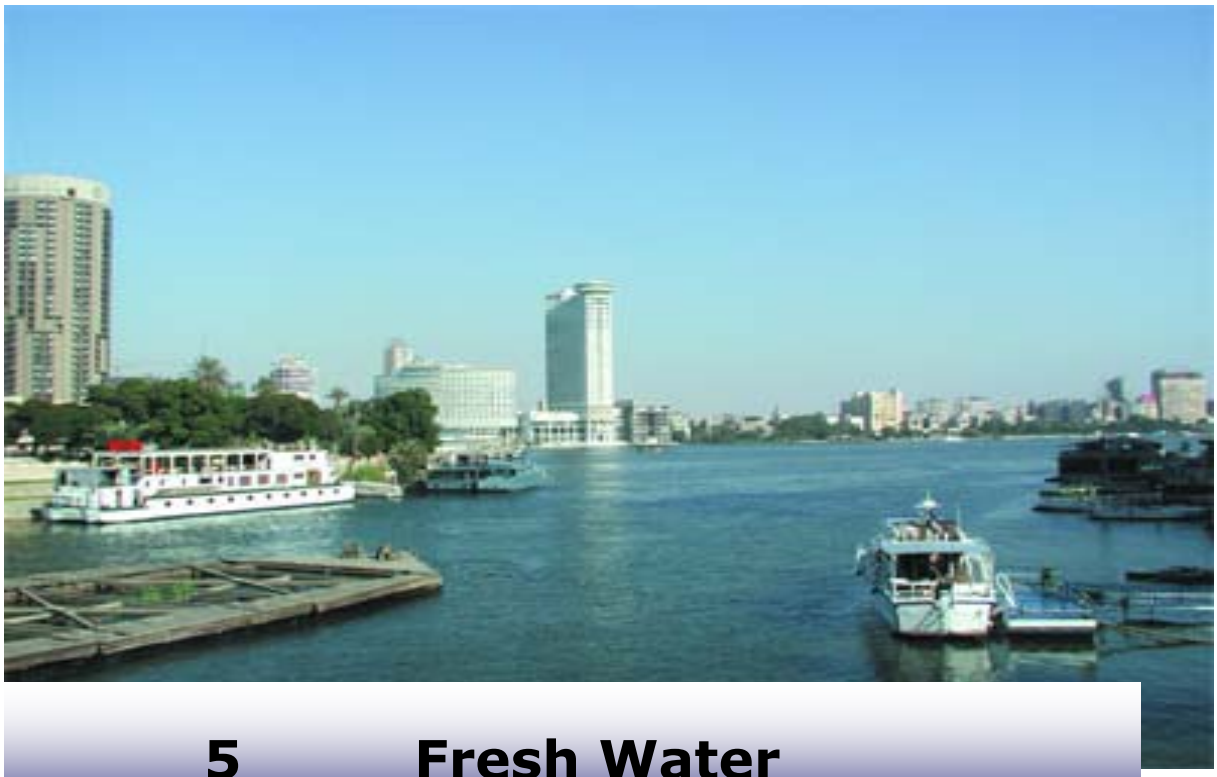


5 Fresh Water

Introduction

The survival of the human race depends mainly on its ability to manage natural resources, to utilize them as efficiently as possible and to protect them from deterioration. Water is one of the most important natural resources that affect all the aspects of development. Given Egypt's limited share of water, whose main source is the River Nile, and in view of the rapid increase in population, it has become imperative to protect the available water resources from pollution. The Egyptian Government, in cooperation with legislative bodies, has adopted several laws that address the protection of waterways and the safeguarding of their water quality.

The Ministry of State for Environmental Affairs plays a major role in protecting the quality of water by obliging industrial and urban enterprises to treat the effluents resulting from (their production processes), and to prevent the drainage of such effluents into waterways.

It is noteworthy that estimating the cost of maintaining water quality represented by pollution-preventing projects, the construction of sanitary and industrial drainage treatment plants and conducting periodic monitoring programs of water quality is a most difficult task. Also, the calculation of the return of providing an environment suitable for the growth and procreation of the various types of living organisms without damaging biological diversity, while guaranteeing water resources suitable for the existing and coming generations, is also a most tough objective. This is because certain factors do not have specific physical values. Nevertheless, the availability of information about cost and return are most important, since development in general dependant upon such data.

Water Resources and their Uses in Egypt

The River Nile and its canals and drains constitute Egypt's surface waterways, and form an intricate network covering vast areas. The River Nile is more than 1,200 kilometers long, extending from Aswan to the Mediterranean Sea, while the main canals and drains serving the Valley and the Delta are about 50,000 kilometers long (20,000 kilometers of which are drains). This network distributes water among the various regions of the State, fulfilling the requirements of the social and economic development plans.

The River Nile is the main source of water, as it provides Egypt with 55.5 billion cubic meters of water annually, representing about 96% of Egypt's renewable water resources.

This is in addition to about 6.1 billion cubic meters of renewable ground water in the Nile Valley and the Delta, and around one billion cubic meters of non-renewable ground water in the Eastern and Western Deserts and the Sinai. Seasonal rainfall provides about 1.3 billion cubic meters of water. Agricultural drainage water in Upper and Lower Egypt amounts to 9.2 cubic meters of water, the quantity of treated sanitary drainage water is about 1.1 billion cubic meters and 0.2 billion cubic meters are produced from seawater desalination.

Figure (5-1) describes the distribution of the mentioned resources.

Figure (5-2) details the present utilization of water, which is a mix of direct and indirect utilization, covering the following sectors:

1. Agricultural requirements represent about 82% of the present utilization of conventional and non-conventional water resources. Presently This quality irrigates 8 million feddans. This area is expected to increase to 10.9 million feddans by the year 2017.
2. Industry requires and consumes about 11% of the available water resources.
3. Potable water and water for domestic use represent about 6.7% of the available water resources, in addition to the quantities of water needed for river shipping and energy generation.

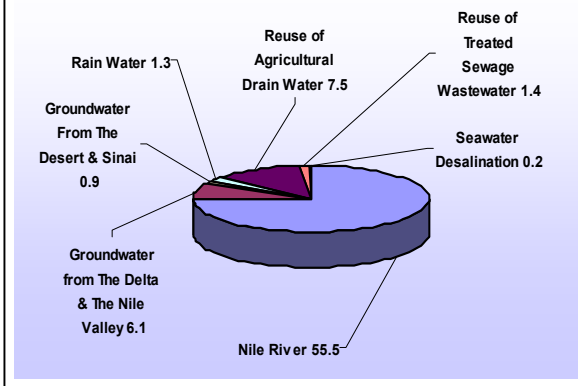


Figure (5-1) Direct & Indirect Water Resources in Egypt (in billion cubic meters)

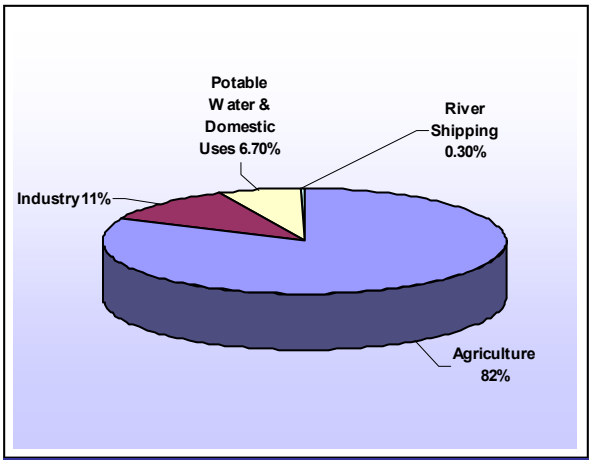


Figure (5-2) Water Utilization

Monitoring Surface and Ground Water Quality

A national network was established to monitor the quality of surface water through the measurement of physical, chemical and biological indicators:

1. 232 Monitoring locations on the Nile River, canals and drains, conducted by the Ministry of Irrigation.
2. 203 Points for monitoring the quality and the variation thereof of ground water, managed by the Ministry of Irrigation.
3. 69 Monitoring locations tracked by the laboratories of the Egyptian Environmental Affairs Agency (EEAA). Those monitoring points determine the quality of the water of the Nile River near sources of pollution periodically every 3 months.
4. 139 Monitoring locations observing the water of the River Nile and its two branches. Those include 18 monitoring points in the Greater Cairo region covering the intakes of potable water purification plants in that region and the inlets to the Damietta and the Rosetta branches. There are also 67 monitoring points in Upper Egypt, including the intakes of potable water purification plants, drain outlets, factory drainage outlets, where they drain in the River Nile or the Ibrahimeya Canal. There are also 54 monitoring points in Lower Egypt, including the intakes of potable water purification plants, factory discharge outlets at the points of drainage in major canals branching from the Nile River or any of its branches. The Center for Environmental Monitoring and Operational Research of the Ministry of Health and Population conduct monitoring periodically every month through the National Network for Monitoring Nile Water Pollutants. This network covers the Nile River from Aswan and its 2 branches up to Alexandria, passing through eleven governorates (Cairo - Gharbia – Alexandria – Assiut – Daqahlia – Menia – Beni Suef – Aswan – Port Said – Damietta – Sohag) in addition to three new laboratories in Luxor, Monofia and Beheira.

Water Sample Analysis

1. Chemical Analysis

Subdivided into analyses that specify the quality of water. These include:
Color, taste, smell, pH, electrical conductivity, turbidity level, suspended solids and dissolved solids (chlorides, sulphates, etc).

Pollution indicator analyses. These include:
The concentration of dissolved oxygen, biological oxygen demand (BOD), chemical oxygen demand (COD), fully dissolved salts and nutrients (nitrates, nitrites, ammonia, organic nitrogen, phosphates and silicates).

Analyses for Monitoring Toxic Substances such as:
Phenol, cyanide, residues of pesticides, heavy metals and hydrocarbons.

2. Bacteriological Analyses:
Bacteriological pollution resulting from pollution by sanitary drainage is measured, especially total coliform and fecal coliform bacteria.

3. Biological Inspection:

A total count of algae is conducted, especially at the intakes of potable water purification plants.

Sources of Pollution on the River Nile and Its Tributaries as well as The Main Canals

1- Industrial Waste Water Effluent

a. Factory effluent, which is the liquid drainage from industrial establishments (116 establishments) that drain directly into the Nile River, or that drain directly or indirectly into the neighboring canals or drains, which in turn drain into the Nile River, lakes or seas.

b. The drainage of effluents of potable water purification plants.

The main pollutants of the above-mentioned sectors are pesticides, organic matter, heavy metals, ammonia, nitrites and phosphates. Those appear in localized areas at the drainage points of such establishments, mainly during the minimum requirement periods (winter blockage). Monitoring results indicate the absence of significant traces of such pollutants at the majority of the monitoring points.

2- Sanitary Drainage Water

a. The untreated sanitary drainage of treatment plants.
b. Sanitary drainage from ships and cruising hotels.
c. The sanitary drainage of villages located on the banks of the river and canals.

The expansion in the consumption of water for domestic purposes, resulting from the construction of potable water networks in 95% of the cities and villages all over the country, has lead to the increase of the quantities of wastewater. So, the outcome of the national plans to expand potable water projects, that were not complemented with the required parallel expansion in sanitary drainage treatment projects was that utilized water is being disposed of by ad hoc methods, such as:

(1) Collection in underground pits, that are usually not lined or connected to pipes at various depths (caisson), to drain the water underground. This type is not flushed, and is considered a serious source of ground water pollution.

(2) The use of lined pits that are flushed periodically every 15 days to one month. The drainage is then poured haphazardly in waterways. Also, due to the high cost of flushing, laundry water is disposed of in front of houses or into nearby waterways, thus causing ground water pollution and subsequently serious environmental and health problems.

This is in addition to the sanitary drainage from primary treatment plants, that may receive quantities of water larger than their treatment capacity. This result in overloading the plant and the drainage of untreated excess quantities of water.

River cruisers are also a source of pollution of the Nile River with sanitary drainage water. This is because most of the treatment units on board such ships do not perform efficiently, and also because of the insufficiency of the number of plants that receive sanitary drainage water from those ships. The number of cruiser hotels in the Nile River has increased over the years to more than 281, operating between Luxor and Aswan. As for the cruisers operating in Cairo, they are all linked with the city's sanitary drainage network.

3- Agricultural Drainage Water

a. Agricultural drainage water accounts for a large percentage of the water resources available annually (about 10%). It includes the requirement of washing off the salts from the soil in addition to make-up of the seepage from the irrigation and drainage network and canal discharges that have not been utilized.

b. Agricultural drainage water contains traces of pesticides, fertilizers, industrial effluent, and untreated sanitary drainage water. This affects its suitability for irrigating certain agricultural crops, as well as the compatibility of canal water as a source of potable water.

c. Efforts are coordinated with the Ministry of Agriculture to optimize the use of fertilizers and pesticides. Coordination also with the Ministry of irrigation is underway in order not to mix agricultural drainage water with the water of the canals used as a source of potable water.

4- Solid Waste

Solid wastes result from disposing of building wastes and garbage along canal and drain banks passing through populated areas. This blocks the waterway and prevents the passage of oxygen to the aquatic living organisms. (Chapter 11 – Solid Waste Management).

Current Status of Water Quality in Egypt

1- Lake Nasser

The lake is about 500 kilometers long, 350 km of which lie in the Arab Republic of Egypt, while 150 km lie in the Sudan (Lake Nubia). The number of groves of greatest importance to fishing wealth is 85. 48 Groves are on the eastern shore, and 37 are on the western shore of the lake.

Various activities take place around the lake. Activities include tourist enterprises by six tourist cruisers, industrial activities of fish processing and limited agricultural activities. Such activities represent sources of pollution to the lake, since they produce sanitary drainage, oil pollution, solid waste and waste water from fish processing.

Due to the importance of Lake Nasser to Egypt as a Central Bank for Water, the quality of its water is monitored, and the variations that occur to it are tracked in summer and in winter. This tracking is conducted through the four tracking points belonging to the Ministry of Water Resources and Irrigation. The Ministry of Health and Population monitors the water quality periodically every month. This is in addition to the annual monitoring program conducted by the Ministry of State for Environmental Affairs.

The monitoring results show that the concentration of the total dissolved solids does not exceed 165 mg/l, and that the pollution indicators are well below the limits permitted by law no. 48/1982. The exception to this is the concentration of the chemical oxygen demand (COD), which rises during the summer time to 14 mg/l, this is 4 mg/l higher than the permitted limit (10 mg/l). In the meantime, the concentration of diluted oxygen drops reaches the minimum permissible limit of (5 mg/l). The concentration of organic matter decreases during wintertime to become 8 mg/l. The concentration of diluted oxygen meanwhile increases to about 9 mg/l.

2- The Quality of Nile Water from Aswan to Cairo to The Damietta and Rosetta Branches and the Major Canals (Al-Ismailiya and Mahmoudiya)

Monitoring reports of the year 2005 are issued by the Environmental Monitoring Center affiliated to the Ministry of Health and Population, including the chemical and bacteriological analyses of water quality. Those reports cover the main waterway of the river in the governorates of (Aswan – Sohag – Assiut – Al-Menia – Beni Suef – Cairo – Gharbia), the Rosetta Branch in Al-Gharbia Governorate, the Damietta Branch in the Daqahlia and Domiat Governorates, the Ismaileya Canal in the Port Saeed Governorate and the Mahmoudeya Canal in Alexandria. These reports indicate a slight increase in the organic load represented by the increase in the Biological Oxygen Demand (BOD) above the permissible limits (6 mg/l) at certain monitoring points on the River Nile and on the Rosetta Branch in the Gharbia Governorate. This is in addition to its increase at some monitoring points on the Damietta Branch in the Domiat Governorate, as shown in Figure No. (5-3).

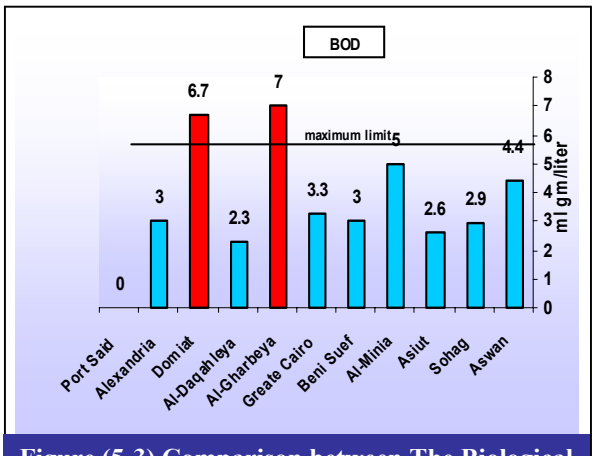


Figure (5-3) Comparison between The Biological Oxygen Demand (BOD) in the Governorates of fhe Arab Republic of Egypt in 2005

The reason behind this increase in the the Gharbia Governorate may be the industrial effluent by some factories located on the banks of the Rosetta Branch, in addition to direct sanitary drainage resulting from the absence of a sanitary drainage network. As for the Domiat Governorate, the cause of the increase may by referred to the drainage of the Higher Serw Drain. The results also indicate the increase of the average organic load represented in the increase of the chemical oxygen demand (COD) above the permissible limit (10 mg/l) at a number of monitoring points on the main waterway. This included the governorates of Greater Cairo, Sohag, the Damiatta Branch in Domiat Governorate, the Rosetta Branch in Gharbia Governorate and the canals of Ismaileya in Port Said Governorate and Mahmoudeya (which is considered an extension of the Rosetta Branch) in Alexandria. This is shown in Figure No. (5-4).

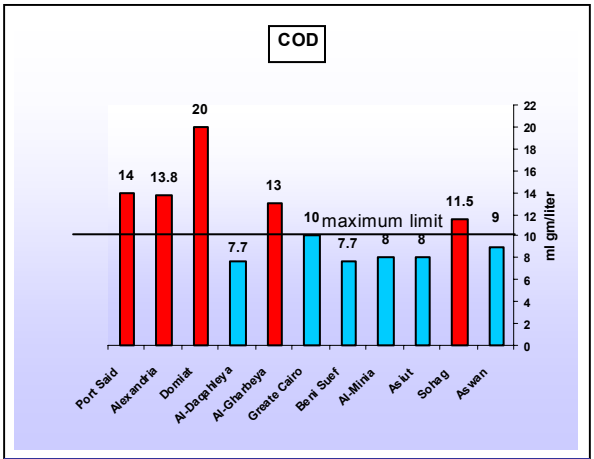


Figure (5-4) Comparison between COD Averages in Some Governorates in the Arab Republic of Egypt

The reason for this may be attributed to:

- The lifting of agricultural drainage water from the Mazalwa Drain to the Nile River in the Governorate of Sohag.

- The existence of a number of food processing plants which have not yet complied with Environmental laws and regulations, in addition to small vessel and Nile cruiser quays.
- The Mahmoudeya Canal being fed by the Rosetta Branch, which is considered a polluted waterway. It is polluted by the industrial effluent from Kafr El-Zayyat in addition to the agricultural drainage from the Rahawy and Tala drains.
- The existence of a number of sanitary drainage pipes draining into the Ismaileya Canal, in addition to environmental mal practices by the individuals residing on the banks of the canal, such as the disposal of animal waste, etc.

Results indicate that the concentration of the Dissolved Oxygen in all Governorates is higher than the level permissible in the Nile River, namely (5 mg/l); Figure (5-5). The exception is the Alexandria Governorate, where it is lower by 0.3% than the permissible limit.

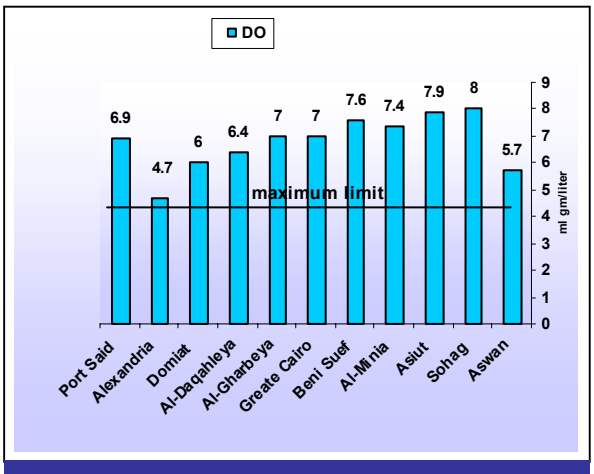


Figure (5-5) Comparison between the average concentration of Dissolved Oxygen (Do) in the Governorates of the Arab Republic of Egypt.

A comparison of the results of the year 2005 with the results of previous years, shows a considerable improvement in the quality of the Nile water among the preceding years, as shown in Figures (5-6) and (5-7). The exception is the dissolved oxygen as shown in Figure (5-8).

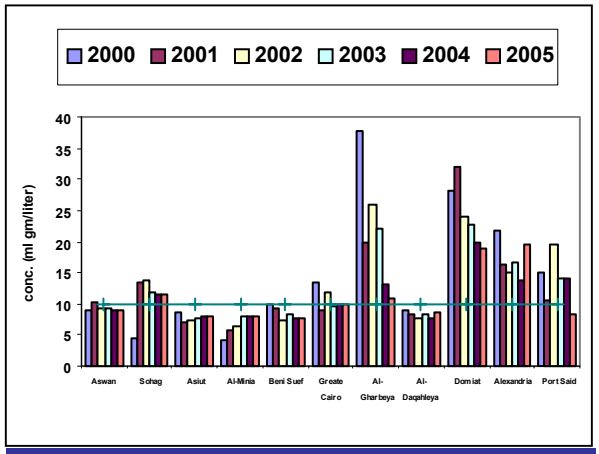


Figure (5-6) Comparison between The Average Organic Loads Expressed as Biological Oxygen Demand (BOD) in The Different Governorates of the Arab Republic of Egypt

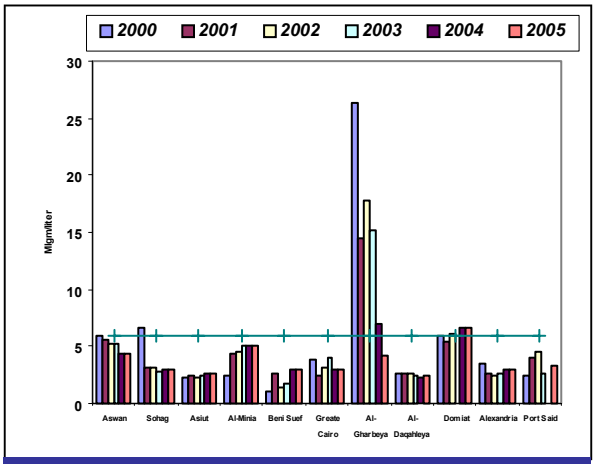


Figure (5-7) Comparison between the Average Organic Loads Expressed as Chemical Oxygen Demand (COD) in the Different Governorates of the Arab Republic of Egypt

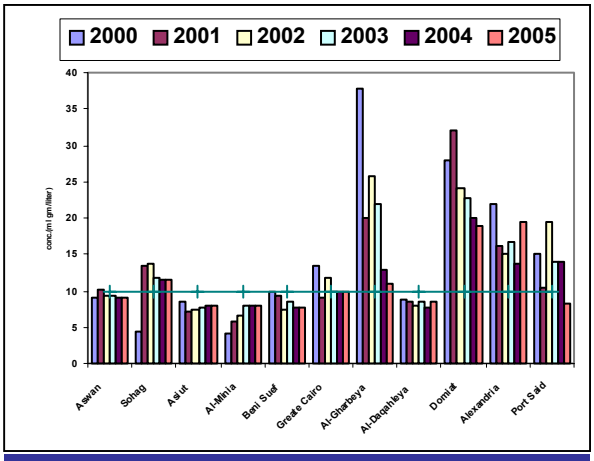


Figure (5-8) Comparison between The Average Results of Dissolved Oxygen (Do) in The Different Governorates of the Arab Republic of Egypt

In general, the results indicate that the quality of Nile water is generally lower in the Damietta and the Rosetta branches than in the main waterway from Aswan to Cairo. Nevertheless, the water quality has been improved in the two branches by 2005 compared with the preceding years. This becomes apparent on comparing the findings of the year 2005 with those of the preceding three years. A considerable improvement in the water quality in the two branches of Damietta and Rosetta is observed, as per Figures (5-9), (5-10) and (5-11).

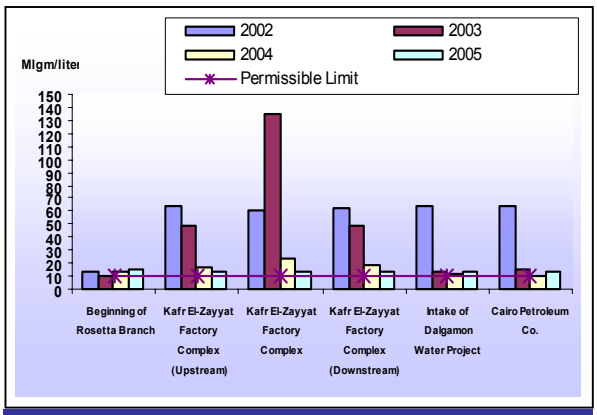


Figure (5-9) Comparison between The Average Results of Organic Load Expressed as Chemical Oxygen Demand (COD) at The Monitoring Points on The Rosetta Branch during The Period from 2002 to 2005

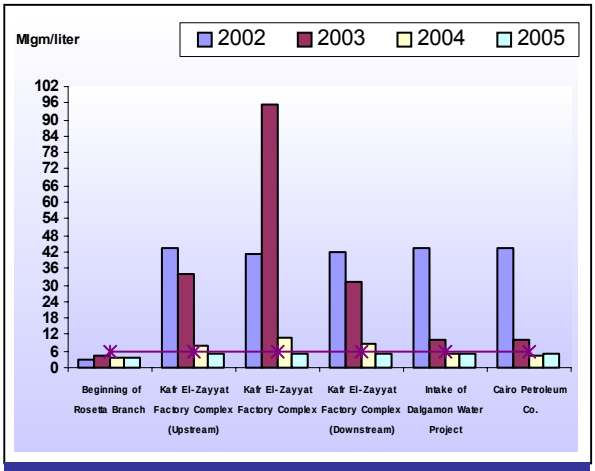


Figure (5-10) Comparison between The Average Results of Organic Load Expressed as Biological Oxygen Demand (BOD) at The Monitoring Points on The Rosetta Branch during The Period from 2002 to 2005

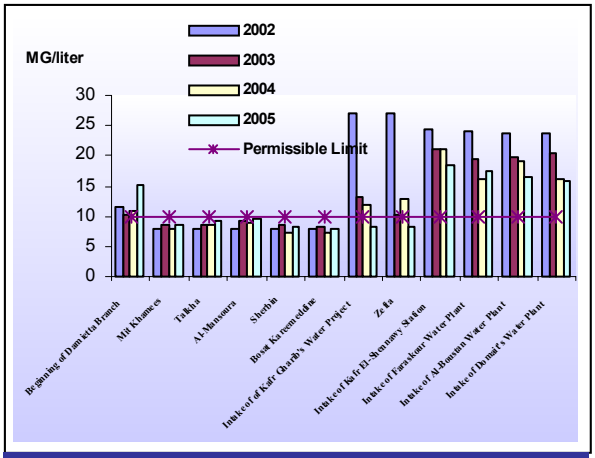


Figure (5-11) Comparison between The Average Results of Organic Load Expressed as Chemical Oxygen Demand (COD) at The Monitoring Points on The Damietta Branch during The Period from 2002 to 2005

This improvement is attributed to efforts exerted to prevent the drainage of effluents from the various establishments into the Nile River or into waterways in general. The drainage of the industrial effluent of 83 establishments into the Nile River was terminated. This is in addition to the utili-

zation of the major part of treated sanitary drainage water in irrigating forestry.

Regarding other indicators related to the quality of the Nile Water, the monitoring results of the year 2005 show that:

1. The concentration of nutrients were within the permissible limits at most monitoring points, where the concentration of nitrates ranged between 0.002 and 9.4 ml gm / liter, while the permissible limit is 45 ml gm / liter. The ammonia concentrations were less than the permissible limits (0.5 ml gm / liter) at most monitoring points, but it surpassed the permissible limits at two monitoring points on the Damietta branch. This may be attributed to the agricultural drainage mixed with sanitary drainage that flows into the Damietta branch.

2. As for the concentrations of non-organic matter (florides, sulphates, total solids), they were within the permissible limits at all monitoring points. Their concentration ranges were as follows: Fluorides from 0.20 to 0.45 mg/l ,Sulphates from 11.70 to 61.20 mg/l ,and Total Solids from 179 to 338 mg/l, While their permissible limits are 0.5, 200 and 500 mg/l respectively.

3. The concentrations of residual pesticides tested for, including 29 pesticides, were less than the permissible limits for the quality of potable water along the river.

4. The concentrations of heavy metals (iron, manganese, lead, chromium and cadmium) were less than the permissible limits for the Nile River water quality in conjunction with the executive regulations of Law no. 48 / 1982. The concentrations were in fact less than the concentrations that were detectable with the instruments used at most monitoring points. The highest concentration monitored at the Daqahlia monitoring point was that of iron, 0.71 mlgm/liter, (the limit is 1 mlgm/liter). This may have been caused by the sanitary drainage of the Nassereya village. As for manganese, its highest concentration was 0.30 (the permissible limit is 0.50 mlgm/liter) at the monitoring point on the Rosetta branch. This may have been caused by the effluent of the Edfina company in Metoubes.

As for bacterial pollution, the Ministry of Health inspects bacterial pollution at 18 locations on the Nile River in the Greater Cairo region on a monthly basis. It was observed that the count of total and fecal coliform bacteria is on the rise all year long. Its highest rate is during the months from May to July. It then starts to recede gradually from the beginning of August as a result of the rise of the water level and the decrease of pollutant concentrations in general. Notably, there are no Egyptian bacteriological criteria for the Nile water quality.

Canals and Waterways

The quality of canal and waterway water depends mainly on the quality of water in the main Nile River waterway. As a result of commingling the agricultural drain water, which contains a large quantity of sanitary drainage, with canal water, the quality of water in canals is deteriorating rapidly. The Ministry of Water Resources and Irrigation conducts periodic monitoring of the water quality in canals and waterways in both Upper and Lower Egypt. The Ministry of Health and Population also monitors water quality at certain points in major canals.

The results of pollution monitoring during 2004, conducted by the Ministry of Water Resources and Irrigation on canals in Upper Egypt including (Bahr Youssef, Al-Ibrahimeya, East Nagaa Hammady, West Nagaa Hammady, Al-Kelabeya and Asfoun canals) indicated that the average concentrations of heavy metals, nitrogenous and phosphate compounds and dissolved salts are within the permissible limits in accordance with Law no. 48/1982. However, the concentrations of organic loads were high in Bahr Youssef, Al-Ibrahimeya, East Nagaa Hammady, West Nagaa Hammady and Al-Kelabeya canals, where concentrations ranged between 27 and 36 ml gm / liter, which are all surpassing the permissible limits pursuant to the said law (10 ml gm / liter). It is quite probable that the high organic load is caused by the direct discharge of sanitary drainage water by the villages through which those canals flow.

The dissolved oxygen is still within the permissible limits which helps in the self-cleaning of the canals from organic pollutants.

As for the Rayyahs and the major canals in the Delta region, including (The Tawfiqy Rayyah – Al-Sharqaweya – Al-Mansoureya – Al-Ismaileya – Bahr Moweis – Al-Bahr Al-Sagheer – Port Said – Bahr Teera – Al-Bagoureya – Bahr Shebin – Al-Mahmoudeya – Al-Noubareya – Al-Khandak – Al-Hager and Abu Diab), monitoring results indicate that the concentrations of heavy metals in all the monitored canals and Rayyahs had not exceeded 50% of the permissible limits for those elements. The concentration of dissolved salts, on the other hand, ranged between 250 and 500 ppm (parts per million), hence, it is within the permissible limits according to the law (500 ppm).

It thus became clear that organic pollutants are quite high in all the canals and rayyahs in the Delta, and exceed the permissible limits, (10 ppm) by 50% or more, while nitrogenous and phosphate compounds were within the permissible limit.

Public Drains

The Ministry of Water Resources and Irrigation conducts continuous monitoring of drains, including 29 Upper Egypt' drains (Khour El-Seil in Aswan – Al-Tawansa – Al-Ghabah – Abu-Wanass – Mendraw – Al-Barabrah – Komombo – Fiterra - Khour El-Seil – Radissia – Edfu – Hawd Al-Seba'eya – etc), East-Delta drains including (Bahr Al-Baqar – Bahr Hadous – Upper Serw – Lower Serw – Faraskour – Al-Mahsama – Al-Matareya), Middle Delta drains including (Gharbeya-Main – Sobol – Tala – Al-Qarnein – Nashart – Zaghloul – Omar Bek – Teerah – drains no. 1, 2, 7, 8, 9, and 11) and the Western Delta drains including: Al-Omoum – Edku, Abu-Qir = Al-Noubareya – and others.

The monitoring results indicate that the majority of drains suffer from excessive concentration of dissolved salts, in addition to considerable increase in the concentration of organic loads. These concentrations vary between winter and summer.

All drains showed a considerable drop in the concentration of Dissolved Oxygen, which confirms their saturation with high concentrations of organic matter, and their inability of self-cleaning. It was observed that the concentrations of heavy metals vary from one drain to another, and that these concentrations exceed the permissible limits in the Greater Cairo region. This is because of intensive metal industries such as foundries and others. The concentrations of nitrogenous and phosphate compounds vary from one drain to another, and they

exceed the permissible levels in most of the drains.

Ground Water

Groundwater is one of the most important resources of water in Egypt, ranking second after the River Nile. The quality of groundwater depends on two main factors, namely, the origin of the water and the type of rocks bearing it. Also, the movement of water and its flow from one point to another are important factors.

The major feeding sources of renewable groundwater are rainwater seepage, irrigation water and sanitary drainage water and industrial effluents. Thus, the quality of groundwater is greatly affected by surface activities and their products as well as the type of water feeding underground reservoirs.

There are 6 underground Reservoirs in Egypt, namely:

1. The Nile reservoir, which covers the Nile Valley region and its desert edges, representing 4% of the area of Egypt.
2. The Nubian Sandstone reservoir, located mainly in the Western Desert.
3. The Moghra reservoir, covering the desert area at the edge of the West Delta.
4. The coastal reservoirs located on the north-western coast.
5. The underground reservoir located in the northern region of the Western Desert.
6. The underground reservoir in the Eastern Desert and Sinai.

The salinity of groundwater in Egypt ranges between 700 and 3,000 ml gm / liter. The salts' concentration depends on the location of the reservoir, and the type of water-bearing rocks. Salts' concentration in the Nile Valley underground reservoir is less than 1,000 ml gm / liter.

The interpretation of the monitoring results conducted by the Ministry of Water Resources and Irrigation in the Nile Valley underground reservoir in 2004 indicates a slight rise in the concentrations of iron and manganese elements in the Baraqshah region in Al-Minia Governorate, exceeding the permissible levels for potable water in conformity with the World Health Organization standards. Coliform bacterial pollution was also detected in the shallow domestic wells due to the ad-hoc drainage of sanitary drainage water, without complying with the sound conditions and precautions that are required while constructing domestic sanitary drainage pits. The monitoring results show also that deep wells are not polluted with bacteria. Ground-water resources in Egypt still need more programs to develop those resources and optimize their utilization. The Law on Irrigation and Drainage no. 12/1984 is presently being amended, concentrating on groundwater licensing, the bases of its safe use, the procedures for conserving it and imposing more strict penalties on violators.

Lakes

Lakes in Egypt occupy special locations on the map of Egypt. They are among the most significant Egyptian natural aspects, and represent an outstanding landmark that is linked with Egyptian ancient and modern history. They are the landing zones of migrating birds, and are the largest wetlands in the Arab World. Some of them form a protective barrier safeguarding arable lands and ground-water against the salinity of seawater. They are among the most important Egyptian environmental resources, and are major sources of fish, birds and salts, which are the source of livelihood of thousand of Egyptian families.

Egyptian lakes suffer from violation of their surface areas by having parts of them backfilled, dried and urbanized. This caused a shrinkage of the areas of several of them.

These lakes also face several environmental problems due to their use as drains for industrial effluents, agricultural wastes and sanitary drainage water, thus negatively impacting on the quality of their waters and accordingly represent a threat to fish wealth and salt-extracting industries.

Table (5-1) Shrinkage in Areas of Lakes

Lake	Area / km^2 Year 1913	Area / km^2 Year 1997
Al-Manzalah	1,710	1,200
Al-Borollos	588	430
Mariout	284	60
Edku	150	71

Efforts to Overcome Environmental Problems Relating to Lakes and Fresh Water

The Ministry of State for Environmental Affairs exerts favorable efforts to improve the environmental conditions in the Egyptian lakes, including:

1. Studying the environmental conditions of those lakes.
2. Conducting continuing programs to monitor the quality of water in the lakes, and deducing indicators about the loads and types of pollutants in them.
3. Creating natural reservations in parts of the lakes, for the purpose of protecting natural wealth and increasing environmental awareness among both visitors and residents. Also conducting scientific researches and studies on the natural wealth in these reservations. Examples of such reservations are:

Ashtoum Al-Gameel	in	Al-Manzalah Lake
Al-Zaraniq	in	East Bardawil Lake
Al-Borollos	in	Al-Borollos Lake
Qaroun	in	Qaroun Lake
Wadi Al-Alaqy Wady Al-Rayyan	in	Fayyum

4. Continuous inspection of industrial establishments that discharge their effluents into agricultural drains that end in those lakes while taking legal action against the violators.
5. Issuing environmental conditions and standards that need to be fulfilled for building fish baskets, in coordination with the General Authority for the Development of Fisheries as well as with the other entities concerned. It shall be prohibited to erect fish ranches on the Nile River or its two branches or on the main canals.
6. Financing environmental projects in these lakes through the Tourist and Environmental Service Fund.
7. Implementing pilot projects in these lakes, such as the wetland project in Al-Borollos Lake, and the bio-treatment project using wetland techniques in Al-Manzalah Lake.

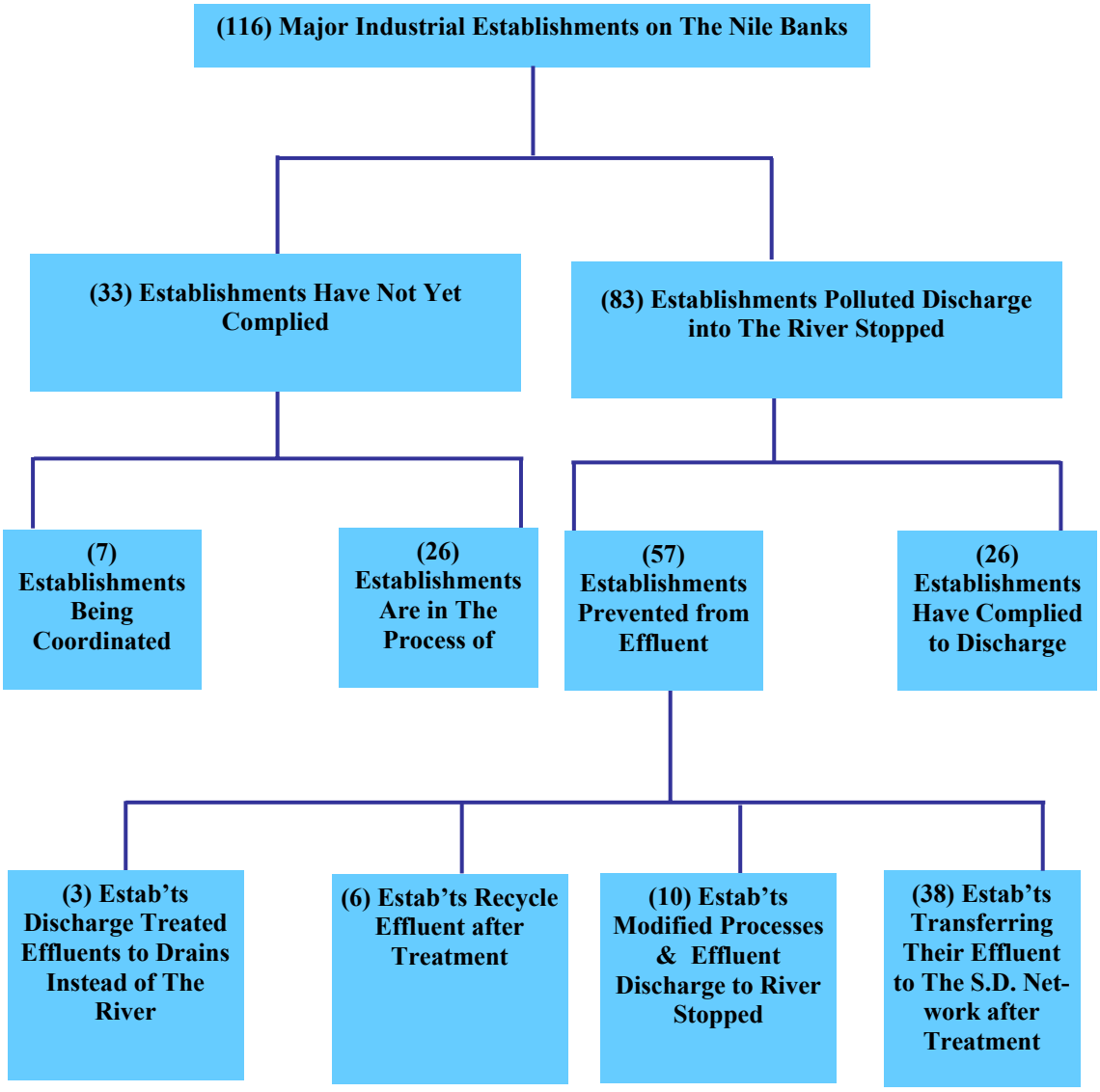
The Ministry of State for Environmental Affairs also exerts efforts to preserve fresh water from pollution through the following approaches:

1. Conducting periodic monitoring of the quality of the Nile water, and exchanging the monitoring data with other entities that conduct similar monitoring. This is aimed at depicting the changes

that may take place in the quality of water, and specifying the suitable scientific methods to improve its quality. The effluent from the various establishments is also monitored through environmental inspection programs performed on such establishments.

2. Compiling the main sources of industrial pollution (116 establishments) along the Nile River, and specifying areas of concentration of industrial pollutants that seriously affect the water quality besides preparing maps pinpointing the sources of pollution.
3. Evaluating the pollutants produced from each source in order to design mechanisms of environmental reform programs bearing in mind their potential environmental impacts.
4. Supporting programs of industrial pollution control, by providing grants or soft loans in addition to technical support to industrial establishments assisting them to comply with environmental regulations. Figure (5-12)
5. Conducting inspection on the establishments that still discharge into the Nile River, and have them comply with the criteria enforced by the relevant laws. Also, to coordinate with the environmental and water surface police department to conduct snap inspection campaigns to control the establishments discharging its waste directly into the Nile River, or indirectly into waterways that in turn discharge into the Nile River. The mentioned campaigns are to ensure that the discharge is within the standards set by the relevant laws.
6. Continuously coordinating with the Ministry of Water Resources and Irrigation to regularly redress the violations committed on the banks of the river or the canals, and to cover the drains passing through residential areas to prevent the disposal of solid waste into them.
7. Conduct research and studies that determine causes of pollution, so as to evaluate the water quality in the various water bodies in Egypt, such as:
   a) Studies aimed at in determining the causes of the increase of the concentration of ammonia in the Rosetta Branch of the Nile River, to identify the sources of this increase and to minimize their polluting effects by taking the necessary steps to stop the discharge of the mentioned sources.
   b) The study on the implication of problems caused by fishing baskets on the Nile water. A report has been issued regarding this problem, and was discussed by the People's Assembly which issued a decision on the removal of the mentioned baskets from the Nile River.
   c) The study of the negatively affected crops in the Kafr El-Zayyat region. Irrigation water was behind this negative effect, as polluting sources were identified as industrial factories, masonry kilns and the discharge of agricultural drains that contained pesticides and sanitary drainage from the villages on the banks of the drains.
8. Implementing programs for the reuse of treated sanitary drainage water, and utilizing it in irrigating tree forests. Twenty four forests were planted, among which are: The Serabium forest in Ismaileya, the Sadat forest in Menufia and the Edfu forest in Aswan, thus conserving water and protecting waterways from pollution.

Figure (5-12) Major Industrial Establishments Located on the Nile's Banks



Future Plan 2007 – 2012

1. cooperate with the Ministry of Housing to expand sanitary drainage networks in as many villages as possible, thus preventing direct discharge to waterways. This is to be implemented according to the priorities proposed by the Ministry of State for Environmental Affairs and the other ministries concerned. A listing of sanitary drainage project priorities has been finalized, and it has been agreed to coordinate with other ministries to devise an overall plan, which is to be implemented and funded by means of the supplementary fund appropriated to the Ministry of Housing (L.E. 20 billion).
2. cooperate with the Ministries of Agriculture and Housing in expanding the planting of tree forests, and the possibility of utilizing part of the treated sanitary drainage water in agriculture, provided it is in compliance with the Egyptian Code.
3. Sustainable development of the Northern lakes, in which the environmental dimension is taken into account at each and every stage of development.
4. Terminating the discharge of liquids from river cruisers into the Nile River, and transferring such discharge to sanitary drainage networks.
5. The Ministry of Water Resources and Irrigation has devised the national plan for water resources up to the year 2017. The plan was approved by the Cabinet in 2005. Its objective is to secure Egypt's water resources at present and in the future, taking all economic, social and institutional structural aspects into consideration. All the entities involved in water resource management have participated in devising this plan.

This national plan for water resources is based on three main approaches:

a) The development of the existing water resources: by increasing the utilization of deep groundwater, collecting rainfall and floods, cooperation with the Nile Valley States through the Nile Valley Initiative, in addition to the utilization of non-conventional water resources such as semi-saline water and seawater desalination.

b) Raising the efficiency of water utilization by taking the necessary measures to minimize the losses in irrigation networks and improving the efficiency of water use on the field level in the agricultural sector. As for the measures proposed in the potable water sector, those include: Increased awareness of the importance of water, minimized losses in distribution networks and improved metering and accounting systems.

c) Environmental and general hygiene protection: The plan addresses the handling of pollutants on three levels, namely, (preventing pollutants from reaching waterways, treating pollutants that cannot be prevented from reaching the waterways and control of pollutants to minimize their harmful effects on general hygiene and on the environment). The above objectives are to be achieved through incentive measures in the various sectors.

The cost of the plan is estimated at about L.E. 145 billion distributed among the various ministries. The share of the Ministry of Housing and Urban Development is 63% of the total cost. The share of the Ministry of Water Resources and Irrigation is about 31.5%, while the share of the private sector will be about 4.5%. The ministers involved

have participated in setting the executive scheme of the national plan in order to facilitate and follow-up implementation processes in addition to the establishment of the technical secretariat committee to support the role of the Supreme Committee for Water.

6. Climatic changes and their potential impacts on Egypt's water resources:
   The world is witnessing climatic changes caused by the effects of human activities. Such activities are causing an increase in the quantities of gases such as water vapor, carbon dioxide, methane and fluorocarbons. Many of those gases are produced by the combustion of flammable materials used as fuel. This led to a disturbance of natural equilibrium, resulting in a greenhouse phenomenon. This phenomenon is extremely dangerous, and may result in environmental and hygienic catastrophes. This disturbance may cause a rise in atmospheric temperature, which would in turn start a rise of sea and ocean levels and an increase of sea gales, hurricanes and floods. Scientists estimate the changes that will occur during the coming 50 years to be equivalent to the changes that occurred during the last 4 million years due to natural causes.

Currently research is being conducted to study the impacts of climatic changes on the Egyptian coastal zones and on the Nile water. The research aims also at identifying and analyzing the scenarios that may result from those changes in an attempt to tailor the baseline strategy of future water resource management in Egypt.

References

(1) Ministry of Health and Population: The Annual Report on The Results of The National Network for Monitoring The Pollutants of The Nile River and Its Branches for The Years (2001 thru 2005).

(2) Ministry of Water Resources and Irrigation: The second Annual Report on The Status of The Quality of Water.

(3) Ministry of State for Environmental Affairs: The Annual Report on the Quality of Water of The Nile River.

(4) The Plan of The Ministry of Water Resources and Irrigation Regarding The Protection of The Nile River and Its Branches from Pollution.

(5) Egyptian National Environmental Action Plan (NEAP) (2002 – 2017).

(6) Egypt State of The Environment Report (2004).

(7) Executive Regulation of Law 48 / 1982.

(8) Recommendation of the World Health Organization on The Permissible Limits for The Quality of Potable Water.

(9) Recommendation of The Supreme Committee Regarding The Permissible Limits for The Quality of Potable Water in 1995.