Bin Abdul Muttalib School

b. To preserve genetic resources of different plant species, Ministry of State for Environmental Affairs established the Botanical Peace Garden in Sharm El-Sheikh on an area of 33 Feddan ;in which South Sinai governorate's genetic resources of medical and aromatic plants were collected and raised (38 genus and species); in addition to 50 types of palm ,semi-palm trees ,shrubs , herbs ,climbers and hedges covering the entire park "picture (8-4) ,(8-5)" . Establishment of Cactus Garden has been finalized " picture (8-6) and (8-7)", and continuous efforts are going to maintain green spaces and different species cultivated in the garden. This year H.E President of Tajikistan Republic visited the garden for planting a tree, picture (8-8).

Pics (8-4) and (8-5) Botanical Peace Garden in Sharm El-Sheikh

Pics (8-6) and (8-7) Cactus Garden in Sharm El-Sheikh

Pic (8-8), President of Tajikistan Republic while planting a tree

c. Within the framework of World Environment Day celebration 2009 held under the slogan (Your planet needs you Unite to combat climate change), MSEA provided and distributed 600 400 trees and seedlings from 26 species to all governorates (29 governorates) with an average of 20700 trees and seedlings for each governorate ;in addition to distributing some species coping with the climatic conditions of each governorate to NGOs and civil society organizations in some governorates (the Good Evangelical Samaritan Society in Moqattam, Friends of Nature Society in Aswan and Future Generation Society in Belbais).

d. Establishment of Suzan Mubark's Garden for Families in Al-Rehab City is continued, to which 10 feddans are added to become 70 feddans. Different spices of trees have been planted (Picture 8-9) on garden's fences (picture No. 8-10) ; species of plants in the garden amounted to 98 from palm ,semi-palm, trees, shrubs, soil coverage , flowering herbs ,climbers ,cactus and green spaces . Surface irrigation networks, drip irrigation and sprinkler irrigation were implemented (picture 8-11). They launched the establishment of computerized centralized control system for these networks and development of timing programs for automatic operation of irrigation systems.

Pic. (8-9) different species of cultivated plants

Pic. (8-10) tree fence after planting

Pic. (8-11) spray irrigation

e. Many central security units and hospitals were environmentally supported with trees , shrubs and green spaces (Nasser Institute for Researches and Treatment, National Bank Hospital), faculties (Faculty of Social Work and Faculty of Applied Arts affiliated to Helwan University), mosques and monasteries ; in addition to cultivating gardens in public squares (5 public parks in 15 May City in Helwan governorate , pictures " 8-12 "," 8-13",public parks such as the main entrance park in front of Talkha Bridge – Mansoura City in Dakahlia governorate, governmental schools in various educational levels (190 schools) .The number of trees provided in the framework of this activity reached 23000 trees covering an area of 19000 m^2.

Pic. (8-12) Entrance of Helwan city

Pic. (8-13) Public garden in 15 May City - Helwan

f. Cultivate 10 feddans with olives within Innovative Methods Project to raise resources in Gifgafa village –North Sinai governorate; these lands had been distributed on project's beneficiaries.

g. Within the framework of establishing governmental or NGOs nurseries in many governorates on an area ranging from one to ten feddans for each nursery, a nursery for timber trees has been established in New Valley Governorate, as well as in Bir Al-Abed City in North Sinai.

8-3 Future vision (until 2012)

With the currently increasing quantities of treated wastewater due to the establishment of treatment plants throughout Egypt , Ministry of State for Environmental Affairs in cooperation with all concerned ministries are interested in achieving progress and cultivating more timber forests , for the sake of the following :

a. Cultivate green belts to reduce air, soil and water pollution.
b. Wood production.
c. Produce Bio fuels (Jatropha).

Planting green belts irrigated by treated wastewater is one of MSEA's priorities, whether through finalizing phase II and III of the green belt around Ring Road of Greater Cairo or by planting green belts on crossing roads on the ring road with depth that reaches to 25 km, as well as green belts around old and new cities.

Exerted efforts are going on to plant more green spaces and trees to improve the environment by intensifying afforestation and construction of parks, both in schools , old towns or new urban communities and support NGOs afforestation efforts due to the great health , aesthetic, environmental and tourist benefits.

References

Research Center of Housing and Construction - Ministry of Housing, Utilities and Urban Communities - 2005 and 2007: Egyptian Code for the use of treated sewage water in agriculture.

PART FOUR

URBAN ENVIRONMENT

Chapter Nine

ENVIRONMENTAL URBAN & INDUSTRIAL DEVELOPMENT

9-1 Introduction:

Urbanization rate in Egypt is characterized by being high if compared with other world countries, as its urban population reached 42.6% in 2008. This urbanization was accompanied by industrial growth that led to the emergence of many problems concerning urban slums in both residential and industrial areas.
There is no doubt that challenges facing development of new urban communities, not only concentrated on construction and executive activities, but on the interaction of different development elements to create a society characterized by good quality of life, which is the main target of development. This can be realized through planning, implementation and management. If all these approaches do not realize good quality of life ,development will become incapable of achieving its objectives, hence investments directed to this development would be considered waste for country's different resources, where it is essential to deal with these resources efficiently and effectively till achieving best possible revenues to the national income.

Industrial sector in Egypt is considered one of the sectors that have a direct impact on Egyptian national income and major field for achieving economical and environmental development. Industry is a major consumer of energy and natural resources and consequently has great impacts on water, air and soil quality

.

9-2 Environmental Development:

9-2-1 Urban Development

Inhabited areas in Egypt extend along both sides of the River Nile valley, and urbanization spread extensively on Delta's fertile lands. Current Egyptian population is 77.5 million, with about 1.900 million in temporary migrations occupying 5.5% of Egypt's total area. These figures indicate the imbalance between occupied land and total area of Egypt. Steady growth of population led to the unplanned construction of these urbanized areas across fertile lands of the valley which resulted in decreasing agricultural lands, extensive pressure on economic resources and emergence of many problems and environmental challenges.

9-2-2 Challenges and Pressures facing Urban Development

1. Encroachment on agricultural land has led to the loss and waste of one million and two hundred feddans of fertile agricultural lands, mostly in the Delta region.
2. Current rates of population growth (20.5 per thousand population) ,will decline per capita share from arable land to less than 0.05 feddan in 2050 as shown in Figure (9-1)

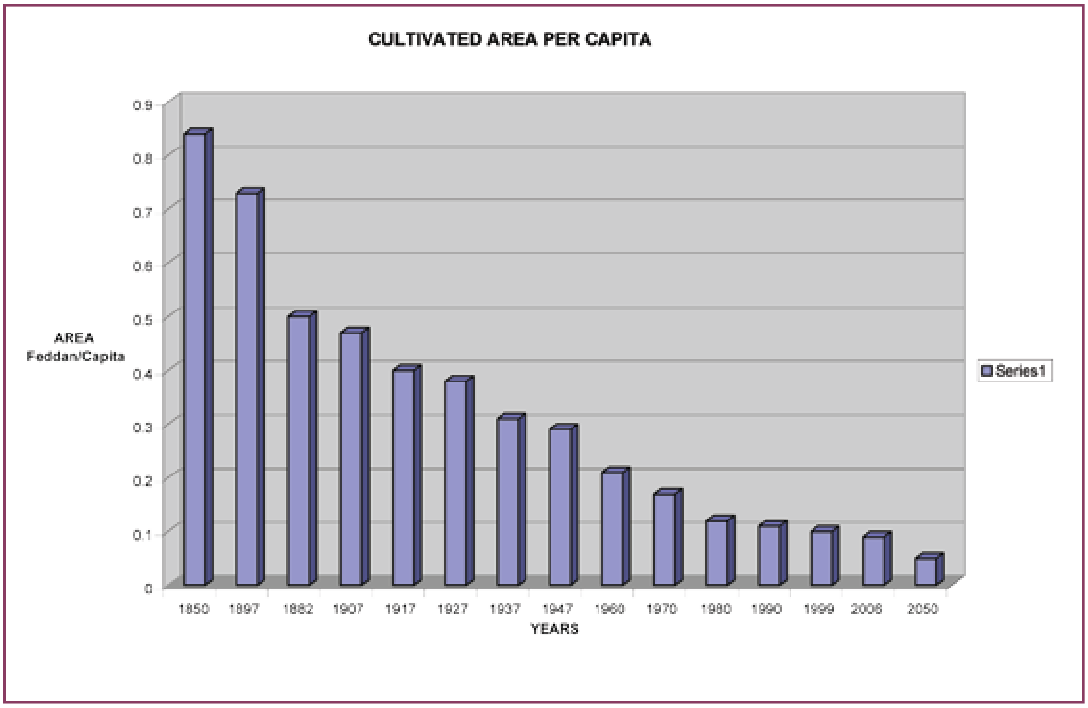


Figure (9-1) shows per capita declining share from cultivated area

3. Increasing density of population in urban and rural areas.
4. Degradation of urban environment and encroachment on lands in cities and villages.
5. Increasing costs of residential areas development.
6. Difficulty in allocating lands for public utilities and infrastructure works.
7. Lack of allocated funds for expanding water services and sanitation.
8. Increasing pressure on public utilities networks (electricity - sewage - roads, etc.) as a result of vertical urbanization.
9. Increasing consumption of energy in housing sector is one of the most serious challenges facing urban development; modern life depends greatly on electricity, generated from burning fossil fuels, for operating electronic devices which represent a serious economical burden that led to environmental pollution and depletion of resources. Residential sector consumes 18% of energy which situated it in the third rank after industrial and transport sectors, as shown in figure (9-2), in addition to pressures exerted on public utilities' networks (electricity - sewage - roads, etc.) as a result of vertical urban expansion.

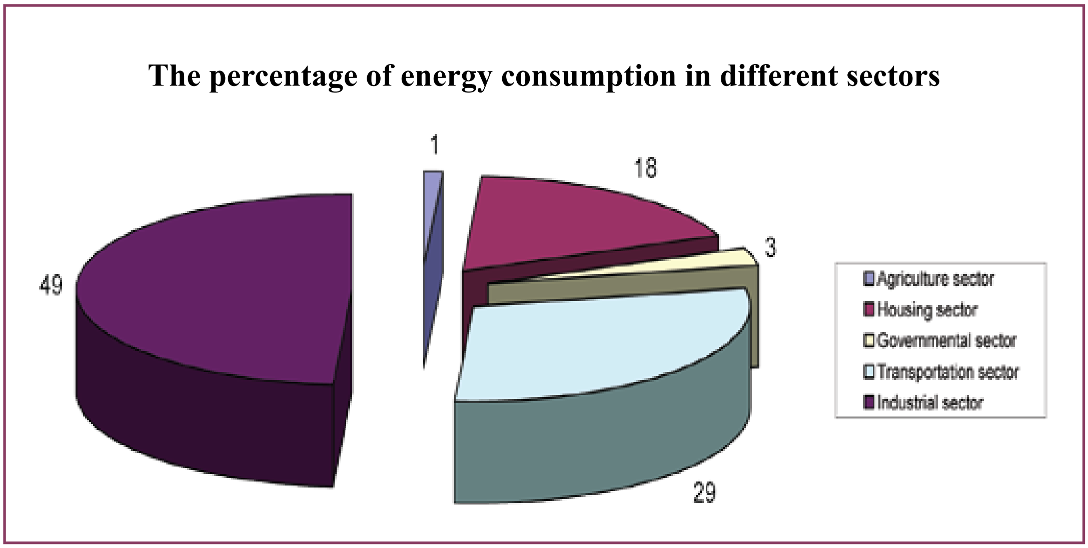


Figure (9-2) shows energy consumption of housing sector

Source: Environmental Affairs Agency

9-2-3 Environmental impacts resulting from deficiencies in development of urban communities.

The existing gap between residential settlements and used land areas is an expected result where about 77.5 million people occupy an area not exceeding 5.5% (55 367 km^2) from the total area , in addition to the constant increasing rate of population which is estimated with one million and two hundred thousand people every year. This led to the emergence of some economic and social consequences, which have negative impacts on urban development, as follows:

1. Urbanization of rural areas:

One of its main disadvantages is decreasing number of workers in agricultural field which is reflected in life style of countryside and properties of the construction clusters in terms of land use, building height, density of population and environmental change in general. This resulted in rural community to abandon their productive role and acquire new consumption habits.

2. Rural characteristics in urban areas:

Increasing rate of internal migration conveyed behaviors and habits of rural areas to urban areas, emergence of slums and deterioration of urban environment in many parts. The steady crawl of urban areas led to reduce agricultural land and increase internal migration from rural to urban areas, resulting in increasing urban population from 19% in 1907 to 42.6% in 2008, as shown in figure (9-3), therefore, the urbanization rate in Egypt is very high compared to other world countries.

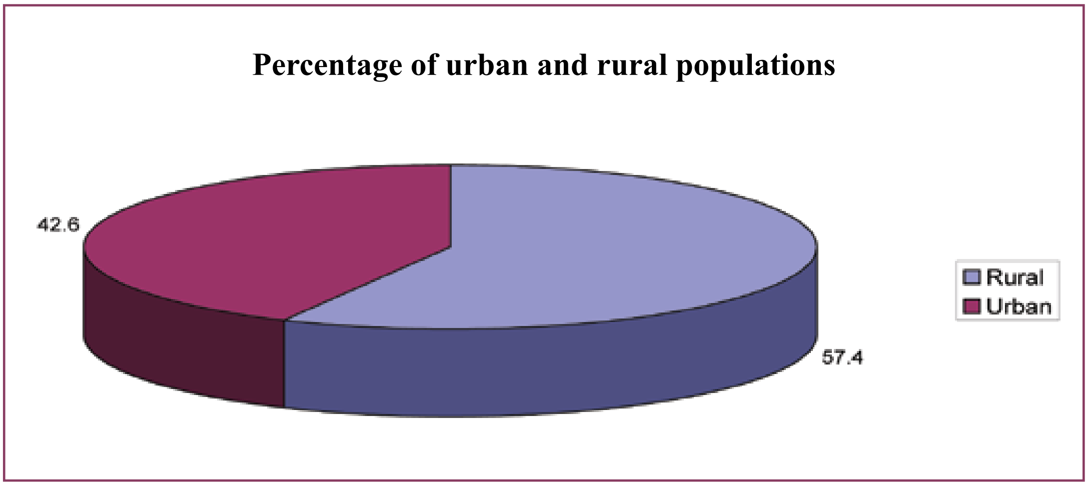


Figure (9-3) shows the proportion of urban and rural dwellers in 2008

Source: Central Agency for Public Mobilization and Statistics

3. Emergence of informal housing:

Egypt monitors three new types of housing, out of control or supervision of official planning agencies, called (informal housing – resemble housing - cemeteries housing) and became part of the contemporary urban structure. Lack of control over them and their increased numbers led to the presence of 1221 slums in Egypt.

4. Informal industrial activities:

Some informal industrial activities spread in slums causing environmental pollution and negatively affect health of residents of these regions. These informal industries include the following:

A. Small and medium industries (pottery - foundries – charcoal kilns)
A. Crafts workshops.
A. Areas storing quarry products.
A. Piles of sorting and recycling municipal waste.

5. Problems of transport and traffic in urban communities:

The problems of transport and traffic are worsening and growing in Egypt, especially in cities and major urban centers. They do not only economically affect life of individuals or families, but extend to affect national economy causing loss of productive labor hours, consumption of energy, infrastructure and vehicles; increase of air pollution and accidents resulting from traffic congestion. This is clarified by the study conducted by "Regional Environmental Management Improvement Project" (REMIP) under the program of inventorying vehicles emissions (Environmental Affairs Agency - JICA).

6. Reduce per capita share from green areas:

Rapid and continuous crawl of residential buildings, various establishments and road construction have great impact on declining and shrinking green areas which reflected negatively on urban environment. This fact can be proved by increasing rates of air pollution in cities which is one of the most dangerous types of pollution that had an impact on increasing mortality rates, especially in developing countries with rapid urban growth. According to World Bank, between 2-5% of deaths in these countries are due to environmental pollution. Currently, green areas become an important component taken into account while planning and implementing new cities, conducting expansion for established cities, or within its old regions , as they are considered their lung and important for the aesthetic, recreational and health purposes and in reducing air pollution. Table (9-1) shows improvement rates in per capita share from green area in Cairo, but it is still far from global standards of green areas that should not be less than 0.8 hectares per 1000 people (8000 square meters per 1000 inhabitants) or 8 m2 per capita. In Cairo, the proportion of green areas reached to 2.11% from its total area.

Table (9-1) improvement rates in per capita share from green area in Cairo.

Year	Population	Green areas	m^2 / capita	Global standard m^2 / capita
1983	5,688,415	5,257,875	0,92	
1998	6,007,280	5,431,125	0,90	
1990	6,291,693	6,301,400	1,00	8
1996	6,800,992	8,827,350	1,30	
2000	7,109,997	10,335,993	1,45	
2001	7,487,851	11,408,875	1,52	
2005	7,765,000	13,119,651	1,69	

Table (9-2) clarifies current situation and targeted green areas in Egyptian cities and villages, which is still far from the minimum level to meet environmental requirements. This necessitates consolidating municipalities and civil society efforts to raise per capita share from green spaces and raising public awareness with the importance of green areas and their maintenance

Table (9-2) shows the current situation and targeted green areas in Egyptian cities and villages.

Type of settlement	per capita share / meter square (per capita/ m^2)		
	Minimum limit	Target value	Current situation
Existing cities	7	10	0,5-3
New cities	15	20	4-13
Large villages (more than 50 feddan)	5	10	0,5 >
Small villages (less than 50 fedaan)	3	5	

Source :website www.urban harmony.org.eg

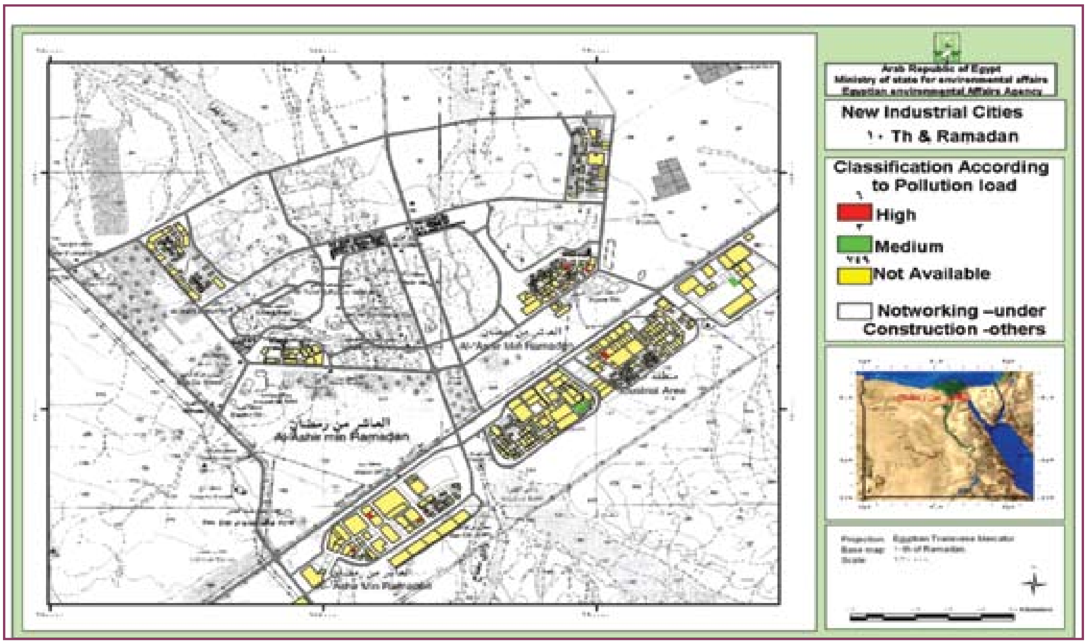
7- Urban development distortions resulting from unbalanced growth between economic rate of development and population growth; in addition to absence of environmental aspects in development plans during decades preceded eighties, rural migration to urban areas and the emergence of slums on the outskirts of cities lead to distort physical character, as follows:

A- Overlap of activities and unplanned urban expansion that led to lack of urban balance of the city.
B- Demolition of many distinguished buildings with architectural, cultural and historical values.
C- Distortion of buildings built on a particular architectural style by adding extra floors contrasting their original style.
D- Visual pollution resulting from the individual characteristic of each building (color and construction style).
E- Use of streets as car parking which obstructs traffic flow.
F- Villages expansion encouraged encroachment on agricultural lands and creation of slum areas within cities.
G- Absence of basic concepts related to protection system of historic sites.
H- Failure to maintain historic buildings with comprehensive planning outlook.
I- Establishment of some industries outside the urban boundary with failure to provide suitable housing for workers, which encouraged the establishment of slums near these areas.
J- Issue permits to construct buildings in areas close to factories without identifying cordons to these towns.

9-3 Industrial Development

Industrial Environment in Egypt marked with the following:

1. Continuous increase of industrial facilities reaching more than 40000 facilities ranged between large, medium and small enterprises.



Map (9-1) Al-Ashir min Ramadan industrial Zone

2. Encourage private sector, Egyptian and foreign investments.
3. Expand in using modern technologies, cleaner production techniques and rehabilitation of outdated technologies.
4. Reduce industrial clusters within cities' cordons.
5. Allocate large areas specified for industrial activities outside residential areas (industrial cities and zones).
6. Expand in selecting qualified industrial zones (QIZ) capable of integrating into international agreements to expand export base of industrial activities and gain competitive advantage with foreign goods and industries.

9-3-1 Kinds of industrial cities and areas in Egypt:

1. New industrial cities (17 industrial cities).
2. New industrial areas in governorates (73 industrial zones).
3. Free, industrial investment zones in governorates (9 regions).
4. Special industrial economic zones (2 zones).
5. Proposed heavy industrial zones (24 zones).
6. Industrial vocational clusters within Egyptian cities.

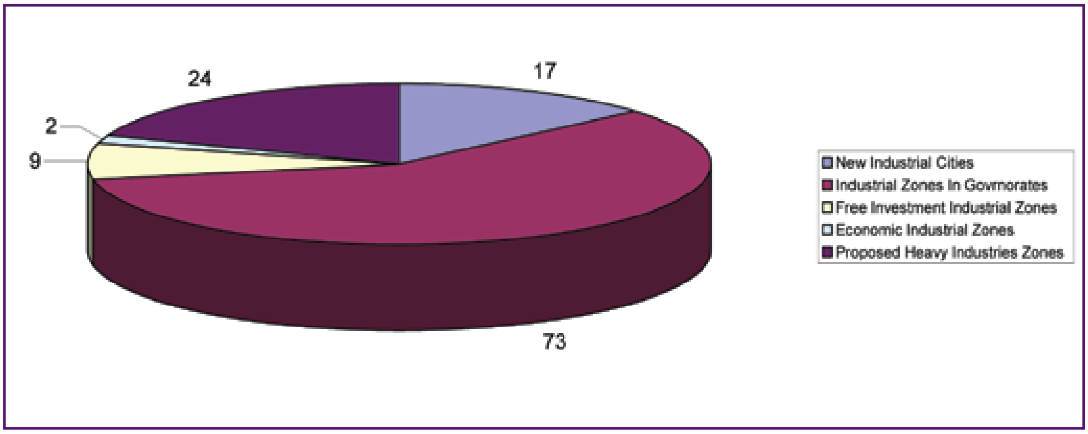


Figure (9-4) industrial zones and cities

9-3-2 Challenges facing industrial cities and zones: -

1. Preferring economic over environmental feasibility for industrial projects.
2. Increasing investments in industrial activities polluting environment due to increasing demand as : cement - ceramic - dyeing textiles - carpets - activities of smelting and casting - charcoal production - fertilizer - petrochemicals ...etc.
3. Increasing volume of industrial waste with lack of sound landfills.
4. Increasing costs for transferring established industrial clusters within cordons of residential cities outside these areas .
5. Compliance with environmental regulations, laws and standards.
6. Increasing costs of pollution control systems, treatment plants and environmental friendly raw materials.

9-4 Efforts to reduce adverse impacts of urban and industrial development imbalances

9-4-1 Development of urban and rural areas

1. Ministry of State for Environmental Affairs gave particular attention to improve integrated management system of municipal solid waste from the environmental point of view, for that reason developed a long-term strategy which is currently under updating by MSEA's concerned sectors. Political leadership approved a plan prepared by MSEA for integrated solid waste management in Greater Cairo and its implementation began in 2010.
2. Ministry of State for Environmental Affairs takes precautionary approach to preserve the environment and ensure its development in line with the latest available technologies. EEAA reviews environmental impact assessment studies for the establishment or expansion of wastewater treatment plants to estimate

environmental impacts that may result from their operation in urban and rural areas. .

3. MSEA participates in the "Permanent Committee of Egyptian Villages and Cities' Enclosure and Cordon" formed by Ministry of Housing and Urban Development. This committee contributed in setting up the enclosures and cordons of 657 villages and 41 cities. It aims at considering environmental and urban planning objectives while conducting urban expansion to meet development needs that take into account environmental and regulatory dimensions, such as transport, and traffic and avoid the emergence of slums through meeting real demand for housing with its various economic classes.
4. MSEA participated in the amendments of the Executive Regulations of "Building Law No.119 / 2008 .It emphasized the importance of taking provisions of Environment Law, its Executive Regulations and amendments into account.
5. Due to the important impact of transport and traffic system on environmental quality of residential areas ,MSEA through "Regional Environmental Management Improvement Project " (REMIP)conducted a study to identify impact of traffic density, type and volume of emissions on "Warraq Bridge" to sample and investigate traffic problems and their impact on quality of life of urban environment.

9-4-2 Development of industrial cities and zones :

MSEA paid great attention to industrial zones and new industrial cities to face negative impacts on the environment resulting from the continued increase in number and size of industrial facilities ,use of old technologies and spread of industrial establishments within cordons of cities , so it takes the following actions:

1. Issue Law No. 4 / 1994 on environment protection amended by Law No. 9 / 2009, which singled out specific provisions to environmental impact assessment procedures required to construct new industrial facilities or expand established ones.
2. Coordinate with relevant ministries and agencies to integrate environmental dimension in stages of planning, implementation and operation of industrial zones and facilities (Ministry of Housing and Urban Development - Ministry of Industry and Foreign Trade - Industrial Development Authority - concerned governorates).
3. Follow up some industrial zones and new cities, establish an integrated database, deduce and study environmental indicators, and develop appropriate environmental solutions in collaboration with research centers, concerned ministries and entities.
4. Issue standards and environmental requirements required by new industrial zones

and expansion of established ones.

5. Coordinate and participate in selecting environmentally suitable sites for new industrial zones and sites for transferring activities polluting environment outside residential areas.
6. Issue “Environmental Planning Log” about the distribution of activities within industrial zones.
7. Issue standards and environmental requirements for infrastructure projects (roads and sewage plants).
8. Participate in environmental planning for industrial zones in coordination with Industrial Development Agency - Ministry of Industry.
9. Coordinate with General Authority for Urban Planning, National Center for Use of State Land and Industrial Development Agency to integrate environmental dimensions and requirements for rehabilitation of established industrial zones.

9-5 Future Vision

Ministry of State for Environmental Affairs and various governmental agencies (Ministry of Local Development, Ministry of Manpower and Training, Industrial Development Agency, Federation of Industries, Research Centers, etc ...) developed the requirements for achieving sustainable urban development, especially in industrial development field to consider environmental commitments without hindering economic development and prosperity. The following are among the most important objectives:

1. Reduce environmental degradation and pollution levels in urban areas:

A. Provide adequate housing and urban services to citizens.
B. Achieve good governance through popular, private sector and government participation in urban development projects.
C. Strengthen and improve role of local authorities.
D. Encourage private sector participation in urban environmental projects (especially water supply, drainage and sewage treatment).
E. Promote reuse of sludge resulting from wastewater treatment.
F. Reduce rate of poverty in urban areas by providing land for low-income people, employment opportunities and expand in supplying services and utilities.
G. Provide new cities with better infrastructure to achieve urban growth.
H. Good distribution of urban services for all areas.

2. Equitable distribution of wealth, ensure provision of education services and achieve social justice through the following:

A. Provide housing and infrastructure for urban areas, especially for marginalized social groups, while maintaining agricultural land through the following:
   - Provide adequate housing and services to citizens, especially young people.
   - Improve land use planning.
   - Re-plan and develop established urban areas.
   - Plan and develop selected desert areas to establish new cities.
   - Provide high quality drinking water.
   - Develop slums.

3. Raise level of economic and industrial growth while preserving the environment and natural resources through the following:

A. Adopt cleaner production ideas.

B. Improve environmental compatibility, follow safety and occupational health regulations in industrial establishments and encourage companies' social responsibility.

C. Improve cooperation among government agencies responsible for implementing environmental regulations and requirements of sustainable development.

D. Develop comprehensive database about all information of established industrial areas, new industrial zones and activities in governorates.

E. Introduce policies for developing lands for industrial purposes and make them available for investors, facilitate licensing procedures and establish specialized industrial complexes.

F. Prepare studies, sectors and spatial plans for redistributing polluting factories outside residential areas.

G. Develop a system to encourage investors in industrial zones.

H. Develop established industrial areas and design public plans for their expansion and increase their efficiency.

I. Introduce policies that encourage research and their application in industrial field.

J. Use of credit as revolving funds to address and treat negative impacts of industry on the environment.

K. Adopt privatization based on separating ownership from management.

L. Introduce system of developed industrial zones by investors in cities of 10th Ramadan – 6th October - Burj Al Arab.

M. Give priority to strategic industries while adopting industrial planning.

N. Adopt strategic planning for industrial zones

O. Although migration from rural to urban areas contributed in the growth of slums by 5%, economic development of rural areas, provision of jobs, stability of residents (especially in upper Egypt) , improving infrastructure services that would make their living conditions more acceptable and satisfied would contribute in reducing internal migration.

P. Modify government investment policy in luxury housing and balance expenditure among society classes.

Q. The state must depend on its own resources in developing slums and adopt policies to reduce their emergence without relying on international donors. As well as develop mechanisms for exchanging local, regional and global experiences in the field of slums development and monitoring success stories and deficiencies.

R. Raise public awareness among slums' residents about the importance of developing these areas (socially, culturally, religiously, and environmentally) and involve their inhabitants in development programs.

S. Local administration's view of considering landscaping as an issue of comfort and luxury must be changed and per capita share of green spaces must reach to world rate, which is 8 square meters per capita.

T. Increase awareness about the need to avoid environmental degradation , promote sustainable use of natural resources , conscious with environment role, importance of preserving it and increase public participation in environmental management through community and NGOs participation.

U. Encourage decision-makers to integrate environmental dimension in development policies and link them to building and construction industry during different stages of these projects starting from site selection, operation and maintenance.

References

1. Informal urbanization, Dr. Galila Al-Kadi, National Center for Translation, first edition, 2009, Dar Al-Aain for Publishing, Egypt.
2. Vision of "Information and Decision Support Center ", Cabinet of Ministers - "Cairo-2050", Nahla Sebaai Cairo's Informal Areas, Between Urban Challenges and Hidden Potential, PDP's Program-GTZ & A. R.E.
3. "International Experience" by David Sims and "Re-Thinking of Housing," an article by Amira Hewaydi (Egyptian journalist and political editor in El- Ahram Weekly), published in: Cairo's Informal Areas, Between Urban Challenges and Hidden Potentials PDP's Program-GTZ & A. R.E.
4. "Development of Arab cities in light of the current global situation" seminar conducted on December 26, 2006, through which
   - Prof. Dr. Sheriff Mohamed Sabri Al-Attar Associate Professor - Department of Architectural Engineering, Fayoum University - Faculty of Engineering presented a paper entitled "Towards a methodology for activating the role of materials and construction techniques in achieving sustainable development for residential neighborhoods".
   - Prof. Dr. Ali Raafat, Professor of Architecture - Cairo University presented a paper entitled " Creativity in the physical architecture".
   - Prof. Dr. Mohamed Ragheb Radwan, Professor and Chairman, Department of Architecture - Faculty of Fine Arts, presented a paper intitled "Methodological approaches to address environmental problems in existing urban communities (applied study to Abu Qir area in Alexandria).
   - Prof. Dr. Abd El-Nabi Ismail El-Tokhe, Faculty of Commerce - Assiut University presented a paper entitled "Modern entrance of planning and urban development to achieve sustainable development in Egypt ".
   - Prof. Dr. Ahmed Al-Sayed Al-Zamli, Department of Geography - Faculty of Arts - Cairo University presented a paper entitled "Green spaces in Cairo City ".
   - Dr. Afify Abbas , Institute of Land, Water and Environment Research Center -Agricultural Research Center presented a paper entitled "Causes and risks of urban sprawl on the territory of Nile Delta".
5. Symposium of " Environmental and demographic risks of urbanization on the Nile

Valley and Delta held on 22/06/2009- National Authority for Remote Sensing and Space Sciences.

6. Eng. Mohamed Lotfy Kamel Abou zaid – EEAA-Egypt Egypt presented a paper intitled “Healthy housing between capability and historical, economic and political stresses in Egypt “ to “Healthy economic housing in small and medium size cities” conference held in Dongola - Republic of Sudan, March 9 - 12, 2010 .
7. Local Authorities Institutional Development in respect of the functions related to engineering and transportation planning and traffic - Transport Program, Centre for Development Research and Technological Planning - Cairo University - August 2003.
8. General Authority for Industrial Development
9. Environmental Status Reports - EEAA.
10. Database of industrial zones - EEAA.

Chapter Ten

ENERGY

10-1 Introduction

Recent developments that the international energy markets have witnessed, clearly confirm the continuing importance of applying energy efficient projects in all sectors; by having important role in reducing energy consumption rates. Consequently, achieving balance between oil products consumed cost and foreign currencies revenue from oil and gas exports.

10-2 Current Situation:

10-2 Oil and Gas Projects:

During 2009, MSEA issued environmental approvals of 234 environmental onshore and offshore projects for oil and gas concessions. These approvals include 5 seismic surveys to determine potentials of oil and gas reserves, 130 exploratory drilling wells including 35 for gas (32 onshore and 3 offshore) and 95 for oil (81 onshore and 14 offshore); in addition to 86 development wells to extract oil / gas and to set up required facilities for platforms and gas processing that included 22 for gas (20 onshore and 2 offshore) and 64 for oil (47 onshore and 17 offshore). Additionally, there were 7 projects for gas pressure stations networks and 6 projects to extend natural gas pipelines to Aswan , El-Bhera , Assuit , Souhag , Khafr El-Sheik governorates and to Badr city.

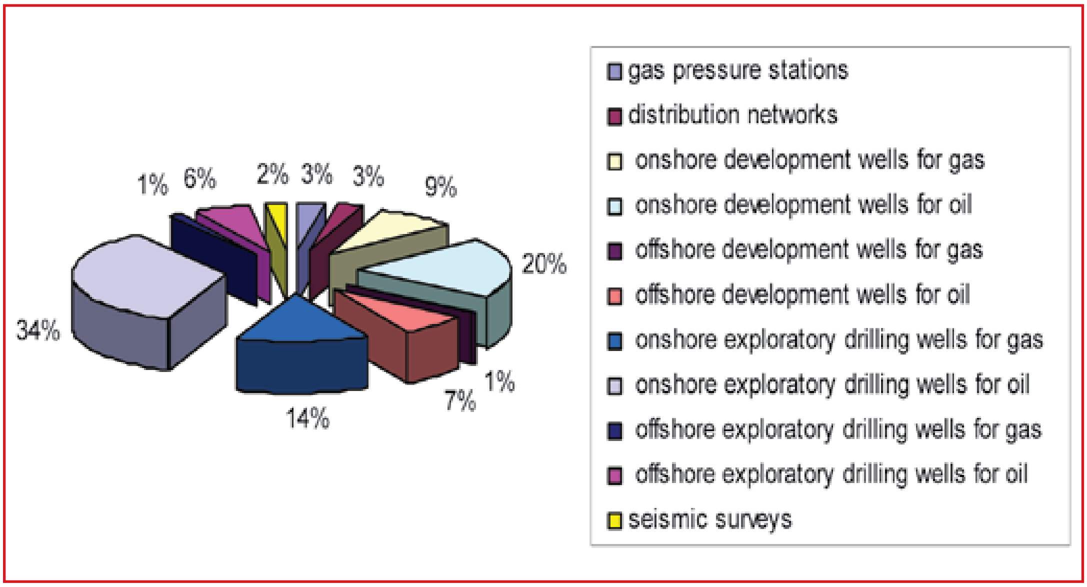


Figure (10-1) Percentages of environmentally approved oil and gas projects in 2009

10-2-2 Electrical Energy:

MSEA issued 4 environmental approvals for power generation stations operated by natural gas that could use diesel only as an alternative fuel for emergency, two wind farms, one thermal power station; and one small station affiliated with private companies.

Moreover MSEA prepared guidelines for Environmental Impact Assessment for steam power plants to be distributed to concerned entities, investors and consulting offices for their reference in preparing EIA studies for power plants in the future.

MSEA is currently preparing and reviewing draft guidelines for Environmental Impact Assessment for nuclear power plants in cooperation with "National Center for Nuclear Safety and Radiation Control" and "Atomic Energy Authority"; in addition to preparing terms of references of quantitative & qualitative risk assessment studies for nuclear energy plants. Table (10-1) lists the main indicators of electricity production in Egypt during 2007/2008 – 2008/2009.

Table (10-1): Main indicators of electricity production in Egypt during 2007/2008 - 2008/2009

Technical indicators of electricity production sources		2007/2008	2008/2009
Peak load (M.W)		19,738	21,330
Total generated & bought energy (G.W.H)		1,251,229	131,040
	Thermal*** (G.W.H)	95,782	101,898
	Hydro (G.W.H)	15,510	14,682
Generated energy from wind farms (G.W.H)	Wind farm (Alzafarana)	831	931
Generated hydro power(G.W.H)	G.W.H	14,682	15,510
Generated energy from private sector (Boot)		12,642	13,241
Generated energy from unconnected plants		350	271
Rate of fuel consumption in hydro power plants (G.M./ K.W.H)	Generated G.W.H	217.6	218.9
Rate of saved fuel by using hydro power	(equivalent thousand ton heavy oil)	3,395	3,195
Bought energy from industrial companies		14	17
Unconnected plants		350	271
Total fuel consumption (equivalent thousand ton heavy oil)		23,562	24,895
Total sold energy from distribution companies (low and medium voltage)		106,595	111,714
Sales of connected countries' Boot		631	903
Total of sold energy from distribution companies and connected countries		107,226	112,617
Rate of electric energy consumption per capita (K.W.H)		1,565	

10-2-3 Industrial Projects:

1. MSEA has issued 3 environmental approvals for cement and fertilizers industrial projects; their average consumption estimate of natural gas is 2 million m3 / day distributed as follows:
   - Cement plant at Assuit, for one production line (1.5 million ton cement /y) with total approximate consumption of natural gas of 0.5 million m3 / day.
   - Cement plant at El-Menya, for one production line (1.5 million ton cement /y) with total approximate consumption of natural gas of 0.5 million m3 / day.
   - Rehabilitation of Kema – Aswan plant to operate with natural gas and to establish ammonia production line from natural gas with approximate consumption of one million m3 / day.

2. Two environmental approvals have been issued for two Cement Companies in Helwan and Katameya. They use municipal solid waste, agricultural residues and sludge as alternative fuel in cement kilns, which will lead to an estimated reduction of 10% that would be increasing annually; from the total fossil fuels (mazot - natural gas) consumption.

10-3 Future Vision:

In light of the increased and accelerated energy consumption to meet development demand in Egypt, MSEA has established an Energy Unit in August 2009 to initiate all activities related to energy rationing, disseminate renewable energy applications in all sectors, whether energy production or energy consumption to achieve environment protection by reducing green house gases GHG emissions associated with energy production from fossil fuel sources.

The Energy Unit aims at developing the following programs to increase efficient uses of conventional and renewable energy.

1- Program of rationalizing and improving energy consumption efficiency:

This program aims at reducing energy consumption and emitted pollutants in the industrial sector. To achieve this target, the Energy Unit will provide technical and financial support for industrial activities by performing energy audits to specify opportunities of reducing energy consumption and proposing technological applications. The Unit will also, contribute through Environment Protection Fund 80% of the total cost of preliminary energy audits, with maximum cost of 3,500 Egyptian pounds for each industrial facility.

2- Program of Renewable Energies and Environment Protection:

This program aims at encouraging all industries related to renewable energy equipments, facilitates production and utilization of renewable energy applications to reduce dependence on fossil fuel resources (oil, gas, coal) and to reduce all pollutants associated with fossil fuel consumptions through the following procedures:

Provide all available information about energy in Egypt regarding sources, current and future applications, capacities, and expected renewable energy sources.

Provide all available information regarding feasibility of executing energy production projects from renewable sources.

Participate in discussing all mechanisms, measures, current and new legislations aiming to facilitating production and use of energy produced from renewable sources.

Provide technical support and assistance to producers of energy from renewable sources to prepare required environmental impact assessment studies, quantitative and qualitative risk assessment studies for gaining necessary environmental approvals to implement their activities.

Chapter Eleven

INDUSTRY

11-1 Introduction

Industrial development was one of the main features that prevailed in Egypt during the last fifty years, because of the industrial expansion that was accompanied by development and construction. During this period, the interest in achieving high levels of industrial development has resulted in rapid expansion in the industrial sector without the appropriate environmental planning needed for proper geographical distribution of the different industrial activities, and without taking into consideration the old and outdated technologies, that would negatively affect environmental conditions in Egypt. That also has led to natural resources degradation and deterioration. This necessitated the application of important initiatives in different fields, such as reducing industrial pollution, encouraging industrial modernization and integrating cleaner technologies in new industries.

Industry contributes to about 37.6% of the GDP in Egypt. The Egyptian Environment Law No. 4 / 1994 as modified by Law No. 9 / 2009 is considered one of the main tools to achieve environmental protection. The Executive Regulations of this law are being modified to include appropriate new limits of emissions and pollutants loads to improve the nature of the Egyptian environment.

MSEA has been taking many initiatives to raise environmental awareness within the industry sector through holding different and specialized workshops on the best practices and available technologies to deal with environmental problems. Furthermore, the ministry distributes periodical publications and brochures of the latest updates and best solutions to environmental problems.

Additionally MSEA has been conducting several financial programs to help achieve environmental compliance, by providing affordable packages to finance pollution abatement and cleaner production projects. Implementation of cleaner production projects is considered the main method to achieve sustainable development and to reduce pollutants at the source, as well as to comply with global industrial policies for comprehensive quality of the product.

11-2 current programs and projects

11-2-1 Egyptian Pollution Abatement Project (EPAP) –Second Phase (2007-2012).

The EPAP provides financial packages to support pollution abatement projects in the industry sector as 20% grant and 80% loan. EPAP II focus is on highly polluted areas in Greater Cairo & Alexandria governorates containing large industries emitting large amounts of air and water pollutants loads from such factories as cement, iron and steel, chemicals industries and tanneries.

The total Funding of Phase II is estimated at 185 million American dollars (one billion Egyptian pounds). Provided support of the program includes the following:

1. Financial Component :

Provide soft loans for industrial facilities, through the National Bank of Egypt (80% loan, 20% non-refundable grant). The following illustrates total budget of that component:

a. World Bank for Construction and Development	20 Million US$
b. Japan Bank for International Cooperation (JBIC)	equivalent 40 Million US$
c. European Investment Bank (EIB)	40 Million €
d. French Development Agency (AFD)	40 Million €

2. Technical support Component:

Technical support provided to industrial facilities and funded by financial component (non-refundable grants).

❖ Current status (2009)

There are 37 projects currently listed in the second phase, that are directed for 19 major companies and 200 brick factories with total cost estimated at 156,40 million US$, distributed as shown in table (11-1). This table shows that 43 % of the available finance were allocated for cement industry, 20% for brick factories, 7 % for paper industries and 30% for supporting fuel switching projects.

Table (11-1) Companies applying for financing their environmental projects

No.	Company name	Project name	Finance from the project (Million US$)
Helwan Governorate			
(Helwan – Torah - El-Tebeen)			
1	National Cement Co.	Installation of new technologies to control dust emission- installing vacuum cleaning unit	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	2.5
		Using alternative fuels (Sludge, agricultural waste and RDF) instead of mazot and natural gas	7
		Installing small bag filters in cement mills area	4
4	Egyptian Starch & Glucose Co. (torah plant)	Fuel switching from mazot to natural gas	0.34
5	El-Nasr for Coke	Replacement of 180 Coke oven doors	2
6	South Cairo & Giza mills	Replacement of old mills with new mills	3
7	Arab Abu Saad brick factories	Fuel switching for 200 brick factories from mazot to natural gas	25
Total			79.34
El-Qaliobia Governorate			
(Mostorod – Shubra El-Khima)			

No.	Company name	Project name	Finance from the project (Million US$)
8	Abu zabaal fertilizer company	Modifications of production lines and Installation of new technologies to control dust emissions.(10 projects)	15
9	Egyptian Starch & Glucose Co.	Replacement of glucose production line	10
10	Delta for Steel Co.	Fuel switching from mazot to natural gas - installing dedusting unit in furnaces area	4.314
11	Swailem for Pottery Co.	Installation of purification filters for preparation and milling units.	0.18
Total			29.494
Giza Governorate			
Imbaba			
12	South Cairo & Giza mills	Replacement of old mills with new ones.	3
Total			3
Total for Greater Cairo(Helwan, Qalubia, Giza, 6th October)			111.834
Alexandria Governorate			
(Baqoss – Borg El-Arab – El-Max – Abu Qir – El-Ameria - Kafr El-Dwar)			
13	Ameria for Cement	Installation of new modern filters to control dust emission (4 projects).	15

No.	Company name	Project name	Finance from the project (Million US$)
14	Misr for Chemicals Industry	Fuel switching from mazot to natural gas	0.44
15	General Company for Paper industry (RAKTA)	Fuel switching from mazot to natural gas	4.2
16	Ameria petroleum refining co	Rehabilitation of production units to decrease pollutant discharged into Mariuot Lake.	15
17	Alex. for Mineral Oil Company (AMOC)	Installation of waste water treatment plant	0.33
18	Alexandria Fertilizers Co.	Installation of waste water treatment plant and modern technology equipment.	3.6
19	Alexandria Sodium Carbonate	Installation of modern technology equipment for dust control.	2
Total			40.57
Suez Governorate			
Qattamya			
20	Qattamya Cement	Using Alternative fuel (Agricultural waste, Refuse Derived Fuel (RDF))	4
Total			4
General Total for (Greater Cairo , Alexandria , Suez)			156.404

Source: EEAA (Central Department for Industry – December 2009)

Examples of financed projects:

a. Arab Abu Saed Brick Factories:

The new project aims at switching (Mazot) used as fuel in brick factories' kilns to natural gas in 200 factories (turn-key), to reduce air pollutants emissions within Greater Cairo. The contract was signed with Town Gas in June 2009. The Project will be finalized by August 2011. Total cost of the project is estimated at 25 million dollars, which is equivalent to 140 million Egyptian pounds, this includes financing an external network containing pressure reduction station (estimated cost 70 million Egyptian pounds) ; in addition to financing an internal network connecting burners for each kiln.

Picture (11-1) Stacks of Arab Abu Saed Brick Factories

b. Egyptian Starch and Glucose Company (Mostorod plant)

This project encompasses installation of new line for glucose production to reduce gaseous emissions in the work environment, achieve compliance with Law No. 4 / 1994, and reduce pollution loads on the waste water treatment plant. Total cost of the project is 10 million US dollars offered by the Egyptian Pollution Abatement Project (Phase II)

Picture (11-2) Old Glucose Production Line

11-2-2 Private and Public Sector Industry Project (PPSI) 2008 - 2012

1- Background:

Private and Public Sector Industry Project (PPSI) aims at supporting Egyptian industry (small – medium – large industries) to comply with environmental laws and regulations as well as improving its environmental performance; it is a joint project between the Federal Republic of Germany represented by KFW, and the Egyptian government represented by the Central Bank of Egypt as recipient and implemented by the Egyptian Environmental Affairs Agency (EEAA).

2- PPSI's Objectives:

a. Support industrial pollution abatement projects in industrial enterprises for both private and public sectors.

b. Develop sustainable financial, technical and institutional mechanisms for pollution abatement and for reducing pollution loads in Egypt's hot-spots areas, particularly in the Delta and Upper Egypt Governorates, to improve environmental conditions inside and outside industrial establishments.

c. Activate legislative procedures, improve environmental inspection efficiency, and develop environmental technical capacity for officials in the EEAA and participating banks. Also, to raise public awareness and general knowledge relating to industrial environmental affairs in Egypt, particularly in the Delta and Upper Egypt Governorates.

❖ **Current Status (Dec.2009)**

- Total grant 7.26 Million Euro with total investment potential estimated at 31 million Euro, including 6.55 Million Euro grant directed to industrial enterprises and the remaining to technical support component.
- Estimated value of industrial projects that gained approval and are being

implemented is 26.430 Million Euro, including 5.602 Million Euro grant, (4.287 Million Euro for Large enterprises and 1. 314 Million Euro for small and medium-enterprises (SMEs).

- The remaining grants for new projects of 0.948 Million Euro will be allocated for SME's.
- 27 industrial enterprises supported by the project, 15 large enterprises and 12 SMEs, involving 14 public sector enterprises and 13 private sector enterprises.

Table (11-2) shows list of enterprisers recorded in the project and their geographical distribution

Table (11-2) Companies applying for financing their environmental projects

No.	Company name	Project name	Cost (Million Euro)	Grant (Million Euro)
Qena and Sohag Governorates				
(Qena – Nagaa Hemady – Qous – Gerga - Armant)				
1	Sugar and Integrated Industries Company – Armant Factory	Water Recycling & Installation of 2 cooling towers (currently preparing environmental studies).	0.479	0.096
2	Qena for Paper	Stopping direct discharge of waste water into the River Nile, switching it to special network for treatment and irrigate timber forests. Contracting with General Authority for Drinking Water and Waste Water for conducting engineering studies.	4.085	0.8
3	Aluminium Company of Egypt	Replacement of old tar melting unit with new one to eliminate tar/VOCs emission (under installation and will start operation on February 2010)	2.285	0.457

No.	Company name	Project name	Cost (Million Euro)	Grant (Million Euro)
4	Al- Ahram Company for Plastic Bags Production- at El-kawther city , Sohag	Installing recycling line of solid waste (under installation)	0.332	0.1
5	El-Romani for Plastic Bags Production at El-kawther city , Sohag	Installing recycling line of solid waste (under installation)	0.101	0.034
6	Bebobeard Factory for leather products at El-kawther city , Sohag	Installing recycling line of solid waste (under installation)	0.243	0.074
7	Al-Kawther Company for Food Production (Macaroni) at El-kawther city , Sohag	Installing new boiler with its connection utilities (under installation)	0.039	0.012
8	Al- Kawther Factory for Animal Fodder production	Installing suction system in working areas & two silos at the feeding areas (under installation)	0.152	0.046
Total			7.716	1.619
Aswan Governorate				
(Edfu)				
9	Egyptian Ferrosilicon Co.	Gas treatment units (contracted & under installation).	0.204	0.041

No.	Company name	Project name	Cost (Million Euro)	Grant (Million Euro)
10	El-Nasr for Mining Co.	First project: Installation of filters for the raw material crushers (Supplying)	0.42	0.085
		Second project: replacement of 3 crushers with new one (reviewing offers)		
11	Misr Edfu for Pulp and Paper	Installing a unit for pulp washing & pulp recycling (under installation)	3.94	0.788
Total			4.564	0.914
El-Menia Governorate				
(Abu Qurqas)				
12	Sugar and Integrated Industries Company – Abu-Qurqas Factory	Switching to Natural Gas (under installation)	4.614	0.803
Total			4.614	0.803
Total for Upper Egypt governorates(Qena-Menia- Aswan - Sohag)			16.894	3.336
El-Dakahlia Governorate				
(Mansora - Talkha - Sandop)				
13	Delta Fertilizer (Environmental Studies)	Installing of Nitrogen emission reduction (Nox) unit	0.001	0.001
14	Mansoura for Resins	Switching to Natural Gas, (Technical studies have been prepared & internal gas piping line is under installation)	1.57	0.314

No.	Company name	Project name	Cost (Million Euro)	Grant (Million Euro)
15	Dakhlia for Textile	Switching to Natural Gas, (installing internal gas pipe line supplying burners & external network is under installation)	0.135	0.027
16	Misr Oil and Soap (Sandoub factory)	Switching to natural gas, (Internal & External gas piping lines have been installed, burners is under installation).	0.64	0.129
17	Ashmawy Brick Factory	Switching to Natural Gas, (operated)	0.084	0.0258
18	Abd El Hay Brick Factory	Switching to Natural Gas, (operated)	0.094	0.0287
Total			2.524	0.5255
El-Sharqia Governorate				
(Zaqaziq – 10th Ramadan)				
19	Misr Oil and soap (Zaqaziq factory)	Switching to Natural Gas,(operated)	0.683	0.136
20	CAN for Manufacturing and Filling cans	Liquid wastes minimization units (operating)	0.442	0.089
21	Sharkia Rice Mills Co.	Fuel switching to NG (preparing technical studies).	0.036	0.012
22	Gest for Metal Co.	Install new sanding machine (preparing technical studies).	0.219	0.066
23	El Rowad Poultry (ROFI)	Wastewater treatment plant, (operated).	1.704	0.52
		Solid waste treatment unit, (operated).		
Total			**3.084**	**0.823**

No.	Company name	Project name	Cost (Million Euro)	Grant (Million Euro)
El-Behaira Governorate				
(Kafr El-Dawar)				
24	Misr Fine Spinning &Textile (spinning factory)	Switching to Natural Gas,(installation of internal piping is under going , a contract has been signed for supplying burners)	1.84	0.368
25	Misr Fine Spinning &Textile (Bida factory)	Switching to Natural Gas,(installation of internal piping is under going , a contract has been signed for supplying burners)	0.769	0.153
Total			2.609	0.521
El-Gharbia Governorate				
(El-Mahla)				
26	Othman for Dyeing	Installation of waste water treatment plant and modifying production process, (reviewing offers).	1.24	0.372
27	SMC Electronics - Mahalla	Installation of waste water treatment plant and modifying production process, (reviewing offers).	0.079	0.024
Total			1.319	0.396
Total for Delta governorates (Dakahlia, Behaira, Sharqia, Gharbia)			9.536	2.2655

Source: EEAA (Central Department for Industry – December 2009)

11-3 Future vision:

1. Raise public environmental awareness among civil society by applying different systems, such as assessment and classification of pollution resulting from industrial projects (Program for Pollution Evaluation Report (PROPER); through publishing results of programs in Egyptian newspapers to evaluate environmental performance of companies.

2. Apply Environmental Impact Assessment studies (EIA) for all new projects to comply with requirements of co-financers (International Bank for Reconstruction and Development, Japan International Cooperation Agency, European Investment Bank, French Agency for Development). The most important thing is to hold public hearings and announce to the public these projects before their implementation in order to guarantee transparency and improvement of the environmental condition.

3. Reduce pollution loads resulting from cement companies in Greater Cairo and Alexandria, to achieve comprehensive compliance with permissible indicators and standards allowed for the local area and for some companies to reach the international standards within the next five years.

4. Remove all small polluting factories from residential areas to planned industrial zones such as (Badr and El-Akrasha).

5. Change discharging of waste water from the River Nile to public networks for some of major industrial companies that are considered a main source of Nile pollution, and to treat waste water and recycle it.

6. Reduce pollution loads in hot spots areas in Greater Cairo (air quality) and Alexandria (discharging in sea), after completion of specified projects by industrial companies through financial programs provided by MSEA.

Chapter Twelve

SOLID WASTE

12-1 Introduction

"Sound environmental management of solid waste should go beyond safe disposal and recovery of generated waste; it should deal with the radical root of the problem by changing the unsustainable patterns of production and consumption", (Agenda 21, Earth Summit Rio de Janeiro, 1992).

The National Strategy for Integrated Solid Waste Management in Egypt includes adoption of new and effective polices to develop sustainable system for integrated solid waste management. The proper approach in implementing this strategy would take into consideration the necessity of identifying different timeframes concerning present and future conditions.

The most important elements and main factors of a sustainable system would include proper identification of roles and responsibilities, active compatible institutional system that ensures effective coordination according to the roles and responsibilities; and to reduce overlapping of responsibilities and authorities; in addition to the necessity of developing an effective monitoring system to prevent deviations, and to accelerate corrective processes.

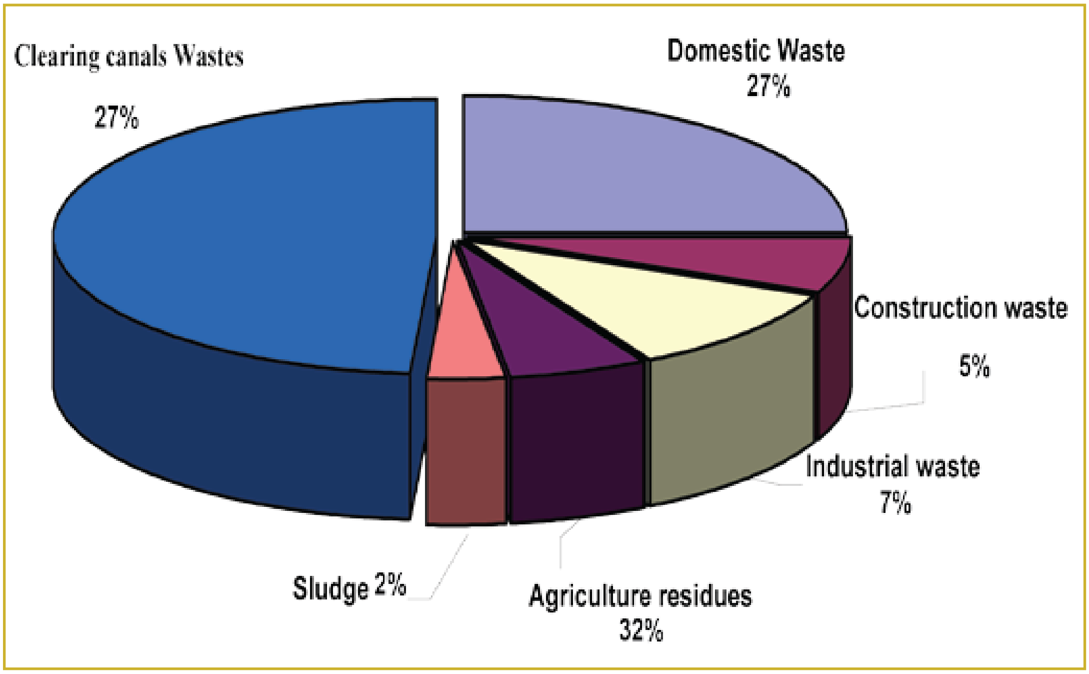


Figure (12.1) shows the quantities of solid wastes in Egypt

12-2 Quantity of generated solid waste in Egypt:

12-3 The current state of municipal solid waste in Egypt:

Total quantity of generated municipal solid waste (household only) is estimated at about 20 million tons annually, which means a daily generation is about 57,000 tons. Nevertheless, recycling processes do not exceed 20%, and are not done in a safe and effective manner; which might expose citizens and workers to many health risks. Additionally, many dumpsites, where final disposal takes place, are being exposed to intentional or self-ignition. This might be due to unavailability of necessary equipments at these sites to properly cover the waste, to prevent such burning, that exposes the ambient environment to contamination and worsens its conditions.

12-3-1 Reasons for municipal solid waste problems in Egypt

1. Deficiency in implementing integrated and sustainable systems of solid waste management.
2. Lack or deficiency in capabilities of equipments, and their inefficient operation and maintenance.
3. Shortage and inadequate financial resources to achieve needed services.
4. Lack of expertise and human skills.
5. Lack of institutional and administrative systems, and the lack of coordination between different stakeholders.
6. Unclear roles and responsibilities; as well as ineffective monitoring and control processes.
7. Lack of environmental awareness and proper behaviors in dealing with municipal solid waste.
8. Severe deficiency in enforcement and the development of legislations concerned with the solid waste problem.

12-4 Exerted efforts to reduce negative impacts during 2009:

12-4-1 Managing public landfills during severe air pollution episodes.

1. Develop a plan to manage dumpsites within boundaries of Greater Cairo such as (Al-Wafaa & Al-Amal, Shabramant, Al-Rubiky, El-Nahda, 15th May, Shak El-Teaban and Abu Zaabal).
2. MSEA provided governorates of Cairo, Giza and 6th October with one truck of 20 tons capacity and one truck of 5 tons capacity, to remove pigs' farms waste and to prevent waste accumulation within each governorate.

3. A coordination was made with the Construction Authority to start work at Al-Wafaa & Alamal, Shabramant, Al-Rubiky and El-Salam dumpsites.

Summary of achievements during that period:

a. Al-Wafaa & Al-Amal Site:

- The site has been provided with one permanent loader and one truck to transport waste material.
- Leveling and covering large parts of the dumpsite that were exposed frequently to ignition.
- Equipments were used to level and cover 16 burn pits that were used by some rubbish collectors to burn electrical wires and rubber.
- Leveling of 25,700 square meters of land.

b. Shabramant:

- The site was supplied with one permanent loader and one truck for dust transfer.
- Leveling of 25, 350 square meters of land.
- Equipments used in leveling and covering 6 burn pits that were outside the boundaries of the dumpsite near the quarries.

c. Al-Rubiky:

- 1- The site was supplied with two permanent loaders and one truck for dust removal.
- 63 burn pits have been covered with soil and leveled.

d. El-Salam:

- The site was supplied with one permanent loader and one truck for dust removal.
- Large parts of the dumpsite which were exposed to self-ignition were covered.
- Equipments were used in covering one burn pit.
- The old unit was closed and was covered with soil.
- Grading and leveling of about 12,500 square meters of land were made.

Table (12-1) Shows plan for controlling landfills during severe air pollution episodes:

Site	Extinguished fires	Leveling
Al-Wafaa & Al-Amal	16	25,700 m^2
Shabramant	6	25,350 m^2
Al-Rubiky	63	-
El-Salam	2	12,500 m^2
Total	87	63,550 m^2

Pictures :(12-1) (12-2), (12-3), (12-4), Shows El-Salam landfill during work

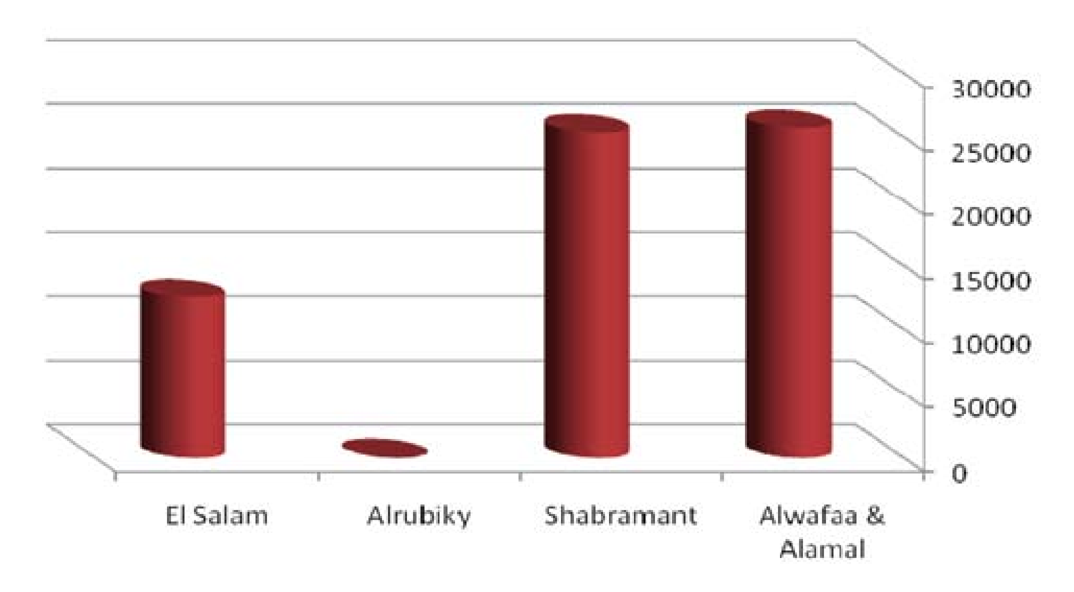


Figure (12-3) shows burning pits fires controlled from 26/9 to 10/11/2009

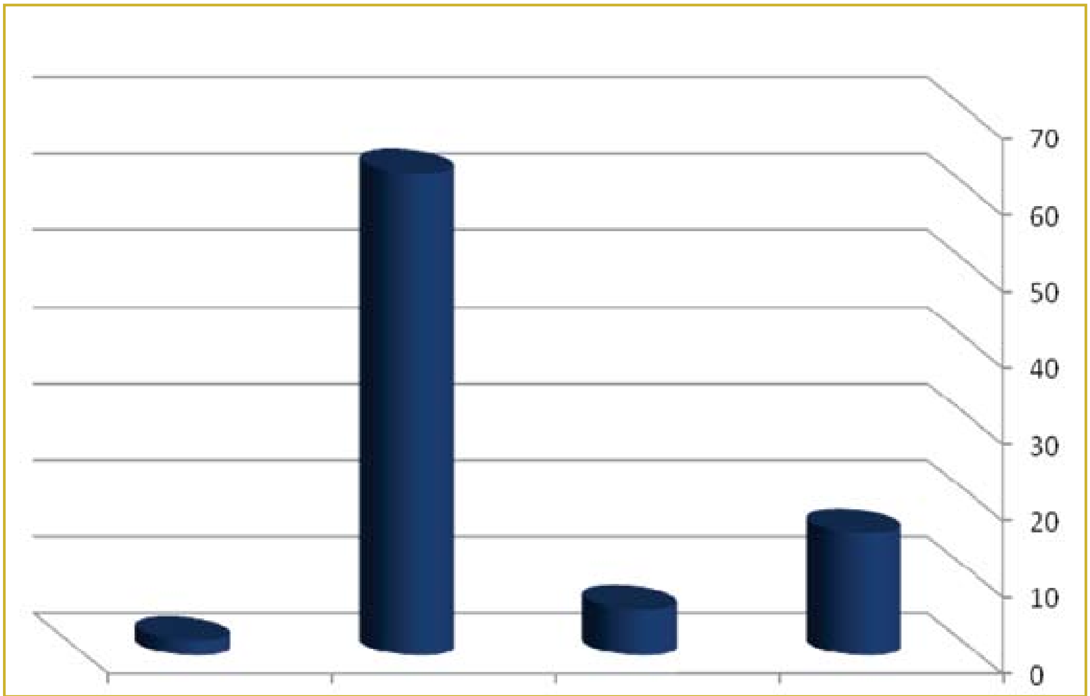


Figure (12-2) shows leveling amounts completed in dumpsites from 26/9 to 10/11/2009

12-4-2 Participation in transferring pigs' farms to outside residential areas of Greater Cairo

1. Presidential Decree No. 338/2008 was issued as a result of cabinet of Ministers' resolutions taken in its meeting, held on 16/4/2008. The decree approved of allocating 238 feddans in Wadi El-Dbab area, located in eastern of 15th May City to locate pigs' farms activities from Cairo, Giza and Qalubiya governorates. The decree emphasized the importance of taking all environmental requirements into account while implementing the project.
2. However, because of Helwan's area residents', objections of the selected site, Presidential Decree No. 271 /2009 was issued for selecting another proper site after the approval of concerned authorities. Accordingly, the Cabinet of Ministers approved in its meeting held on 13/5/2009, the return of the 238 feddans, that were selected in the Presidential Decree No. 338/ 2008 to its private owner, and to allocate another 238 feddans for pigs' farms in Cairo and Helwan governorates.

12-4-3 Participation in preparing an integrated solid waste management system in the neediest villages:

Special programs have been prepared with the first phase of 151 villages and the second phase of 500 villages of the neediest villages, to develop solid waste management system; by providing the necessary equipment for lifting waste accumulations, and for raising the efficiency of collection and transportation. This is in addition to providing garbage bins for collecting waste and to establish managed landfills for safe disposal. The first phase was completed. Table (12-2) shows the total of equipments and activities needed for the villages that will be included in the second phase.

Table (12-2) Shows total equipments and activities for each governorate that will be submitted to the villages of the second phase with an estimated value

Work shop	Tress	Support for assigning drivers and workers (thousand pounds)	Collection station	Landfill	Waste box	Loader	Tank for irrigation	Tractor normal	5tons of garbage a car	Trailer	Tractor	No of village	Required governorate
175	87.500	27.66	2	4	1750	4	33	33	157	56	34	175	Minya
64 million + 4 million to raise the efficiency of the 2 factory (total 52.3 million)												Estimated value of the pound	
103	51.500	1590	-	3	1030	3	27	27	94	18	9	103	Assiut
38.6 million												Estimated value of the pound	
133	66.500	2012	-	4	1330	4	32	31	117	38	20	133	Sohag
50.3 million + 2 million to raise the efficiency of the 2 factory (total 52.3 million)												Estimated value of the pound	
59	29.500	1067	1	1	590	1	13	13	35	52	28	59	Qana
20.5 million												Estimated value of the pound	
30	15.000	587	2	1	300	1	11	11	31	6	7	30	Luxor
15.6 million												Estimated value of the pound	
500	250.000	8022	5	13	5000	13	115	115	434	170	98	500	Total request
1	0.005		1000	3000	1	1000	30	100	195	30	120		Value of each unit (thousand pound)
500	1250	8022	5000	39000	5000	13000	3450	11500	84630	5100	11760		Total value (thousand pound)

Therefore, the total required to support the 500 villages in four governorates about 195 million pounds.

12-5 Future vision:-

1. Study and implement several procedures to develop Integrated Solid Waste Management System, that include all phases of the system starting with generation, transportation, implementation of recycling, and final and safe disposal of wastes into proper landfill sites.
2. Prepare an executive plan with the participation of the ministers of Environment, and Local Development as well as the Greater Cairo governorates and other concerned authorities, to develop an integrated management system of solid waste, with the first priority for implementation in Greater Cairo. The plan is then to be evaluated for possible application in other governorates. This plan would include the following:

    a. Technical, geographical, administrative and financial aspects; contracting, transport, recycling and selection of new sites for landfills and treatment of waste outside residential areas, but within the desert areas of Greater Cairo.
    b. Study the possibility of taking advantage of some available railway services in supporting and developing part of the system of solid waste management.
    c. Review current legislative, regulatory frameworks and institutional structures to ensure good management of the system.

3. Prepare needed biding documents and TORs for disposal, transport, collection of waste and street cleaning; to be reviewed by the Ministry of Finance that would be issued as a pilot project for other interested entities.

Chapter Thirteen

HAZARDOUS SUBSTANCES & WASTE

13-1 introduction :

Using hazardous substances including pesticides is considered a crucial matter from old to modern ages. They are used to satisfy society needs and develop its economy. Lifecycle of these substances causes many health and environmental problems starting from its production, transportation, handling, and storage to final disposal. Hazardous substances and waste spread everywhere and have significant impact on public health and the environment due to its various forms. Dealing with its impacts has become an inevitable task that may cause risks resulting from its burning, leakage, spill, ingestion, inhalation or touch. Therefore, there was broad recognition of the importance of safe and integrated chemical substances management to achieve sustainable industrial and agricultural development without affecting the protection of environment and health.

Thus, management of hazardous waste and substances is considered one of the major activities of Egyptian Environmental Affairs Agency, as it is one of the main pillars of preserving public health and environment. This requires great efforts to find suitable solutions to avoid any harmful impacts resulting from improper management, or by reducing their production and leakage to environment.

Hazardous substances must be observed and managed safely starting from their production, collection, treatment until their final disposal. This requires effective management by reducing their produced quantities or by reducing damages through surveying, collection, treatment and final disposal.

13-2 Hazardous Substances:

13-2-1 Sources of pollution:

Many sources of chemical substances are found everywhere, in addition to the existence of toxic substances in air, water and soil. Most important sources of pollution are:

1. Industrial sources:
   The most dangerous industries (metal plating - textiles -paints…).
2. Agricultural sources:
   Unsafe use of agricultural pesticides with large quantities drained into waterways that have negative impacts on water quality, animals and aquatic plants.
3. Industrial and agricultural drainage:

One of the most important sources causing soil and groundwater pollution.

13-2-2 Harmful impacts:

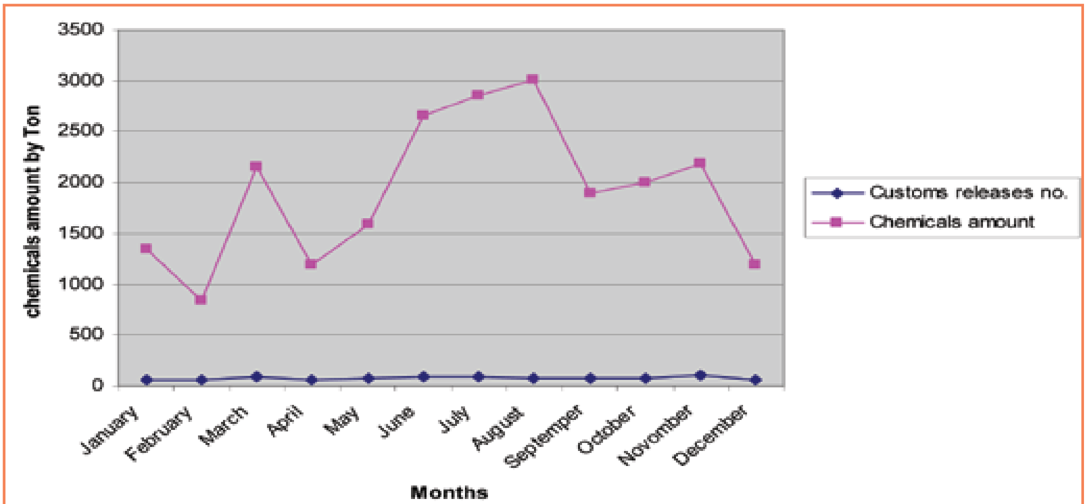
The number of chemical substances is increasing and its usage is related to many human activities. It is acceptable knowledge that there is no chemical substance that can be considered entirely safe or harmful. Each has different adverse impacts (toxicity - explosion - ignition) according to its type, quantity and extent of exposure.

Table (13-1) Shows examples for adverse impacts caused by using hazardous substances

Metal	Effect	Exposure source
Cadmium (Cd)	Poisoning kidney	-Occupational exposure resulting from inhalation of Cd fumes. -Emissions from industrial facilities -Contamination of food
Chromium (Cr)	Skin irritation	-Occupational exposure in some industries " metal plating - textiles - paints”
Lead Pb	-Impede production of hemoglobin in the blood due to kidney malfunction. - Mental disability in children	-Occupational exposure - Inhalation of motor fuel, emissions from foundries and factories containing lead.

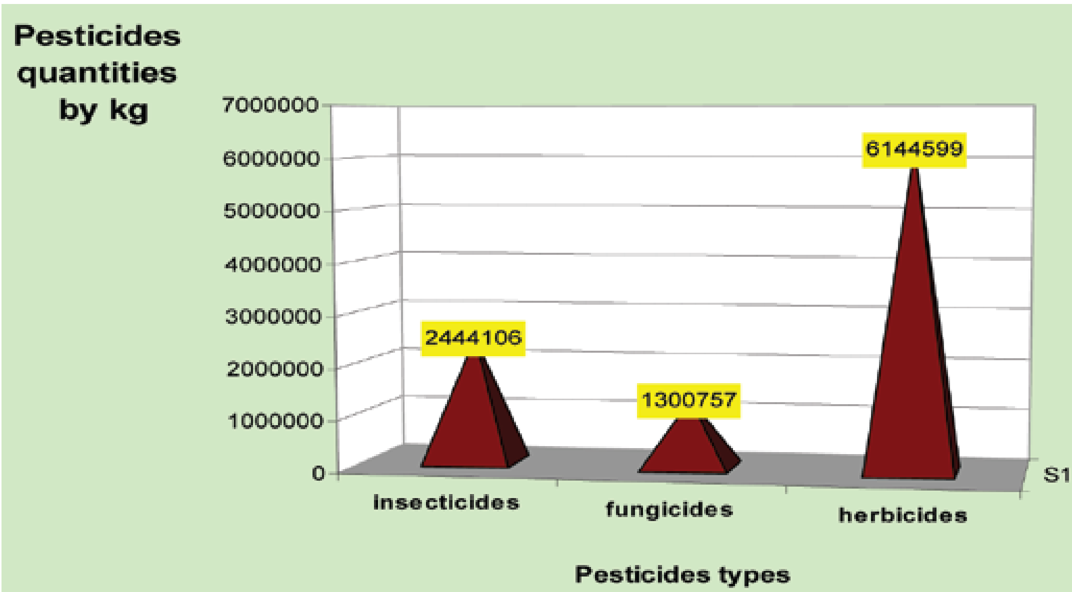
13-2-3 Environmental indicators:

1- Conduct inventory of imported hazardous substances through customs releases: Study all documents received from companies and customs outlets about imported chemicals during 2009 (932 custom release), to express technical opinion from the environmental aspect. Figure (13-1) clarifies that the largest amount of chemicals were imported during August and July, due to increasing production rates during summer.



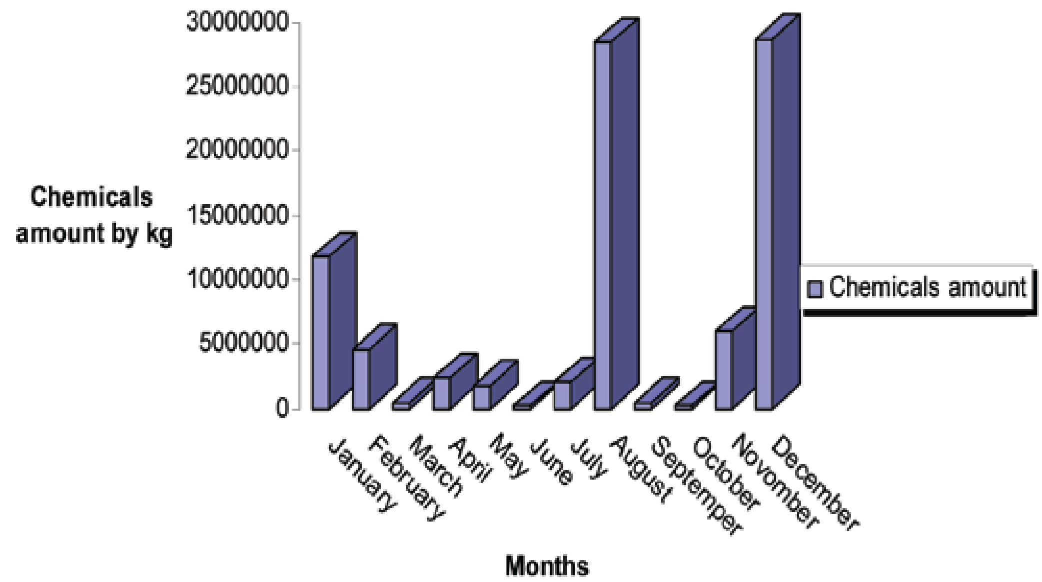
(13-1) Amount of chemicals received by custom releases during 2009

2- Inventory of imported pesticides and chemicals through agricultural sector (Central Laboratory of Pesticides):
Amount of pesticides released and handled in local market during 2008, (revised by Agriculture Pesticides Committee - Ministry of Agriculture and Land Reclamation). Figure (13-2) clarifies that the largest amount of pesticides in local market are herbicides, insecticides and fungicides respectively.



(13-2) Quantities and types of pesticides used in agricultural sector

3- Inventory of imported chemicals by industrial sector (General Authority for Industrial Development):
The amount of imported hazardous chemicals released for industrial sector and handled in local market during 2008. Figure (13-3) shows that the largest amount of used chemicals were in August and December.



(13-3) Quantity of chemicals used in the industrial sector

13-2-4 Exerted efforts to mitigate adverse impacts of hazardous substances:

1- Provide technical support for integrated management of hazardous substances:
A committee has been formed from EEAA with membership of concerned authorities "Egyptian Petroleum Research Institute, Ministry of Scientific Research, General Directorate for Irrigation at Damnhour, Ministry of Water Resources and Irrigation, General Directorate for Irrigation at Damietta" to survey quantities of expired pesticides like Magnside for safe disposal.

2- Training and environmental awareness:
Within the framework of raising environmental awareness about risks of heavy metals and persistent organic pollutants (POPs) , a training program has been prepared for all categories of the society and local community as follows :-

a. In coordination with the “Al –Thanaa Association “ two workshops were held on “the Integrated Management of Hazardous Substances” & “Mercury and its Health and Environmental Impacts” ; in addition to coordination with “Unit of Mercury Recycling “ for holding workshops for NGOs in (Tanta - Alexandria – Miet Gamr) and the offices of Health and Environment in different governorates and universities.

b. In participation with Women’s Unit , Health and Environment Office , local community and NGOs at El-Monofia Governorate, a workshop was held on “Industrial & Domestic Detergents and their Impacts on Health and Environment “; in addition to coordination with “ Unit of Recycling Fluorescent Bulbs” to conduct “ Mercury and its Impacts on Health and Environment “ workshop in collaboration with Korean project.

c. Some awareness messages have been prepared in Arabic &English about “Health and Environmental Impacts of Mercury”, “Safe Disposal of Fluorescent Bulbs” for displaying on a screen in El - Tahrir Square.

d. A brochure has been prepared about sources, health and environmental impacts of mercury entitled “Mercury and its Recycling Unit”.

3- Projects:

a. Institutional partnership “with German partner “:

For preparing qualified staff in EEAA and its Regional Branches (RBOs), a training program has been prepared in collaboration with project’s experts in global trend and modern systems in chemicals management.

b. “Integrated Management of Mercury Waste Project “and “Recycling Fluorescent Bulbs Project” with Korean partner:

- To achieve global trend and participate in mercury initiative, all types and quantities of fluorescent bulbs had been inventoried by conducting questionnaires and field visits among producers and importers; in collaboration with relevant ministries (Petroleum - Industry - producing factories) and EEAA Regional Branches (Alexandria- Mansoura- Tanta- Greater Cairo).
- The principle of volunteer work has been applied in addressing environmental problems, students from “Faculty of Agriculture – Cairo University” participated in surveying fluorescent bulbs in governmental buildings.
- Training program was held for Regional Branches and Universities about “Health and Environmental Impacts of Mercury”.

Pictures (13-1) Show implemented workshops

c. **Persistent Organic Pollutants' project (POPs) in Egypt**

- After finalizing the inventory that has been conducted for "Shubra Al-Khaymah", hot spots in all governorates have been identified , then participating agencies and Cleaner Production Centre (implementing agency) have been informed with these hot spots to initiate their surveying of PCBs in cooperation with World Bank and Global Environment Facility.
- "Environmental Pollutants Data Base" (JICA Project) has been evaluated, to provide it with all updated data resulting from the inventory, as shown in picture (13-2).

Picture (13-2) Database of environmental pollutants

- Inventory has been conducted through questionnaires and field visits for transformers and capacitors containing PCBs oil (in previously identified hot spot areas) in collaboration with Regional Branches (Alexandria - Cairo - Aswan – Assiut).

A. Field Visits:

All transformers suspected to be contaminated with PCBs have been inventoried as shown in the following table (13-2).

Table (13-2) shows number of transformers and amount of contaminated oil

Rate power of converters (KVA)	Number of surveyed transformers	Weight of oil for every type of transformers per tons		
		Oil in transformers	Proved contaminated oil with PCBs	Assessment of oil contaminated with PCBs in transformers
500>	87	48.3	13.7	15.4
501-1000	566	865.8	12.2	54.9
1001-1500	21	28	11.3	12.1
1501-2000	24	41.9	0	2.1
2001-3000	3	14.4	0	0.7
3000<	125	4030.3	0	4.0
Rate of energy is not known exactly	31761	14536.8	15.6	741.7
Total	32587	19565.5	52.8	831

B. Questionnaires : (Ministry of Electricity and its affiliated agencies).

- The final report was prepared containing future plan's recommendations, important points are to be completed and the participation of new branches to increase qualified staff in the ministry.
- There was a training staff of EEAA , RBOs and Central Lab on methods of using KITS to determine PCBs concentration as shown by picture (13-3)

Pictures (13-3) World Bank's project team members during assembling samples

C. Strategic Approach for the Internationally Chemical Management «SAICM»:

- A National Action Plan concerning Strategic Approach for Internationally Chemical Management «SAICM» has been finalized, concentrating on activities with priorities to Egypt.
- Institutional Twinning project concentrates on GHs system, (life cycle of mercury for its importance and priority for the SAICM).
- Prepare 2 brochures on Persistent Organic Pollutants «PCBs» and «PAHs» to raise environmental awareness with these carcinogens and mutagens substances.
- Establish database about environmental pollutants containing previous studies on environmental pollutants, their chemical and physical characteristics, sources, quantities, inventory and safe disposal methods.

D. Technical Committee of REACH: Registration, Evaluation and Authorization of Chemicals.

- Survey 70 companies in petrochemical sector and other sectors exporting to EU countries, where they were initially registered, and their final registration is continuing to complete needed steps to obtain the certificate.
- Develop REACH website in cooperation with Federation of Industries and Cleaner Production Centre.
- Coordinate with Federation of Industries and Cleaner Production Centre to start procedures of final registration for some factories.

13-3Hazardous waste:

The following activities were implemented during 2009:

13 - 3 - 1 Electrical and electronic waste:

MSEA has implemented an inventory of hazardous electrical and electronic waste (fluorescent bulbs); total waste of fluorescent bulbs generated by factories is about 9,495 bulbs per day. A pilot model has been conducted for surveying waste of fluorescent bulbs generated annually by ministries, some hospitals, hotels and universities. Volume of waste bulbs in these governmental bodies and private sector is about 71,000 bulbs annually, results of this inventory are shown in figures (13-4) (13-5) (13-6) (13-7)

Figure (13-4) Mercury waste management project in Egypt

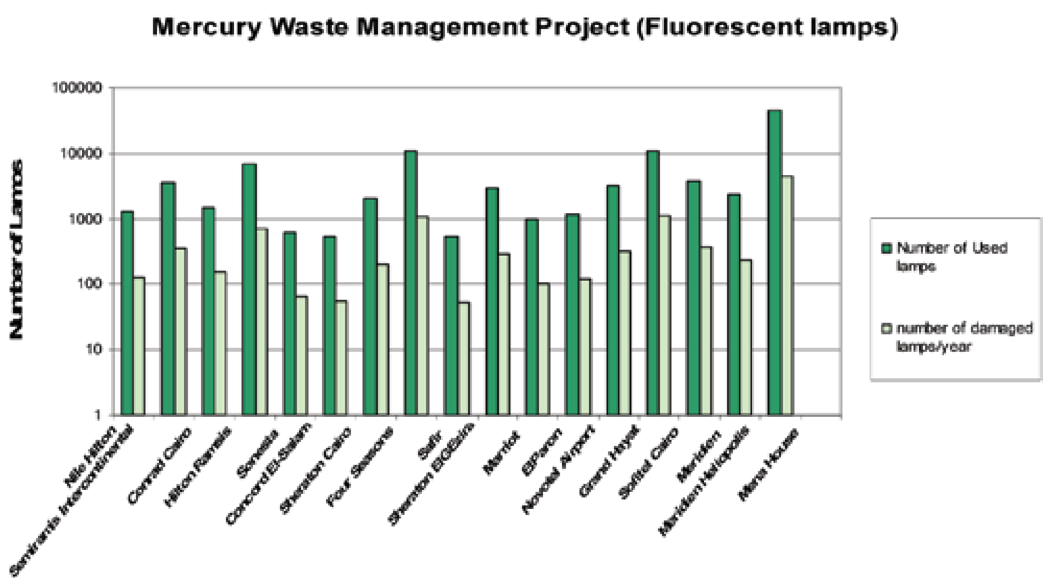


Figure (13-5) Amount of fluorescent bulbs waste generated annually in some hotels

Figure (13-6) Amount of fluorescent bulbs waste generated annually in some universities

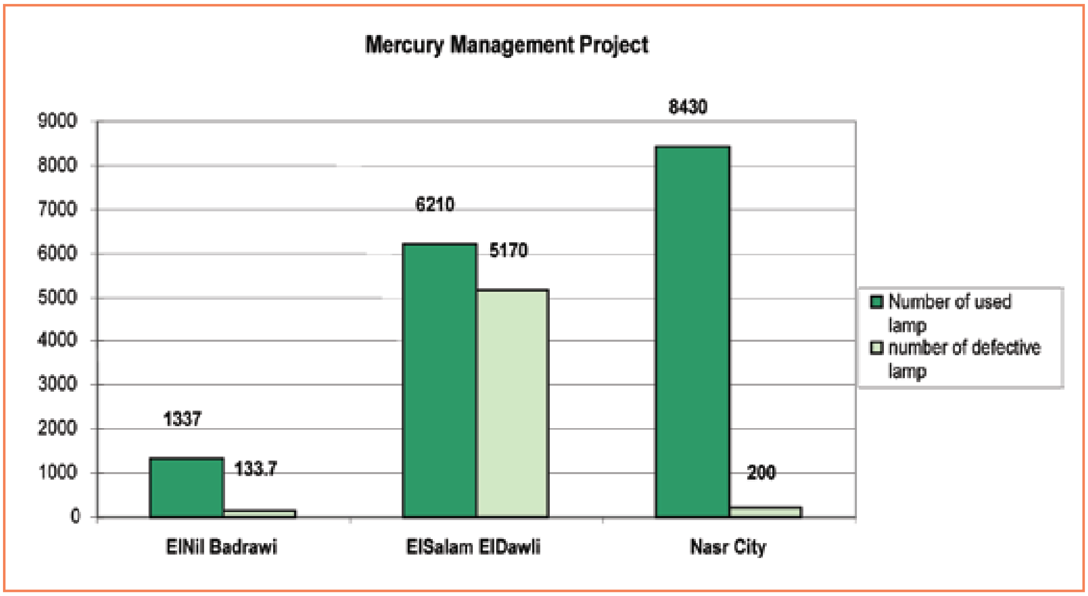


Figure (13-7) Amount of fluorescent bulbs waste generated annually in some hospitals

Currently MSEA is completing an inventory of fluorescent bulbs waste generated in universities, hotels and hospitals in the remaining governorates.

13 - 3 - 2 Plastic wastes:

An inventory of factories producing plastic bags and paper has been conducted to develop a strategy for reducing use of plastic bags and encourage use of alternatives such as paper, cardboard, cloth, thick and multi-use plastic bags. The following figures (13-8) (13-9) (13-10) (13-11) represent results of the inventory conducted for companies producing plastic and paper and their annual quantities.

Figure (13-8) Total number of companies producing plastic bags

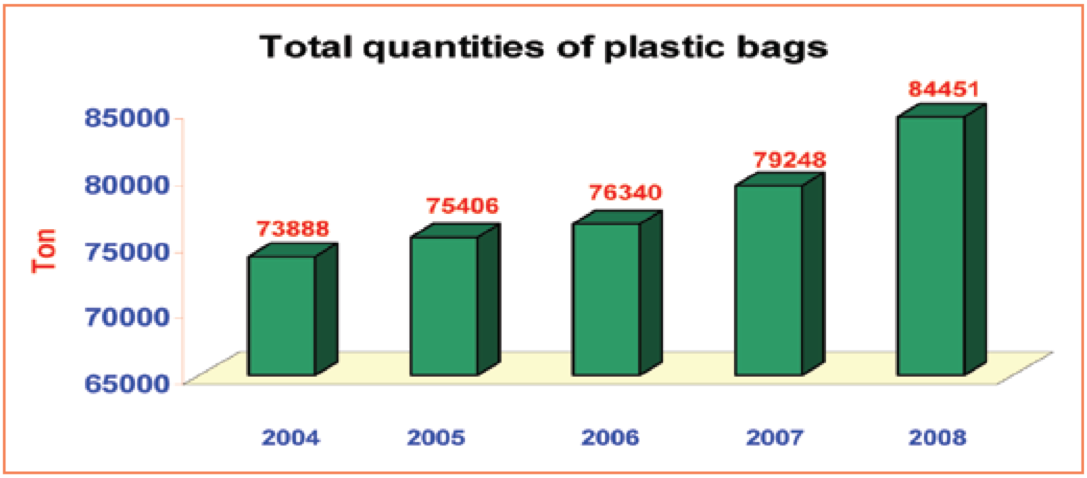


Figure (13-9) Total quantities of plastic bags produced annually

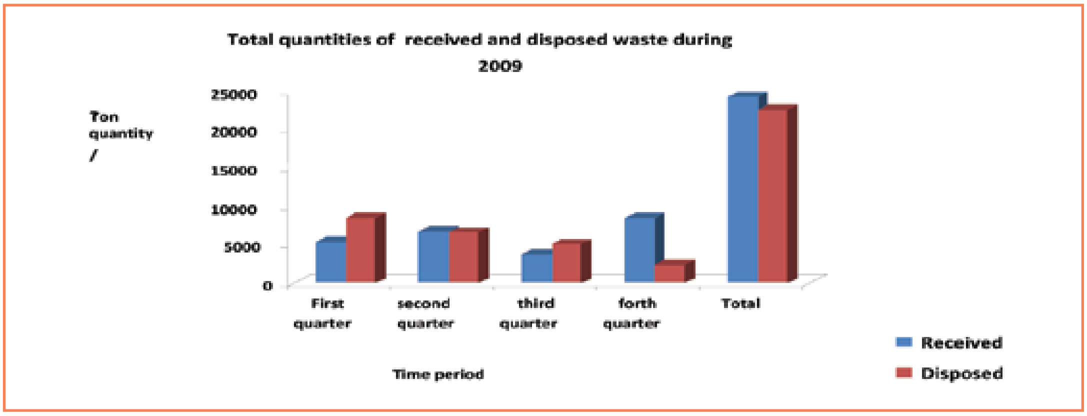


Figure (13-10) Total number of industrial facilities producing paper bags

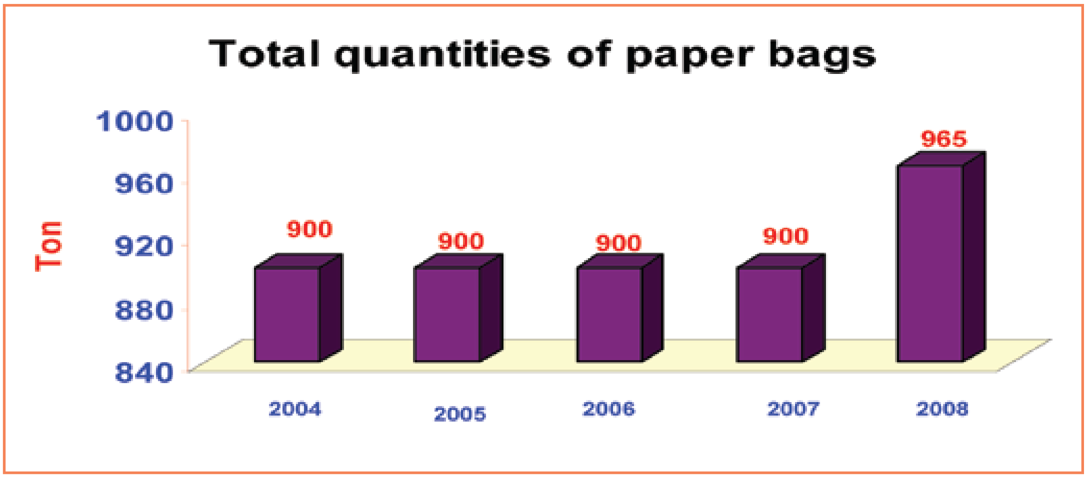


Figure (13-11) Total quantities of paper bags produced annually

13 - 3 - 3 Medical wastes:

An inventory has been conducted for governmental and private sector health-care facilities in addition to quantities of hazardous medical waste generated annually. These quantities were estimated at 40.000 tons annually as shown in tables (13-3), (13-4).

Table (13-3) Total number of health-care facilities in all governments

Authority	Number	Percentage
Facilities affiliated with Ministry of Health	1,166	3.18%
Health-care facilities supervised by Ministry of Health	69	0.19%
Other governmental agencies	119	0.32%
Private sector	35,309	96.31%
Total	36,663	100%

Table (13-4) Total amount of medical care waste generated by health care facilities annually (Thousand tones)

Authority	Total Generation	Hazardous waste
Facilities affiliated with Ministry of Health	57.3	14.32
Facilities supervised by Ministry of Health	12.68	3.14
Ministries and other governmental agencies	22.42	5.61
Private sector	68.75	17.19
Total	161.15	40.26

13-3-4 Collection and treatment of hazardous waste:

For safe and sound disposal of medical hazardous waste in the field of collecting and treating hazardous wastes, MSEA supported the system of medical waste disposal with using some medical incinerators. Tables (13-5), (13-6), (13-7) show a number of vehicles, incinerators and names of companies located in all governorates.

Table (13-5) Number of vehicles transporting hazardous medical waste in governorates

Governorate	No.	Governorate	No.	Governorate	No.
Sohag	5	Kafr El-Shekh	4	Cairo	6
Qena	7	El Gharbia	4	Helwan	4
Aswan	3	El Menofia	4	Alexandria	4
Marsa Matrouh	6	El Behera	7	Port Said	2
El Wady El Gadid	4	Giza	4	Suez	2
Red Sea	4	6^{th} October	4	Ismailia	4
North Sinai	5	Bani-Suef	6	Damietta	2
South Sinai	5	Fayoum	5	Dakahlia	6
Luxor	3	Minya	4	Elsharkia	5
Total	131	Asuit	7	Qaliobeia	5

Table (13-6) Number of hazardous medical waste treatment units located in different governorates

Governorate	number of departments	number of incinerators	Number of sterilization units	Total treatment units
Cairo	27	11	12	23
Helwan	9	3	2	5
Alexandria	7	5	4	9
Port Said	1	2	0	2
Suez	5	1	1	2
Ismailia	7	7	2	9
Damietta	4	2	3	5
Dakahleia	17	14	1	15
El Sharkia	13	13	2	15
Qaliobeia	11	5	5	10
Kafr El Sheikh	10	5	1	6
El Gharbya	13	5	1	6
Menoufya	10	7	4	11
Behera	16	15	1	16

Governorate	number of departments	number of incinerators	Number of sterilization units	Total treatment units
Giza	8	5	4	9
6th October	10	4	1	5
Bani suif	7	5	0	5
Fayom	7	2	0	2
El Menia	9	9	1	10
Asiout	13	9	0	9
Sohag	11	1	0	1
Qena	11	2	0	2
Aswan	6	2	2	4
Marsa Matrouh	7	3	0	3
El Wady El Gadid	4	2	0	2
Red Sea	6	2	0	2
North Sinai	6	1	1	2
South Sinai	8	7	0	7
Luxor	4	2	0	2
Total	267	151	48	199

Table (13-7) Companies transporting and treating hazardous medical waste in different governorates

Serial number	Governorate	Company
1	Cairo	FCC Misr Company for Environmental Services
2	Helwan	Eco Conserv
3	Port Said	Misr Services
4	Alexandria	Violia
5	Suez	Tandhifko
6	Bani suif	The Governorate

MSEA supports management systems of medical waste by providing some incinerators to help in disposing medical hazardous wastes safely and soundly, figure (13-12) shows a number of incinerators provided by MSEA.

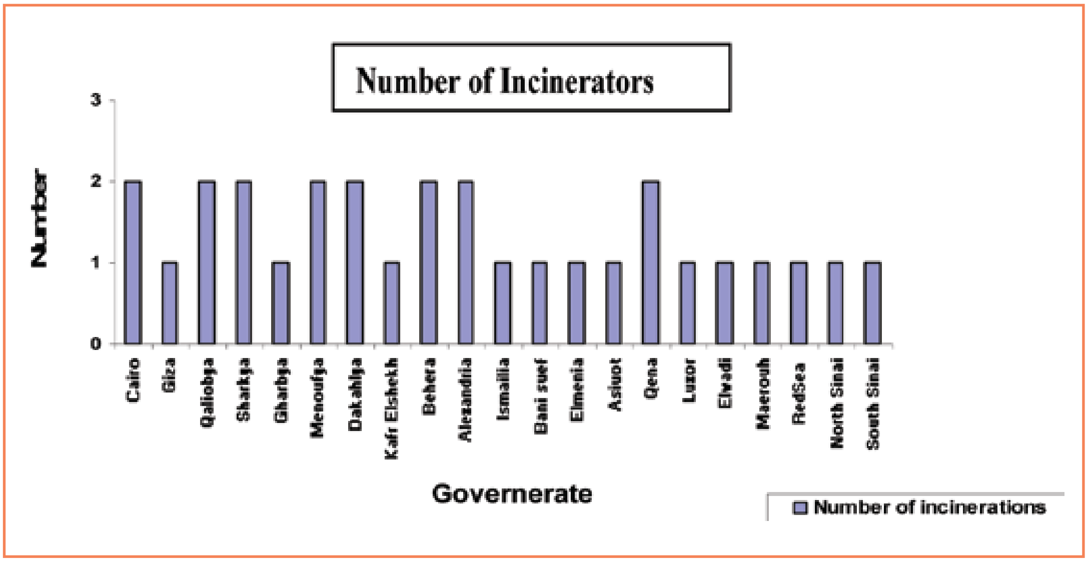
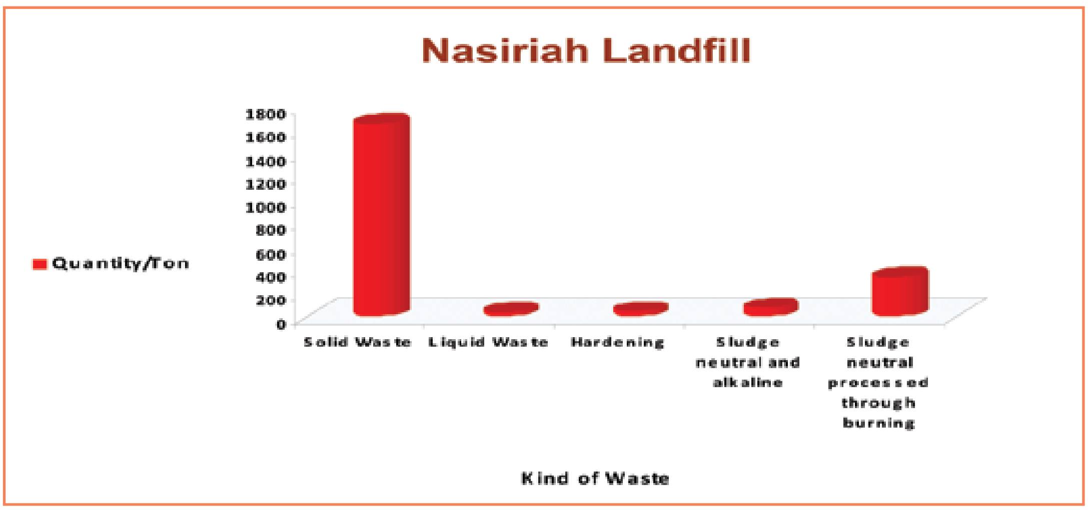


Figure (13-12) Number of incinerators provided by MSEA for different governorates

13 -3-5 Final disposal of hazardous waste:

- Egypt has one sanitary landfill for receiving hazardous waste that is located in Nasiriyah district at Burj Al Arab city, Alexandria governorate. In 2009 , the landfill received 2,129 tons of all types of hazardous waste, as shown in figure (13-13):



Form (13-13) Types of hazardous waste disposed at Nasiriyah landfill

- Egyptian Cement Company (Lafarge) is disposing certain types of its generated hazardous waste in its cement kilns as an alternative for fuel; the company disposed of about 23,640 tons during 2009, as shown in figure (13-14):

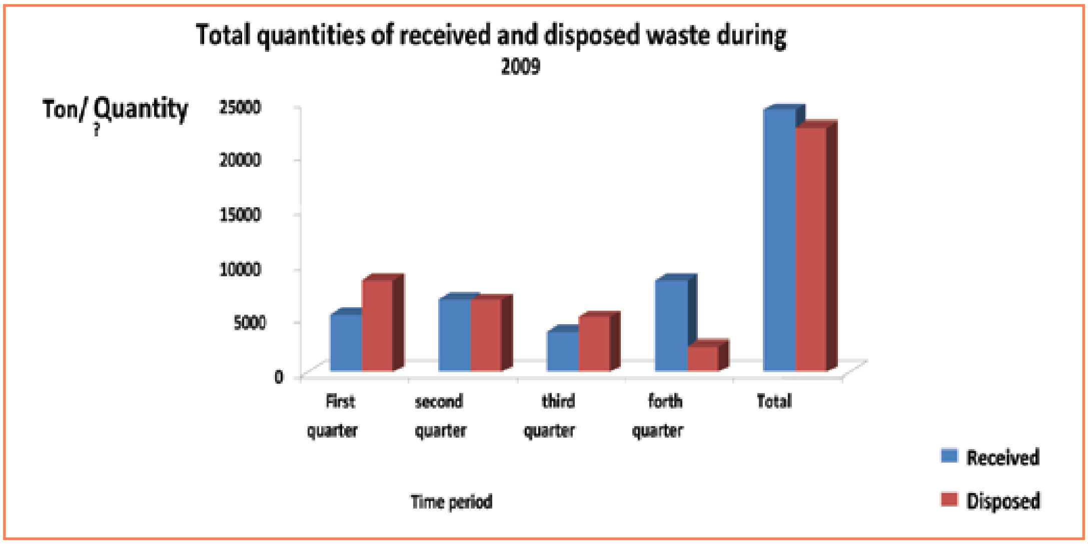


Figure (13-14) Total quantities of waste disposed by cement kilns

- In realizing environmental protection, MSEA has signed a Protocol with Alexandria Governorate to establish a unit for recycling fluorescent bulbs containing mercury; the following picture shows the unit that will be established on the landfill site in the city of Nasiriyah, at Burj Al Arab in Alexandria.

Picture (13-4) Recycling unit for fluorescent bulbs containing mercury

13-4 International conventions and agreements:

MSEA as the acting national focal point under the Basel Convention is responsible for controlling and monitoring trans-boundary movement of hazardous waste passing through Egyptian territory in coordination with the Suez Canal Authority. Hazardous waste Department at MSEA receives notifications of trans-boundary movement from the competent authorities of exporting countries to permit hazardous waste shipments from the Far East to Europe for the recycling or final disposal under the Basel Convention.

In 2009, registered records showed that 86,257 tons of hazardous waste have passed through the Suez Canal from 10 importing countries; figure (13-15) represents the number of ships that passed through Suez Canal during 2009.

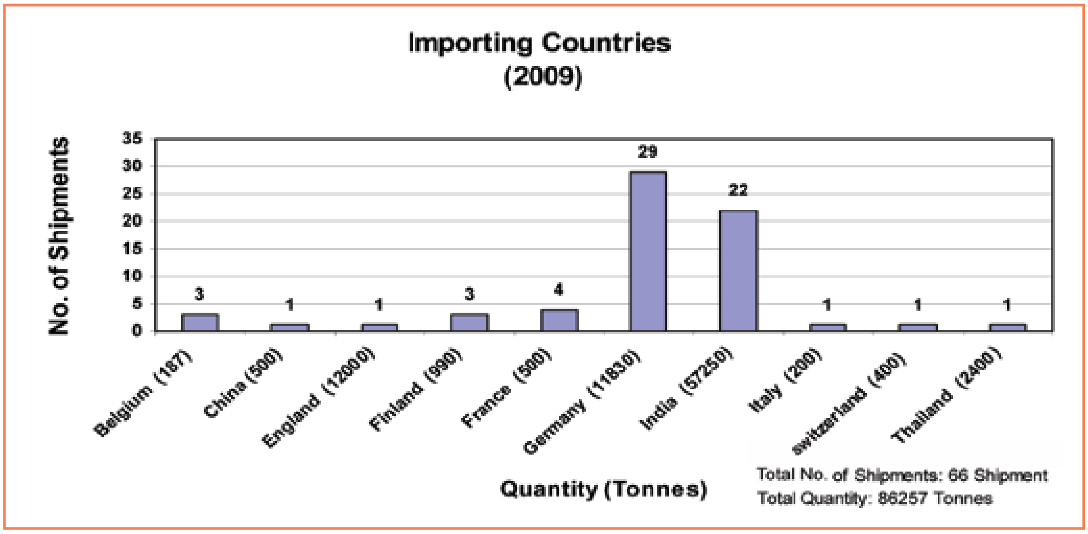


Figure (13-15) Numbers of ships and quantities of hazardous waste transiting Suez Canal

13-5 Future vision:

Future general policy of hazardous substances and waste aims at the following:

1. Raise capacities of trained staff on the different types of treating contaminated oil by Polychlorinated Biphenyls (PCBs).
2. Update legislations and laws concerning handling hazardous substances to reflect the modern legislations and regulations for management of hazardous chemicals and waste.
3. Apply unified system for classifying and coding chemicals (GHS) to comply with international conventions and modern systems in management of chemicals.
4. Develop an integrated system to collect electrical and electronic waste (E-waste) in Egypt, including fluorescent bulbs.

5. Complete survey and inventory of other resources of mercury (quantities - types) to cope with Global Initiative for Mercury.
6. Initiate surveying and inventory of Persistent Organic Pollutants (new candidates of POPs), which contains nine substances in addition to the 12 substances that were stipulated by the Stockholm Convention of Persistent Organic Pollutants; to determine their quantities and sources in Egypt.
7. Finalize implementation of the integrated system for management of hazardous medical waste system in coordination with Ministry of Health to develop an integrated and sustainable system for medical waste management in Egypt; where implementing its first phase has started.
8. Raise awareness of local community of the adverse health and environmental impacts of mercury and E- waste, in collaboration with NGOs.
9. Participate in preparing necessary plans to protect environment from risks of hazardous substances and waste by following up on the implementation of these plans with stakeholders.
10. Provide necessary support to pioneer projects in the field of hazardous substances and waste management (for safe disposal), through international funding agencies and development partners.
11. Update inventory of hazardous waste in all sectors to identify required treatment systems.
12. Raise environmental awareness in the field of hazardous waste management.
13. Develop database of hazardous waste.
14. Encourage processes of prevention or reduction of hazardous waste generation from the source by using cleaner production technologies.
15. Integrate solution of hazardous waste problem with other problems.
16. Prevent illicit trafficking of hazardous waste locally and internationally.
17. Provide adequate facilities for treatment and safe disposal of all kinds of hazardous substances and waste.
18. Provide remediation and rehabilitation for deteriorated polluted sites resulting from accumulation of hazardous wastes.
19. Activate the role of private sector and NGOs in the field of hazardous waste management

References:

1. Environmental Law No. 4/1994, its Executive Regulations and amendments.
2. Basel Convention on (Control of Cross boundary Movements of Hazardous Waste and their Disposal).
3. Annual Statistical Report , Ministry of Health , 2008
4. Information Center, General Authority for Industrial Development.
5. Reports of Egyptian Cement Company (Lafarge).
6. Report of Hazardous Waste Department in Alexandria Governorate.

Chapter Fourteen

ENVIRONMENT PROTECTION FUND

14-1 Introduction:

Environment Protection Fund is established according to Law No. 4 /1994 amended by Law No. 9 / 2009. These amendments include attributing legal personality to the Environment Protection Fund for more powers and capabilities necessary to activate its role in protecting environment and reducing all forms and kinds of pollution. Along with this, Prime Minister issued decree No. 1706/2009 about composition of the first EPF Board of Directors, chaired by Eng. Maged George, Minister of State for Environmental Affairs.

14-2 Projects implemented by Environment Protection Fund in 2009:

1. **Projects totally financed by the fund**

Table (14-1): Projects totally financed by the Fund

Project name	Total funding (with thousand pounds)	Fund's contribution (with thousand pounds	Loan (thousand pounds)	grant (thousand pounds)	Current situation
Provide 6 incinerators for the disposal of hazardous medical waste in governorates.	1330	1330			Install 2 incinerators in both hospitals of Leprosy and Fever in Qena. Other incinerators are currently under installation in Beheira, Marsa Matrouh, Sohag and Kafr El-Sheikh governorates.
Phase II project of garbage recycling and utilization in Minya governorate.	Feddan of land estimated with 40 thousand pounds.	20		20	Preparing the land, that will be used in converting waste into organic fertilizers.
Replace 1000 old taxi.	10000	5000		8140	814 taxis have been replaced till now.
Total		**6350**		**8160**	

2. Joint Projects with foreign authorities

Table (14-2): Projects executed in collaboration with (Danida).

Project name	Total funding (with thousand pounds)	Fund's contribution (with thousand pounds	Loan (thousand pounds)	Grant (thousand pounds)	Current situation
Integrated management of medical waste disposal in Ismailia Governorate.	6255061	3531248			The site has been actually delivered to the contractor to execute civil works starting from 1st September 2009.
Recycling agricultural waste and rice straw; manufacturing organic fertilizer in Behera governorate.	1100000	1100000			Project is currently under implementation.
Total	**7355061**	**4631248**			

Table (14-3): Private and Public Sector Industry (PPSI).

Project name	Total funding (with thousand pounds)	Fund's contribution (with thousand Euro)	Loan (thousand pounds)	Grant (thousand Euro)	Current situation
Project of Environmental Protection for public, private and business sectors in cooperation with German Construction Bank.		670		670	Executing some projects in cooperation with Environment Quality Sector in the field of addressing industrial pollution.

3. **Projects implemented in cooperation with Environmental Compliance Office affiliated to Federation of Industries.**

Table No. (14-4) Projects implemented in cooperation with Environmental Compliance Office affiliated to Federation of Industries.

Name	Sector	Total value of required investment (with Egyptian pounds).	Total value of Environmental Compliance Office's contribution (with Egyptian pound).
Fortuna Egypt Company	Engineering	2,745,000	1,921,500
New Otto Company.	Engineering	2,715,000	1,900,000
International Company for Pharmaceutical and Complementary Industries.	Chemical	2,849,700	1,994,790
Khalid Awni Abdel-Fattah Abdel-Basit Factory for Plastic Bags.	Chemical	670.000	603.000
Sakum Plast Company.	Chemical	3.159.768	2.000.000
Shebl El-Sharkay Company for Modern Textile and Dyeing in Mahalla.	Textile	2,850,250	1,995,175
Al-Azizia Company for Cooling, Freezing and Foodstuff Industries.	Food	3,500,000	2,100,000

Table No. (14-4) Projects implemented in cooperation with Environmental Compliance Office affiliated to Federation of Industries.

Name	Sector	Total value of required investment (with Egyptian pounds).	Total value of Environmental Compliance Office's contribution (with Egyptian pound).
Nefertiti for Food Industries.	Food	3.022.250	2.000.000
Irene for Wood Industries	Wood and Furniture	3.000.000	2.100.000
Nile Gas Company	Chemical	1,622,000	1,200,000
FAW Group Industries	Metallurgical Industries	2,700,000	1,890,000
Al-Haj Hassan Mahmoud Balaha and Partner in Mahalla .	Textile	2,487,300	1,740,000
Syed Mohsin El-Sajeeni and Partners for Dyeing and Processing.	Textile	1,760,000	1,400,000
Atlas for Dyeing and Processing.	Textile	1,598,500	1,278,800
Mansoura for Resins and Chemical	Chemical	3,600,000	2,400,000
El-Negma Glue Company	Chemical	2,800,000	1,960,000
United Company for Chemical Industries	Chemical	3.151.300	2.000.000
El-Feal United Company	Chemical	3.000.000	2.100.000
Tawkeal Company for Metal Castings Industries	Metallurgical Industries	3,500,000	2,100,000

Table No. (14-4) Projects implemented in cooperation with Environmental Compliance Office affiliated to Federation of Industries.

Name	Sector	Total value of required investment (with Egyptian pounds).	Total value of Environmental Compliance Office's contribution (with Egyptian pound).
Zinoteix Company for, Dyeing and Processing Textile.	Fabrics Textile	2.889.375	2.000.000
Fluid Control Industries, Vaiko Egypt.	Engineering Industries - Energy	1.050.000	840.000
Delta Company for Construction and Manufacturing	Engineering Industries - Energy	1,325,500	1,060,400
Abd El-Aty Company for Steel Pipes.	Engineering Industries - Energy	3.000.000	2.100.000
Al-Nanaia Company	Food Industries	3,600,000	2,100,000
Total		**62,595,943**	**42,783,665**

14-3 Future Vision:

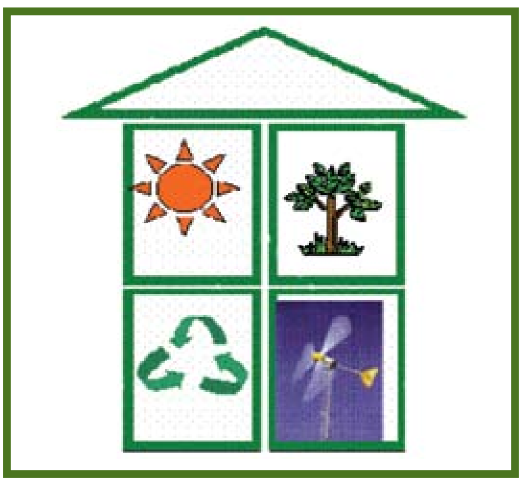
1. Law No. 4/94 amended by Law No. 9/2009 attributed EPF legal personality effective from March 2009, thus to be more capable of performing its active role in executing environmental investments and realizing sustainable development through:

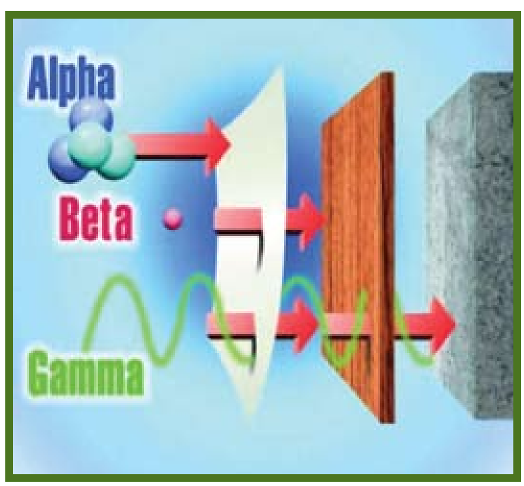
- Independent regulatory structure has all the powers to perform EPF's role.
- Independent accounting unit performing all functions towards the optimum use of EPF's financial resources.
- Board of Directors has all powers to motivate EPF's performance of its assigned tasks.

2. Paying attention to capacity-building and support Fund's employees to be able to achieve Fund and overcome obstacles facing execution of its projects according to the adopted plan.

Part Five

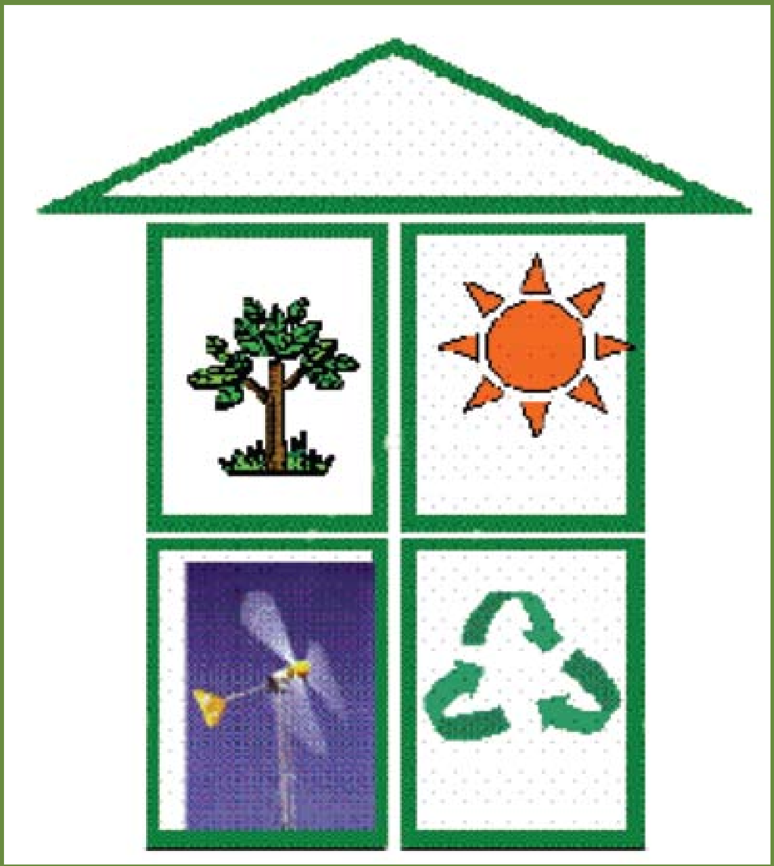
GLOBAL ENVIRONMENTAL ORIENTATIONS





Chapter Fifteen

GREEN ECONOMY



15-1 Introduction

Until recent times black color was the most prevailing color in the field of economy, as it constitutes one of its components, where black markets directed by groups of mine exploiters, illegally handle business transactions without committing with applicable law and customs of a given country. Green economy has emerged to compete with the black one through coloring both the economical terms and market. Now, we have green economy under which green goods and products are sold, resulting in having green national accounts such as: green income, green budget and green balance of payments.

Moreover, green institutions such as green banks, green shops, and green economic sectors (green construction and green energy) have been established on a large scale. Despite the fact that attributing these goods, national accounts and banks with green color has nothing to do with plants or green trees; yet these green trees, water irrigating them, their needed air and yielding fruits and woods are fundamental elements of green economy due to the fact that "green economy" term has originally emerged as a result of linking economy to environment and its resources, such as: water, forests, oil, air etc.

15-2 Green Economy Definition

It is a new fast-growing economic pattern proposed as an opposite to the prevailing economic pattern known as "black economy" that depends on burning fossil fuel (petroleum, coal and natural gas) as a source of energy. Green economy based on information of environmental economics that balance and exchange with economical and ecological systems on the one hand and rate of negative impacts resulting from economic activities concerning problems of GHG and climate change on the other hand .

15-3 Green Economy and Sustainable Development

Green economy is considered clean economy, as it depends on green development. It optimizes use of resources and energies in consistency with environment protection to avoid negative impacts on both environment and human being. On the contrary of that, black economy is harmful to the environment as it wastes resources due to being based on sever competition to gain more wealth without considering standards of clean environment and sustainable development.

Topics of green economy includes those related to green energy generated from renewable sources as an alternative to fossil fuel and means of preserving energy to achieve its rational utilization.

The green economy is promoted by its ability to save global economy from recession, loss of jobs and increased poverty. It can achieve sustainable economic development by avoiding environmental pollution, natural resources depletion, environmental deterioration and GHG problem. For example, in clean energy field, about 2.3 million people are working in renewable energy technologies globally, so that investments in this field would create 20 million job opportunities by 2030 worldwide including 2.1 million jobs in wind energy ,6.3 million jobs in solar energy and 12 million jobs in bio-fuel based on agriculture and industry. Contrary to that, total number of workers in oil, gas and oil refining industries are slightly more than 2 million, which clearly assures figures never lies.

Recent study conducted by the US Green Building Council (July 2009) on job opportunities already offered by green building sector in USA from 2000-2008 and its expected increase from 2009- 2013. Results indicated that first period witnessed creation of 2.4 million job opportunities which expected to reach 7.9 million in the second period. Moreover, the study estimated that this sector had contributed with 173 million US dollars in the GDP for the first period and expected to reach 554 for second period.

Current decade witnesses remarkable increase in the number of private companies willing to "green" their products and looking for the new world. Such as, General Electric initiative conducted within the framework of its "Clean Environment" campaign, it succeeded in transforming engines of railways trains (one of the oldest and strongest means of transportation) into a hybrid railways engines that save energy by reducing 15% of its fuel consumption and 50% of its emissions compared currently used engines .

This trend is not confined to developed countries only; rather it extends to include several developing countries which have interest in green activities investments. For example, Grameen Shakti, a Bangladeshi company established by Nobel Peace Prize laureate, Professor Muhammad Yunus. Since 1996, this company unleashed great revolution in the country in renewable energy field as it financed and sold solar energy units and provided clean energy for more than 8000 houses in Bangladesh every month. Women who bought these units worked later on as distributors of this green energy by selling solar energy to their neighboring houses at prices not exceeding the monthly cost of their traditional kerosene stoves. The company is looking to convert million houses to use solar units instead of kerosene stoves - harmful to health - by next year.

In light of the fact, that market mechanisms can not combine costs of environmental and climate deterioration due to the increased rates of future commercial profits, cost of green products and energy's research, development and marketing. It is not expected that most of public sector companies will express their voluntary interest to investment in environmental protection activities. So that green economy must be supported with market incentives provided by government to motivate this sector to invest in green goods and services. The German law on renewable energy, US code on recycling and reinvestment - 2009 and many other EU legislation are examples of legislative frameworks that establish incentives based on market mechanism that would accelerate green economy rates.

During the climax of global economic crisis, autumn of 2008 witnessed UNDP call for world governments to adopt "Global Green Deal" under which it encourages governments to support the shift towards greener economy that would revive global economy, increase job opportunities, combat climate change, environmental deterioration and poverty. UNDP suggests that the largest portion of economic incentive package – nearly 3 trillion US dollars – should be directed to the following five fields:

1- Optimize energy consumption in old and new buildings
2- Shift to use new and renewable energy sources
3- Increase dependency on sustainable means of transportation
4- Enhance ecological infrastructure of the earth including fresh water, forests, soil and coral reefs.
5- Enhance sustainable cultivation including organic production.

For helping poor countries to meet the MDGs and achieving greener economies, the UNEP's Global Green Deal calls for set of measures:

1- Expand in granting micro credit.
2- Reform subsidy systems directed to fossil fuel and shifting it to develop fisheries.
3- Make economic aid systems greener.

Global Green Deal was represented and discussed in London Summit for G-20 (April 2009), updated and resubmitted to Batesburg Summit for G-20 (September 2009). It encourages the G-20 to spend 750 billion US dollars from the economic incentive packages (2.5 trillion US dollars) towards creating green economy reduces dependency on fossil fuel, combats poverty, creates job opportunities, preserves and maintains our natural systems and moves towards more sustainable consumption. This initiative succeeded in transferring economic collapse from bitter to bless to the environment as most of the countries allocated big shares of economic incentives to programs dedicated to "green economy". For example, South Korea dedicated 80% of the total incentives package to green economy followed by China 38%, USA 25% and Germany 12%.

However, there are contradictions between UNEP's Global Green Deal and current mechanisms of international trade regarding market incentives. For example, WTO agreements contain strict rules against different kinds of governmental subsidies, especially those granted to exported goods. Undoubtedly, these contradictions represent obstacles that must be combated if Global Green Deal will be applied worldwide, particularly in developing countries. In this sense, WTO should reconsider its regulations related to governmental subsidies so as to take into account the prerequisites of shifting towards green economy. There is an urgent need to inform governments and international community with results of researching on how governments can promote green economy within their territories without facing commercial wars as a result of such promotion; in addition how cooperate and coordinate different countries' marketing efforts according to a unified international standard.

5-4 Exerted Efforts to Shift towards Green Economy

Government of Egypt works on different pivots to achieve increased levels of sustainable development and shifting towards green economy policy which is less dependent on carbon through a package of sectoral programs, including:

5-4-1 Energy

1- Ministry of Electricity plans to increase Egypt's consumption from renewable energy to reach 20% by 2020, distributed to 12% from wind energy and 8% from water and solar energy.

2- Ministry of Investment is interested in generating electricity from solar energy and economic utilization of the West desert by investment cultivation of 1.5 million feddans with bio-fuel plants to be irrigated with unutilized water in the Oases area. This would produce liquid fuel that replaces benzene; establish several factories for its refining similar to "Suez Factory for Bio-Fuel". Additionally, the Ministry is wishing to implement solar energy project to generate electric power needed by Egypt, North Africa and Central Europe countries. This would achieve significant development in that field, which would redistribute population, provide millions of job opportunities, increase Egypt's economic income and makes it major center for electric power in the world, Arab region and Africa.

3- Ministry of Electricity aims to rationalize 20% of energy consumption by 2022 based on a plan to be implemented as of this year by offering 6.1 million energy-saving bulbs. Moreover, Ministry of Industry developed a plan to rationalize energy consumed in industry sector as of 2015.

4- Adjust pricing structure of oil products and restructure energy sector to ensure delivery of subsidy to those who really deserve it.

5-4-2 Transportation

1- Ministry of State for Environmental Affairs in cooperation with Ministry of Finance and Nasser Bank implemented the project of replacing taxis in Greater Cairo to reduce emissions of 264.000 tones of carbon dioxide annually, along with the socio-economic return of the project.

2- Ministry of State for Environmental Affairs implements an ambitious program to convert public vehicles into natural gas-operated instead of benzene.

3- Ministry of State for Environmental Affairs in cooperation with Ministry of Trade and Industry successfully prohibited the production and importation of 2-stroke motor bikes, and is currently working on gradual phase-out of such bikes and replace them with 4-strok ones to reduce emission of air pollution.

4- Ministry of State for Environmental Affairs is about to initiate implementing pilot project for sustainable transportation systems.

5- The State supports public transportation systems by start implementing third line of the underground

6- Develop draft law of public and private sectors participation in infrastructure projects to attract more investments including those in energy sector so as to adapt with climate change.

5-4-3 Industry

1- Ministry of State for Environmental Affairs implements two programs for industrial pollution control (EPAP) and Environment Protection for both the private and public sector (PPSI). These two programs cover 120 projects to abate industrial pollution.

2- Encourage shifting towards industries that rationally consume natural resources, energy and water.

3- Encourage cleaner industrial production

4- Redistribute industrial map of Egypt and settle industries in new cities.

5- Expand in providing subsidies for small and medium-size industries implemented in environmental field.

6- Reuse of water and control of industrial discharge

5-4-4 Agriculture

1- Achieve sustainable use of natural agricultural resources

2- Concentrate on methods of integrated agricultural management

3- Optimize water use in agriculture; improve irrigation and discharge systems, and adjust crops composition in favor of crops less-consuming water.

4- Recycle swage and agricultural wastewater.

5-4-5 Institutional Arrangements:

1- Amend environmental legislations and improve environmental management systems

2- Increase orientation toward green economy development that is less dependent on carbon

3- Finalize institutional framework to manage national efforts towards adaptation with climate change impacts.

4- Include environmental dimension in development projects.

5- Adopt internal financial policies that motivate and support environmentally friendly facilities and harsh penalties against illegal environmental practices.

6- Ministry of Investment issued "Egyptian Index for Social Responsibility" of the hundred companies enlisted in the stock exchange. It includes environmental and social aspects which would indirectly lead such companies to reduce their thermal emissions to be consistent with the applicable environmental laws ad standards.

References:

- Common، M. and Stagl، S. 2005. Ecological Economics: An Introduction. New York: Cambridge University Press.
- Daly، H. and Townsend، K. (eds.) 1993. Valuing The Earth: Economics، Ecology، Ethics. Cambridge، Mass.; London، England: MIT Press
- Georgescu-Roegen، N. 1975. Energy and economic myths. Southern Economic Journal 41: 347 - 381.
- Kennet M.،and Heinemann V.(2006) Green Economics،Setting the Scene.in International Journal of Green Economics،Vol 1 issue 1 / 2 (2006) Inderscience،Geneva
- Kennet M.، (2009) Emerging Pedogogy in an Emerging Discipline،Green Economics in Reardon J.، (2009) Pluralist education، Routledge.
- Kennet M.، (2008) Introduction to Green Economics، in Harvard School Economics Review.
- .King، Andrew; Lenox، Michael، 2002. 'Does it really pay to be green?' Journal of Industrial Ecology 5، 105 - 117.
- Krishnan R، Harris JM، Goodwin NR، (1995). A Survey of Ecological Economics. Island Press. ISBN 1559634111، 9781559634113
- Martinez-Alier، J. (1990) Ecological Economics: Energy، Environment and Society. Oxford، England: Basil Blackwell.
- Martinez-Alier، J.، Ropke، I. eds.، Recent Developments in Ecological Economics، 2 vols.، E. Elgar، Cheltenham، UK، 2008.
- Reinhardt، F. (1999) 'Market failure and the environmental policies of firms: economic rationales for 'beyond compliance' behavior.' Journal of Industrial Ecology 3(1)، 9 - 21.

- Røpke, I. (2004) The early history of modern ecological economics. Ecological Economics 50(34-): 293 - 314.
- Røpke, I. (2005) Trends in the development of ecological economics from the late 1980s to the early 2000s. Ecological Economics 55(2): 262 - 290.
- Spash, C. L. (1999) The development of environmental thinking in economics. Environmental Values 8(4): 413 - 435.
- United Nation Environment Program (UNEP), 2008a. 'Global green new deal - environmentally-focused investment historic opportunity for 21st century prosperity and job generation.' London/Nairobi, October 22.
- Usgbc.org
- Vatn, A. (2005) Institutions and the Environment. Cheltenham: Edward Elgar
- Wagner, Ma. (2003) «Does it pay to be eco-efficient in the European energy supply industry?» Zeitschrift für Energiewirtschaft 27(4), 309- 318.

Chapter Sixteen

ROLE OF RADIATION TECHNOLOGY FOR ENVIRONMENTAL PROTECTION

16-1 Introduction

Ever since ionizing radiation was discovered by Marie Curie more than 100 years ago, many beneficial uses of radiation has been found in nearly every activity that touches human life, from medicine to communication to hydrology to archaeology. In spite of this, ionizing radiation is perceived as harmful and dangerous; and that is rightly so, if radiation is being used without proper precautions. Radiation can cause cancer when used indiscriminately and can also cure cancer when used carefully by a skilful technician. Thus, dosage is crucial to radiation and its careful use. Hence, reliable radiation dosimetery assures that radiation always stays beneficial.

The sterilization of medical products by radiation was demonstrated early and accounts for a considerable proportion of the industry, establishing itself soundly during the 1970s. The radiation processing of polymers was also important from the beginning, and it continues to expand introducing novel applications year by year. A third application with early promise, the large-scale treatment of food by radiation has been thoroughly investigated.

Development of a new industry concerning radiation processing of gaseous and liquid effluents is undertaken in three fields: electron beam flue gas treatment (SOx and NOx removal), wastewater purification and sewage sludge sterilization. Wastewater or sludge treatment and flue gas purification all differ from technological points of view, but they are common services and applications of environmental radiation technology applications, based mostly on electron accelerators.

16-2 Radiation Processing of Gaseous and Liquid Effluents

The problems of environmental damage and degradation of natural resources are receiving increasing attention throughout the world in recent years. The increasing population, increasing urbanization and enhanced industrial activities of mankind are all leading to degradation of the environment. For example, fossil fuels, such as coal, natural gas and petroleum, which are the main primary sources of heat and electrical energy production, are responsible for emitting large number of pollutants into the atmosphere with off-gases from industries, power stations, and cement, ceramics, carpets' factories. All these fuels contain major constituents (carbon, hydrogen, oxygen, organic vapors) as well as other components, such as metals, sulphur and nitrogen compounds. Air pollution caused by particulate matter and other pollutants not only directly impacts the environment, but also contaminates water and soil and leads to their degradation. Wet and dry deposition of inorganic pollutants leads to acidification of the environment. These phenomena affect human health, increase corrosion and destroy plants and forests.

About one-third of the world's population already lives in countries with moderate to high water supply stress – where water consumption is more than 10 per cent of the available renewable freshwater supply. If the present consumption pattern continues, two third of the human population will live in water-stressed conditions by the year 2025. The declining state of the world's freshwater resources, in terms of quantity and quality, may prove to be the dominant issue on the environmental and developmental agenda of this century. The available world supply of freshwater cannot be increased; more and more people therefore will depend on this fixed supply in future. Here too, there thus exists a need to develop improved technologies that can control the pollution of this precious resource.

It is becoming increasingly clear that mankind environmental problems are no longer just local or regional, but have become continental in scope. Economically and technically feasible technologies for control of pollution from gaseous and liquid effluents streams are being sought by technologists working in a variety of areas. Radiation technologists offered over the last few decades, an advanced solution to selective environmental problems.

The electron beam (EB) technology for flue gas treatment was developed in Japan in the early 1980s. Later on, this process was investigated in pilot scale in the USA, Germany, Japan, China and Poland. Commercial EB flue gas treatment installations are operating in coal-fired plants in China and Poland. The plant in Poland treats approximately 27 000 Nm3/h of flue gases. High efficiency of SOx and NOx removal (up to 90% for SOx and up to 70% for NOx) is achieved and by-product is a high quality fertilizer. The advantage of this technology over conventional ones has been clearly demonstrated from both the technical and the economic points of view.

Sewage sludge is the waste left over after municipal wastewater treatment plants have done their work. It is a rich source of many micronutrients and a source of carbon that make it a valuable fertilizer. However, it is often contaminated by pathogenic micro-organisms that limit its use as a fertilizer for agricultural applications. A plant for liquid sludge sterilization, using gamma radiation from a cobalt-60 gamma source, has been in operation in India since 1992. The plant has been designed to treat (110 m^3) sludge per day. The operational experience of the plant has shown that the process is simple, effective, and easy to integrate with existing sewage treatment plants, and the radiation sterilized sludge can be beneficially utilized as a fertilizer in the agricultural field. Similarly, an electron beam accelerator can also be used for treatment of dewatered sludge.

Radiation disinfection of effluents from a municipal wastewater plant for re-use has been successfully demonstrated by a number of researchers. Research activities have shown that inactivation of fecal coli-forms in secondary effluents from municipal wastewater plants can be obtained with doses of less than 1 kGy. While conventional disinfectants are adversely affected by the water chemistry matrix, radiation processing for bacteria inactivation is generally unaffected by the matrix. Therefore radiation processing has a clear advantage over the existing methods for municipal wastewater disinfection.

The main focus of radiation treatment of industrial wastewater is to convert non-biodegradable pollutants into biodegradable substances. In the use of high power electron accelerators substantial wastewater flow-rate duty is usually required to make radiation treatment cost effective. Radiation processing for industrial wastewater treatment is under investigation in many countries and is close to implementation.

Preliminary results obtained in Republic of Korea in a textile dyeing wastewater have demonstrated the advantages of radiation technology over conventional techniques. A pilot plant for treating textile dyeing wastewater, equipped with an electron accelerator has been constructed in Republic of Korea, and an industrial project aiming at the treatment of 10 000 m3/day . Accelerator power estimated with 400 kW. The overall costs for plant construction are approximately US $ 4.5 million.

Experiments conducted in recent years in Japan, Poland and Ukraine have demonstrated that besides SO_2 and NON, other potentially harmful chemicals, especially volatile organic compounds (VOC_5) produced during burning process, can also be significantly reduced by electron beam irradiation.

The future of the radiation applications for environmental purposes depends on technical developments in electron beam technology, especially in designing and manufacturing of reliable compact accelerators with high power efficiency and minimal maintenance. This will reduce the operation cost and make the radiation technology very competitive for environmental applications].

The program of electron beam treatment of gaseous and liquid effluents, especially flue gases, wastewater purification and sewage sludge sterilization has been well established in the European countries as well as in China and Japan. Many of the fast developing countries in the East and West Asia regions are interested in the technology conducting feasibility studies and looking for assistance in training and capacity building.

In all these applications, the advantages of radiation technology over conventional technologies have been clearly demonstrated from both, the technical and the economic points of view. It is therefore appropriate that the experience gained at these facilities available, and the future strategies are defined so that the processes can be deployed on a larger scale. The following examples for facilities in-applications are in current to overcome the different pollutants could be useful as transfer technology applicable at many industrial fields in Egypt.

1- Treatment of Volatile Organic Compounds (VOCs):

It is necessary to treat volatile organic compounds (VOCs) contained in exhaust gases because they are detrimental not only to our health but also the environment. The Government of Japan promulgated a law of pollutant release and transfer register (PRTR) in 1999. The PRTR requests industrial corporations to report periodically what pollutants are released, the quantity, and to which environmental media. Pollutants of 354 substances are listed in the PRTR registry, in which many VOCs are included. Companies which use VOCs have to pay an attention to control VOC emission. The Japan Atomic Energy Agency (JAEA) has developed environment conservation technologies for treating VOCs by using electron beam.

2- Treatment of Dioxin

Dioxin is a very toxic chemical, which can bind to a hormone receptor and cause a serious problem to the body. Carcinogenicity and mutagenicity are the most notorious effects of dioxin. New technologies for destroying dioxin are on urgent demand in Japan. Electron beam is expected to be one of the excellent methods for treating the dioxin in exhaust gases because it can decompose dioxin without a second treatment.

16-3 Food irradiation

The reduction of the quality of food on storage is a result of several physiological, chemical and biochemical processes occurring in the food itself, coupled with decay caused by the microbial contamination of the food. These processes eventually lead to the rotting of the food and to its wastage.

Conventional food treatment processes, such as canning, deep freezing, smoking or the application of chemicals, are all used to counteract one or more of the spoilage processes. The problem of insects in grain is currently avoided by the application of insecticides which, unfortunately, are not without hazard. Radiation can be used to counteract or modify the spoilage processes because it slows down the physiological, chemical and biochemical changes occurring in the food and kills insects and microorganisms.
The application of radiation allows the food to be treated in a sealed package thus preventing both the desiccation process and microbial re-contamination.

Food can be treated quite safely by radiation:

1- To prevent e.g. sprouting in onions, garlic and potatoes; to extend shelf-life of mushrooms, cherries and strawberries.
2- to eradicate insects in grain and fruit, to kill pathogenic micro-organisms in fish and meat,
3- To pasteurize dried herbs and to delay ripening of fruit and vegetables.

Food irradiation treatments cover a wide range of doses, and each desired effect tends to be associated with a typical range of dose. The important conclusion to be mentioned here is that, following a thorough review of all the scientific literature available up to 1980, a committee of food experts has concluded that all foodstuff irradiated to an "overall average dose" of less than 10 kGy would be quite safe for human consumption and that there are no indications of toxicological effects or nutritional deficiencies.

Interest in the irradiation process is increasing because of persistently high food losses from infestation, contamination, and spoilage; mounting concerns over food-borne diseases; and growing international trade in food products that must meet strict import standards of quality and quarantine, all areas in which food irradiation has demonstrated practical benefits when integrated within an established system for the safe handling and distribution of food. In addition, with increasingly restricted regulations or complete prohibition on the use of a number of chemical fumigants for insect and microbial control in food, irradiation is an effective alternative to protect food against insect damage and as a quarantine treatment of fresh produce.

The FAO has estimated that about 25% of all worldwide food production is lost because of insects, bacteria and rodents after harvesting. The use of irradiation alone as a preservation technique will not solve all the problems of post-harvest food losses, but it can play an important role in cutting losses and reducing the dependence on chemical pesticides. Many countries lose vast amounts of grain because of insect infestation and moulds. For roots and tubers, sprouting is the major cause of losses. Several countries, including Bangladesh, Chile, China, Hungary, Japan, Republic of Korea , Thailand, USA and Canada (about 40 countries) are irradiating one or more food products (grains, potatoes, spices, dried fish, onions, garlic, etc.) to control food losses on a commercial basis.

Food borne diseases pose a widespread threat to human health and they are an important cause of reduced economic productivity even in advanced countries which have modern food processing and distribution systems.

Although the amount of food borne disease caused by pathogenic bacteria in the United States is not known with accuracy, it was estimated in 1994 by a task force of the Council for Agricultural Science and Technology (CAST) that the number of cases likely range from 6.5 million to 33 million annually and that deaths may be as high as 9,000 annually. Irradiation is currently the only known method to inactivate these pathogens in raw and frozen food.

Considerable amounts of frozen sea foods and frog legs, as well as dry food ingredients, are irradiated for this purpose in Belgium, France and the Netherlands. Spices are being irradiated (instead of being fumigated) in many countries including Argentina, Belgium, Brazil, Canada, China, Denmark, Finland, France, Hungary, Indonesia, Israel, Mexico, the Netherlands, Norway, Republic of Korea, South Africa, the United Kingdom, the USA and recently Egypt.

Trade in food products is a major factor in regional and international commerce, and markets are growing. Major importing countries, including the USA and Japan, have banned the use of and the import of produce treated with certain fumigants identified as health hazards. During 1996, the United States Department of Agriculture (USDA) issued a new policy to allow importation of fresh fruits and vegetables treated by radiation against fruit flies. The developing countries whose economies are still largely based on food and agricultural production encourage food radiation processing as an alternative to fumigation or other kind of treatments.

Food irradiation can be applied to foods in a frozen state. There is no thermal degradation resulting from the treatment, and the treated food remains raw and fresh. Food irradiation is a physical process. There are no chemical additives involved in the treatment. Hence there are no chemical residues remaining in the treated product. Food irradiation can be applied to prepackaged foods, thus eliminating the possibility of re-contamination during subsequent transport and handling. Food irradiation can be applied to liquid, solid or semi-solid foods. The latter two forms generally cannot be satisfactorily pasteurized by heat.

The shelf-life of many fruits and vegetables, meat, poultry, fish and seafood can be considerably prolonged by treatment with combinations of low-dose irradiation and refrigeration that do not alter flavor or texture. Spoilage microorganisms, such as Pseudomonas spp., are relatively sensitive to irradiation. Extension of the very short shelf-life of many commercially important plant commodities is highly desirable, and in some cases, critical. Ripening in bananas, mangoes, and papayas can be delayed by irradiation which results in a shelf-life of up to 14 days, but the extension obtained depends on the initial quality of the fresh food, which should be as good as possible. The sterilized products can be stored at room temperature almost indefinitely. Radiation-sterilized foods are given to hospital patients who have immune system deficiencies and must therefore have a sterile diet. Irradiation sterilized products are also eaten by astronauts in the NASA space shuttle program and officers in armed forces.

The chief problem encountered in preservation of grains and grain products is insect infestation. Most of the pests of concern, e.g. wheat, beetles, moths, weevils and others, are not quarantine insects, but they cause extensive damage to stored products. Irradiation has been shown to be an effective pest control method for these commodities and a good alternative to methyl bromide, the most widely used fumigant for insect control, which is being phased out globally because of its ozone depleting properties. Unlike methyl bromide, irradiation is not an ozone depleting substance and unlike phosphine, the other major fumigant used to control grain pests, irradiation is a fast treatment and its efficacy is not temperature dependent. Irradiation can kill or control phosphine-resistant pests.

Radiation disinfestations can facilitate trade in fresh fruits, such as citrus, mangoes, and papayas which often harbor insect pests of quarantine importance. Insects are easily distributed by international trade in such fruits and also by tourism. To prevent or minimize this risk, many countries prohibit importation of such fruits or require quarantine treatment of imported fruits. The occurrence of fruit flies, such as the Mediterranean, Oriental, Mexican or Caribbean fruit flies, has repeatedly disrupted trade among countries and between states within large countries.

Any food process will add cost. In most cases, however, food prices do not necessarily rise just because a product has been treated. Many variables affect food costs, and one of them is the cost of processing. Canning, freezing, pasteurization, refrigeration, fumigation, and irradiation add cost to the product. These treatments will also bring benefits to consumers in terms of availability and quantity, storage life, convenience, and improved hygiene of the food. Reduced losses will bring revenue to producers and traders, thus in turn, compensating treatment costs.

With the proposed regulations and international guidelines in the operation of food irradiators, the environmental risks are minimal. There are hundreds of different foods approved for irradiation in some 40 countries. Commercial food irradiators have been established in Belgium, Brazil, China, France, Indonesia, Israel, The Netherlands, South Africa, Thailand, U.S.A. , Japan , Thailand and others.

16- 4 Radiation sterilization

The sterilization of medical products depends on the ability of radiation to kill pathogenic microorganisms. It was first initiated in 1956 by Ethicon Inc. together with High Voltage Engineering. It is applied to a large variety of disposable medical products such as hypodermic needles, rubber gloves, surgical drapes, etc., and currently is one of the largest industrial applications of radiation.

The traditional way of sterilization was, Ethylene oxide (EtO) gas used for many products, an effective sterilization agent, as toxic gas. The EtO sterilization process normally requires a product conditioning step in which product is placed in a highly humidified area for a specified period of time. This process humidifies the product, allowing the sterilizing agent, ethylene oxide gas, to penetrate more effectively. After pre-humidification, products are exposed to the EtO by being placed in a chamber for several hours. After exposure, products must be “aerated” by sitting in another chamber in which residual gasses which may have clung to the product are allowed to disperse. This step may take up to several days, depending upon the product and the amount of gas absorbed. After EtO processing, products may not be released for use until a laboratory test on biological indicators has been performed. This test may delay release of product by an additional 3-7 days.

As we notice, sterilization with EtO takes long time comparing with by gamma rays. Also, we eliminate a much quantity of toxic gas by going to radiation processing, which represent a good benefits for environmental protection. According to the international standard regulations, no company working in the field of exporting disposable medical products can exporte any of their products to European countries unless the use radiation sterilisation, where the EtO will be completely forbidden by the end of 2015 year in Europe.

16-5 Conclusion and Future Goals

"Dilution is the solution" the old statement for pollution treatment which is not suitable for our environment today. All over the world, creation of non-conventional methods overcoming the pollution problems become an essential need, for human live to be safe and preserving environment from pollution for new generation.

Radiation technology seems to be the magic solution for our future needs. In many different applications, the advantages of radiation technology over conventional technologies have been clearly demonstrated from both, the technical and the economic points of view.

Radiation technology have been developed, demonstrated and deployed to alleviate most of environmental problems associated with gaseous, municipal water and liquid effluent waste. It has been demonstrated that radiation technology offers an advanced solution to environmental problems.

Food irradiation is a physical process. There are no chemical additives involved in the treatment. Hence there are no chemical residues remaining in the treated product. Where increasing concern with the safety of certain chemical agents such as ethylene oxide used for decontamination and ethylene dibromide or acetylene, phosphine used as fumigants for disinfestations, has motivated some countries to restrict their use.

Egypt, one of the developed countries, needs to import such irradiation technology for cleaning environment, water treatment and healthy food. It is cheap and safe technology providing strong solutions for pollution problems and food storage to extend the shelf-life of wheat, pees, onion, garlic, fish, spices and different kind of food staff needed for regular use, desert area and army camps.

Irradiation technology has many advanced applications for solid waste management, hospital waste, purification of soil and liquid industrial waste.

❖ Radiation Technology at Egypt

The National Center for Radiation Research and Technology "NCRRT" was established at Cairo since 1977. One of NCRRT goals is transferring radiation technology to Egyptian market. NCRRT was provided with Egypt's Mega-Gamma

I radiation facility in 1979. This facility is used in sterilization processing of many medical products for the Egyptian market as well as a lot of food irradiation processes. At the last year 2008/2009, more than 8000 ton of medical disposable products including 600+ items were sterile at NCRRT, represents more than 180 suppliers. All this products were used in the Egyptian market or exported to many countries. Also, more than 5000 ton of irradiated food (dray food and spices) was done at NCRRT. And, because of the increase of need for using radiation treatment of medical and food application in the Egyptian market, another radiation facility is currently under construction in Alexandria to serve costal area of Egypt.

It is important to mention that, all syringe factories at Egypt, which producing more than 200 million of syringe/year, up tell now are using the EtO gas for sterilization their products. Where it will be against the international regulation in near future, irradiation is recommended sterilization of medical disposables according to the ISO standard.

Researchers at NCRRT have work on using radiation technology in the field of food treatment, (fresh fish from Nasr Lake, fruits, vegetables, bees, wheat, seeds, meat products , fresh potato, onion and garlic etc….) to introduce healthy food to Egyptian market. Because of the absence of needed license and local regulation arrangements, this application still out of market .

Radiation technology researcher at NCRRT, have good experience for developing and demonstrating solutions for most environmental problems associated with gaseous, municipal water and liquid effluent waste, solid waste management, hospital waste and sludge. But a lot of work is needed concerning regulation and licence, raising public awareness, providing training, and national projects to introduce and initiate such essential applications to the Egyptian market.

References

- INTERNATIONAL ATOMIC ENERGY AGENCY, Emerging Applications of Radiation Processing, IAEA-TECDOC- 1386, Vienna (2004).
- A.G. CHMIELEWSKI, M. HAJT-SAEID, Radiation Physics and Chemistry 71, www. elsevier. com/locate/rad. phys chem (2004) 17-21. Radiation technologies, past, present and future. Proceedings of International Meeting on Radiation Processing 2003 on "Advancing ionization technology", 7—1 2 September 2003, Chicago, USA.
- INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Processing of Flue Gases:
  Guidelines for Feasibility Studies, TAEA-TECDOC-1 1 89, Vienna (2000).
- INTERNATIONAL ATOMIC ENERGY AGENCY, TC, POL/8/014, Industrial scale demonstration plant for electron beam purification of flue gas, 1994-1999
- INTERNATIONAL ATOMIC ENERGY AGENCY, TC, BUL/8/014, Electron beam technology for purification of flue gases, 1997-2004.
- INTERNATIONAL ATOMIC ENERGY AGENCY, Use of Irradiation for Chemical and Microbial Decontamination of Water, Wastewater and Sludge, IAEA-TECDOC-1225, Vienna (2001).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Status of Industrial Scale Radiation Treatment of Wastewater and its Future, IAEA-TECDOC-1407, Vienna (2004).
- INTERNATIONAL ATOMIC ENERGY AGENCY, TC, ROKJ8/007, Demonstration facility for industrial wastewater treatment using an electron beam 200 1-2004
- INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Technology for Conservation of the Environment, IAEA-TECDOC-1023, Vienna (1998).

- INTERNATIONAL ATOMIC ENERGY AGENCY. TC. EGY/8/014. Irradiated sewage sludge for increased crop production. 2001-2004.
- INTERNATIONAL ATOMIC ENERGY AGENCY. TC. TUR8/017. Radiation processing technology for industrial wastewater treatment. 2003-2005.
- INTERNATIONAL ATOMIC ENERGY AGENCY. TC. IRA/8/017. Feasibility study for radiation treatment of wastewater and sludge. 200 1-2003.
- IAEA. TC. JOR/8/006. Pre-feasibility study for the reuse of wastewater through radiation processing. 2001-2005.
- INTERNATIONAL ATOMIC ENERGY AGENCY. TC. MORJ8/0l0. Decontamination of wastewater and sludge by iffadiation. 2003-2005.
- INTERNATIONAL ATOMIC ENERGY AGENCY. TC. RERI8/006. Radiation treatment of industrial and municipal waste. 1999-2003.
- Facts aboutfood irradiation. International Consultative Group on Food Irradiation. 1999.

List of some Abbreviations in the Report

BOD	**Biochemical Oxygen Demand**
CAST	**Council for Agriculture Science & Technology**
CCRMP	**Climate Change Risk Management Programme**
Ch_4	**Methane**
COD	**Chemical Oxygen Depletion**
Co_2	**Carbon Dioxide**
DO	**Dissolved Oxygen**
EB	**Electron Beam**
EPA	**Environmental Protection Agency**
EPAP	**Environment Pollution Abatement Program**
ETO	**Ethylene Oxide**
GDP	**Global Domestic Product**
GHS	**Globally Harmonized System of Classification & Labeling of Chemicals**
GWP	**Global Warming Potential**
HCFC	**Hydro ChloroFluoroCarbon**
HPMP	**Hydro Chlorofluorocarbon Phase out Management Plan**
IPCC	**Intergovernmental Panel on Climate Change**

JICA	Japanese International Cooperation Agency
NCRRT	National Center for Radiation Research & Technology
NH_3	Ammonia
ODP	Ozone Depletion Potential
PCB's	Polychlorinated Biphenyls
Pfcs	Per fluorocarbons
PM_{10}	Particulate Matter
PRTR	Pollutant Release & Transfer Registers
REMIP	Regional Environmental Management Improvement Project
SF_6	Sulfur hexafluoride
QIZ	Qualified Industrial Zone
UNDP	United Nations Development Program
USDA	United States Department of Agriculture
Ppm	Part Per Million
PPSI	Public & Private Sector Industry Project
VOCs	Volatile Organic Compounds
WHO	World Health Organization

List of some Abbreviations related to the Environment

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
AR_4	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
CO_2	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
PM_{10}	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
Eng. Ahmed Hegazi	Head, Environmental Quality Sector
Dr. Fatma Abu Shouk	Head, Environmental Management Sector
Eng .Ahmad Abou El-Soud	Head, Regional Branches Affairs Sector
Ac. Mohamed Kadry Mohamed	Head, Financial and Administrative Affairs Sector
Dr. Ezzat Louis	Head of Central Department for Climate Change, and supervisor of Ozone Unit
Dr. Hisham El- Agamawi	Minister's Advisor for Energy
Eng. Amin El-Khayal	Head, Central Department of Waste and Hazardous Substances.
Dr. Tahir Ahmad Mohamad Issa	General Director, General Directorate of the Diversity of Species and Races
Chem. Ikhlas Gamal El-Ddin	Head, Central Department of Water Quality
Dr. Mona Kamal	Under Secretary of State for Air Quality & Noise
Eng. Adel El-Shafei	General Director, General Directorate of Hazardous Substances and Waste
Chem. Kawthar Hefni	General Director, General Directorate of Air Quality
Eng. Maher Kamel El-Gendy	General Director, General Directorate of the Quality of Wastewater and Reuse
Chem. Amany Mohamed Selim	General Director, General Directorate of Coastal Water Quality
Mr. Said El-Dalil	General Director of Environmental Protection Fund
Dr. Manal El-Tantawy	General Director, General Directorate of Marine Pollution Control and Ports Affairs
Chem. Gehan El-Saka	Head of Environmental Indicators & Reporting Unit
Chem. Ilham Refaat	Director, Department of Hazardous Substances
Dr. Mohammed Ismail	Director, Department of Hazardous Waste

Eng. Reem Abd El-Rahman	Director , Department of Working Environment Noise
Chem. Maysoon Ali	Deputy Director - National Coordinator for Cleaner Production
MSEA and EEAA Advisors	
Dr. El-Sayed Sabri	Coordinator of Third Communication Project
Dr. Moustafa El-Hakim	Minster's Advisor, Agriculture Affairs
Participants from third-party	
Dr. Khaled Fahmy	Professor of Environmental Economics - National Planning Institute - Ministry of Economic Development
Dr. Seif El-Din Ibrahim	Head of Prevention and Radiation Doses Department National Center for Radiation Research and Technology - Atomic Energy Authority
Environmental Indicators and Reporting Unit	
General Supervision and Coordination	
Dr. Mona kamal	Under Secretary of State for Air Quality & Noise
Eng. Ahmad Awad Allah	Advisor, Environmental Indicators and Environmental Reporting Unit
Team work	
Ghada karem **Mohamed Moatamed** **Suzan Kilany**	
Linguistic review	
Dr. Nabil Seifein Atta Allah	Advisor, Air Quality Sector
Cover Design	
Eng. Sherif Abd El-Rahim	General Director, Minster's Technical Office.
Translation reviewed by EEAA CEO Office	
Mrs. Amany Abd El-Fattah	Director, Translation Department
Mrs. Noura Latif	Translation Specialist
Cairo University	
Center for Foreign Languages	

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