

2 Fresh Water

2-a Introduction

Water resources constitute one of the development pivots in Egypt. They are essential elements of environment, it was necessary to pay more attention to preserving water resources, and exerting relentless efforts to perfectly use them and maintain their quality. Due to limited water resources and the increasing water demand, particularly that current conditions contribute greatly to the pollution of such water resources as a result of the unplanned development and its related industrial, agricultural, urban and tourism activities, it is necessary to the government to consecrate massive efforts to preserve water resources and protect them against pollution.

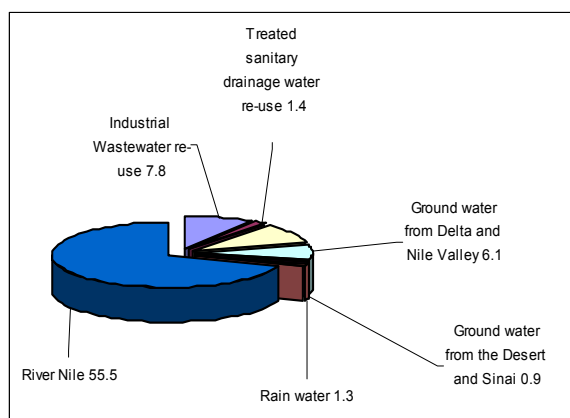
2-b Water Resources and their Use in Egypt

In Egypt, the main water resource is the

River Nile. It constitutes 96% of the renewable water resources in accordance with the Agreement on Full Utilization of the Waters of the Nile concluded between Egypt and Sudan in 1959. Under this Agreement Egypt's annual quota of the Nile water is 55.5 billion cubic meters, while Sudan's is 18.5 billion cubic meters. Moreover, the volume of seasonal rains on coasts and Sinai is 1.3 billion cubic meters annually. Other water resources are the renewable and non-renewable groundwater in deserts. Current water uses are a mix of direct utilization of main resources, and indirect one; namely reuse of agricultural drainage and treated wastewater.

As the following chart shows, the direct use of renewable water resources is represented in 55.5 billion cubic meters of Nile water, 1.3 billion cubic meters of rains, and 0.9 billion cubic meters of non-renewable groundwater in Eastern and Western De-

serts and Sinai. Indirect use is represented in 6.1 billion cubic meters of renewable groundwater in Nile Valley and Delta, 7.5 billion cubic meters of agricultural drainage reuse, 7.8 billion cubic meters of industrial effluents reuse, and 1.4 billion cubic meters of treated wastewater. The use of water resources in different sectors includes agriculture (58.65 billion cubic meters), industry (7.5 billion cubic meters) and drinking or household (4.75 billion cubic meters) in addition to Nile navigation and power generation.



Direct and Indirect Use of Water

Source: Ministry of Water Resources and Irrigation (MWRI)

2-c Pressures Placed on Water Resources

Increasing water needs are due to population growth, standards of living improvement, and the State policy aiming at reclamation of new lands, encouragement of industry and maximization of clean water accessibility. Closing the gap between the available water resources and the increasing water demand by the various economic sectors is a major challenge facing Egypt currently. However, Egypt endeavors to make the optimum use of potable water and non-conventional water resources such as desalination of seawater, reuse of agri-

cultural drainage, and treated wastewater. The Government aims to improve water resources management and increase the efficiency of their use through further utilizing modern irrigation methods to decrease the waste. Raising grassroots awareness with respect to the importance of rationalizing the consumption of water in irrigation, industry and household, and protecting water resources against pollution, as well as involving people in water policies formulations.

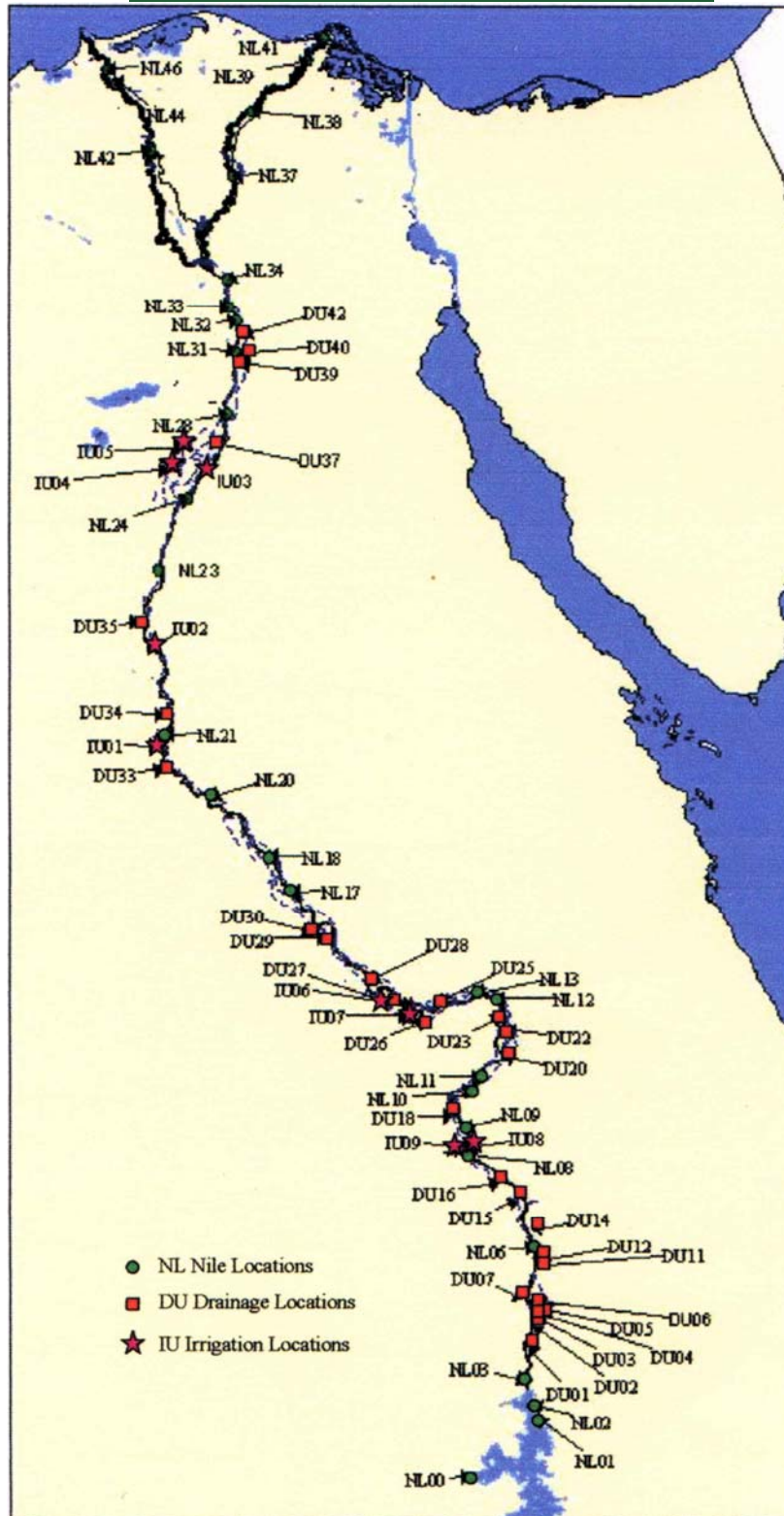
The agricultural sector is the largest water consumer in Egypt. Its quota is almost 85% of the total water demand.

During 1980- 2000, cultivated area has increased from 5.8 million acres to 7.95 million acres. Yield productivity jumped by nearly 180%. Rice and sugarcane are the largest water consuming crops in Egypt. Agricultural expansion has contributed effectively to reducing poverty and hunger, and providing food security.

With population growth, however, any attempt of agricultural expansion would require more irrigation water provision. This necessitates improving irrigation water use, agricultural drainage water reuse, and groundwater utilization. National programs have been adopted to improve irrigation systems, reuse of agricultural drainage and treated wastewater, and make the optimum use of groundwater.

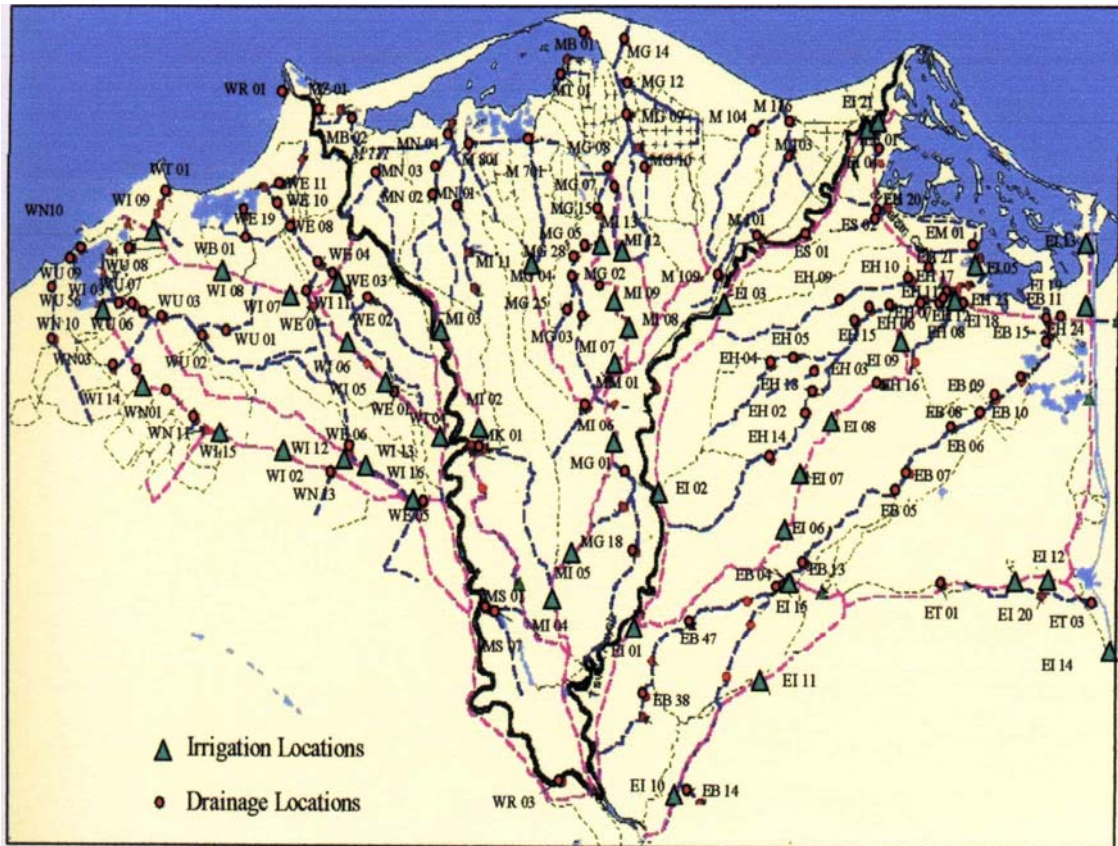
Water quality differs according to locations, flows, water uses, population density, type of pesticide and fertilizers used in cultivation, sanitary drainage and industrial effluents systems, in addition to social and economic conditions. Therefore, preserving the good quality of water is the major environmental challenge in Egypt.

Water Quality Monitoring Network along the Nile



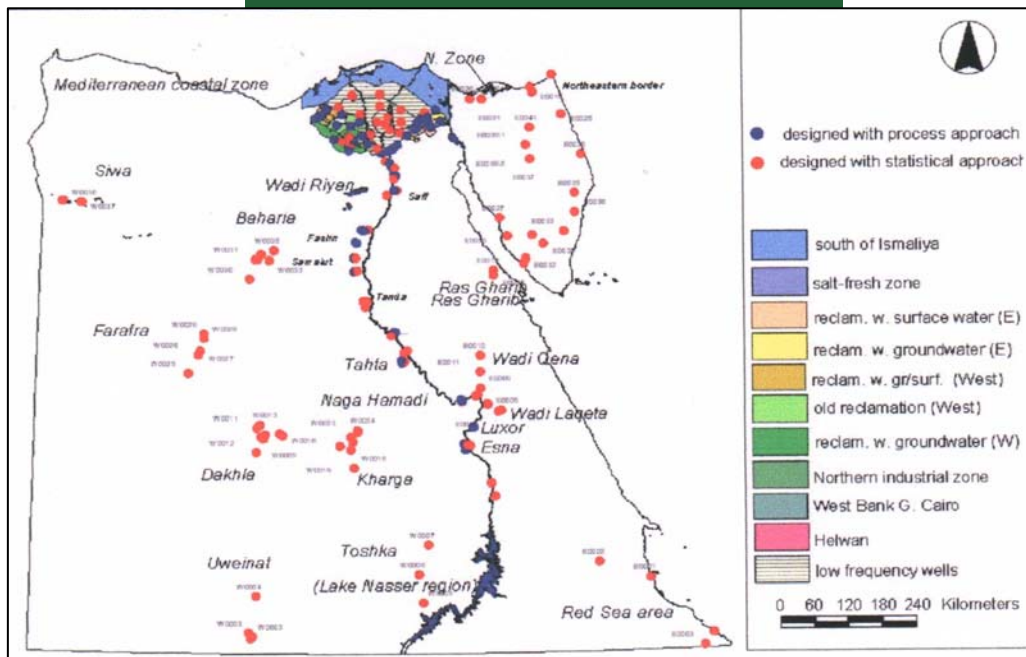
Source: MWRI The National Water Provision and Quality Improvement Project (1992-2005)

Canals and Drains Water Quality Monitoring Network



Source: MWRI The National Water Provision and Quality Improvement Project (1992-2005)

Underground Water Quality Monitoring Network



Source: MWRI The National Water Provision and Quality Improvement Project (1992-2005)

2-d Current Status of Egypt Water Quality

Ministry of Water Resources and Irrigation (MWRI) has, through the National Monitoring Program for assessing and monitoring Surface and Underground Water. 320 surface water sites along canals, main canals, the Nile, Lake Nasser, and drains located in strategic locations, in addition to 250 sites along groundwater aquifers network. MWRI monitors the general indicators of water quality including natural, chemical and biological parameters (such as salts, cations, anions, bacteriological and organic pollutants, Oxygen percentage, heavy elements, and other).

Ministry of Health (MoH) regularly monitors the quality of the Nile water in 10 governorates; Aswan, Sohag, Asiout, Menia, Beni Suef, Gharbeya, Daqahleya, Damietta, Alexandria, and Port Said. While the Egyptian Environmental Affairs Agency (EEAA) runs annual monitoring program for Nile water quality. Monitoring results have indicated slight increase in organic substances above usual limits at some monitoring points in Aswan during certain months represented by Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), distinctively at the meeting point of Khor Elseil (flood catchments) drain and Kom Umbo Sugar Factory drain with the Nile. However, it was noticed an increase in suspended substances at some points above approved limits which may be due to the existence of cultivation, Kom Umbo Sugar Factory, Edfo Sugar Factory, and sanitary drainage from some villages, towns and floating hotels. As a reference, a monitoring site at Nasser Lake has been chosen.

Lake Nasser

Lake Nasser is considered Egypt's main water reservoir. It regulates the Nile flooding before the Aswan High Dam with storage capacity of 162 billion cubic meters between levels of 83.00 to 182.00. Eighty - five catchments are located along the Lake of which 48 are on the east side and 37 are on the left. Lake Nasser extends 350 km along Egyptian land, and 150 km in the Sudan. Due to tourism, navigation and fish processing related industrial and agricultural activities, the Lake has acquired a major development and economic importance.

Lake Nasser Pollution Sources

Lake Nasser pollution sources are represented in the wastewater of urban establishments, solid waste, and bilge mixed with oils and fuel resulting from tourism and navigational activities. Currently, wastewater of existing buildings is collected and transferred to Aswan tree forests.

The Lake's water quality is regularly monitored. It has been found that all results fall within the Nile water quality approved limits. Lake Nasser is the reference point for the remaining monitoring points along the Nile course.

Measures Adopted to Protect Lake Nasser

- Issuing Ministerial Decree no. 209 of 2005 on the establishment of Coordinating Committee for licensing Lake Nasser Developmental activities in accordance with the controls and standards set forth by the Prime Minister Decree.
- Issuing in collaboration with the Ministry of State for Environment Affairs (MSEA) licensing standards by decision of the Committee formed under

Prime Minister's Decree no. 203 of 2002. The standards allowed seasonal cropping, which depended on soil moisture without using fertilizers, chemicals or pesticides, leaving a 2 km protection strip along the Lake above level 182, while prohibiting the implementation of permanent agricultural projects.

- Application of the Ministerial Decree no 199 and 906 of 1990 issued by the Ministry of Agriculture deeming such areas as organic cultivations, and prohibiting the use of pesticide therein.
- The Egyptian Environment Affairs Agency (EEAA) has coordinated with Aswan governorate to prohibit the use of chemicals in combating Bilharzias snails in Lake Nasser, and to rely only on mechanical methods.
- EEAA Aswan Regional Branch Office (RBO) monitors pollution sources from Misr/Aswan Company for Fishing and Fish Processing. Recently, the factory has complied with environmental requirements on 21st March 2003. Effluents are no longer discharges into the Lake. The factory transfers its effluents (60 cubic meters/day) to the tree forest prepared for this purpose in the desert backlog.
- Implementation of a 30 million EGP sanitation network is currently underway to which urban buildings shall be connected upon its completion under EEAA supervision.
- Organizing joint campaigns by the concerned agencies, and conducting unannounced inspection on tourist and floating boats.
- Developing a general framework that sets licensing rules and conditions for any activity in the Lake.
- Conducting a comprehensive study on the spreading of crocodiles in the Lake.
- Issuing limitations and controls for pre-

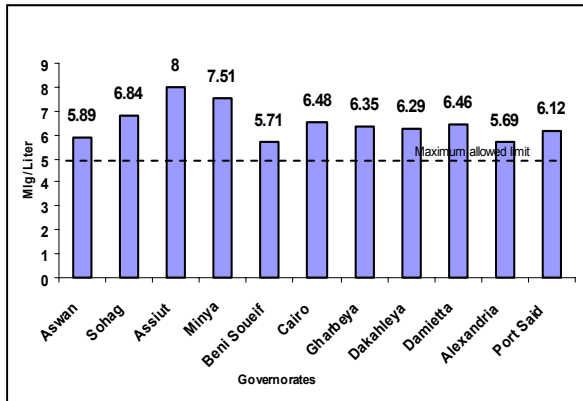
serving the Lake, utilizing its natural wealth, and regulating hunting of water birds, while prohibiting all animal hunting activities, including the Nile crocodile.

- Issuing EIA process guidelines.

In other governorates, results came to be within the accepted limits for the Nile, except for an increase in the percentage of organic substances and suspended particles in some points over permissible rates due to the discharge of industrial effluents into the Nile, or the lack of sanitation networks in some areas. Thus, wastewater is transferred by emptying vehicles and dumped into the nearest watercourse. Soluble salts levels were also found to be higher than permissible limits in some points due to the existence of some drains pouring into the Nile course.

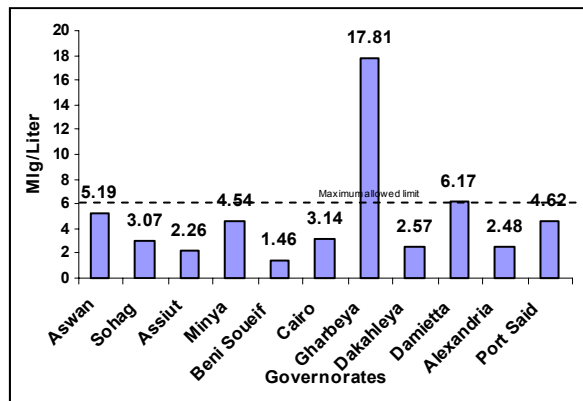
The outcomes reached by different points as regards the Nile water along any governorate reveal that the river water suffers sometimes from an increase in the percentage of organic substances and ammonia, as well as nitrite and nitrate concentrations in the Nile indicating that presence of wastewater discharges from villages and housing blocs located along the two sides of the agricultural drains, discharging in some areas along the Nile. Al-Rahawy drain is considered one of the pollution sources.

The following charts shows comparison conducted among governorates as to the percentage of dissolved Oxygen, Biological Oxygen (BOD) and Chemical Oxygen (COD).



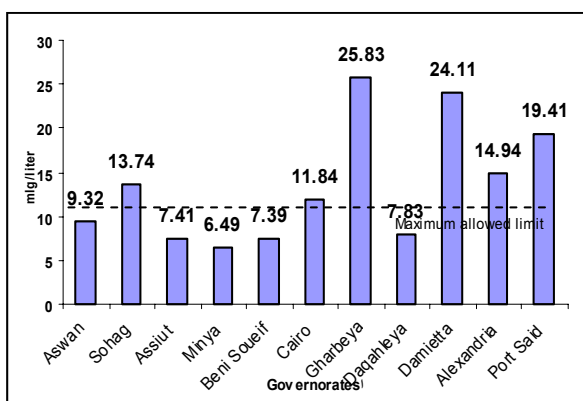
Comparing dissolved oxygen (DO) among all Egyptian Governorates in 2002

Source: Ministry of Health (MoH)



Comparing Bio-oxygen dissolved (BOD) among all Egyptian Governorates in 2002

Source: Ministry of Health (MoH)



Comparison of Chemical Oxygen Demand (COD) Among Egypt's Governorates, 2002

Source: Ministry of Health (MoH)

As a result of water analyses in Rashid Branch at Kafr Elzayat city, it was directed not to license any sanitation or industrial establishment to discharge wastewater or effluents in Rashid Branch.

Al-Rahawy Drain

Al-Rahawy Drain is considered one of the main pollution sources on Rashid Branch. The drain is filled with organic pollutants because of the wastewater discharged by villages located on its sides, either directly or indirectly via drains pouring into it. Moreover, more than 400 thousand cubic meters of untreated wastewater in excess of Abu Rawash Wastewater Treatment Plant capacity are discharges daily in Al-Rahawy drain. Other industrial pollution sources from some of small enterprises can also be found along the drain.

Fish cages in the Nile are considered another pollution source, as some use male hormone to increase the fish productivity in a non-codified manner, or use unapproved fodder produced by unlicensed factories. Water analysis undertaken by the Ministry of Health (MoH) in the fish cages area indicated water pollution. Thus, the People's Assembly Committee on Local Administration and Popular Organizations held a number of meetings to discuss this problem, and came up with the decision to remove all fishing cages from the Nile.

The National Water Provision and Quality Improvement Project implemented by the MWRI National Water Research Institute (NWRI) undertakes periodic monitoring of Nile, canals, drains and groundwater wells water quality through a monitoring network.

Generally, water quality in most of the main canals with respect to dissolved oxygen, and the total of dissolved substances remains within the internationally permissible limits. However, water quality in agricultural drains exceeds those limits, particularly in the Delta drains. The following chart shows that Nile water salinity increases further away from High Dam due to the existence of pollution sources.

Manzala Lake water quality indicates a decrease in dissolved oxygen percentage, and increase in dissolved salts, in addition, the percentage of all elements is higher than the accepted limits for the Nile, which leads to fish deaths, which is attributed to:

- Inefficiency of connection channels between the Lake and the sea, disallowing proper renewal of Lake water.
- Increased wastewater discharges into the Lake (Bahr Elbaqar Drain).
- Water from agricultural drains containing pesticides and chemical fertilizers. Increased percentage of industrial wastes and effluents.

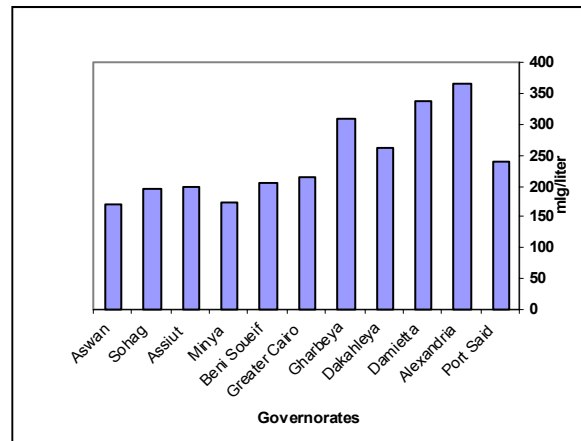
2-e Water Resources Major Challenges

Environment and water resource pollution is the most important and major challenge. Water resources environmental challenges facing water management in terms of water quantity and quality in Egypt can be summarized as follows:

- Consumption rationalization, reuse and provision of additional unconventional water resources.
- Expansion of sanitation coverage in various communities to avoid watercourses pollution in which this untreated or insufficiently treated wastewater is discharged.
- Identification of alternatives for industrial

effluents discharge in canals and drains, as well as the adoption of at-source treatment principle.

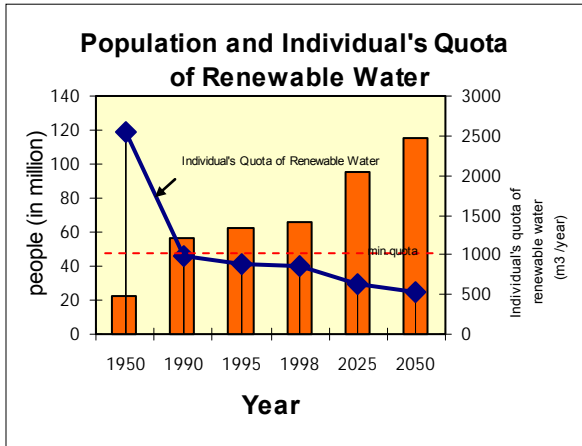
- Identification of alternatives for solid waste dumping into water drains.
- Provision of safe drinking water for all urban and rural populations.
- Lack of awareness as to the importance of protecting water against pollution and loss.
- High costs of water projects.
- The obsolescence of applicable legislations on protecting watercourses against infringements and water quality against pollution.



Comparison of dissolved Salts among Egypt's Governorates, 2002

Source:

- * National Nile Water and Tributaries Monitoring Network Results, Annual Report, 2002.
- * Ministry of Health and Population – Central Department for Environmental Affairs – Environmental Monitoring and Work Environment Studies Center.



First Challenge: reduce consumption, re-use, and providing untraditional extra water resources

Source: Egypt and Global Water Objectives, 2002



Fourth Challenge: Identifying alternatives for solid wastes dumping into watercourses

2-f Efforts for Meeting Water Environment Challenges

Recognizing the importance of having in place a legal framework to govern the mechanism of preserving environmental components in Egypt, the Environment Law no. 4 of 1994 has been issued, and is being enforced under MSEA and EEAA supervision for the purpose of protecting the environment in Egypt. However, Law 4/94 makes reference to Law no. 48 of 1982 on the Protection of Water Resources in Egypt against Pollution authorizing MWRI the supervision of its implementation in cooperation with other line Ministries. Nonetheless, Law no 12 of 1984 is the law that governs the irrigation and sanitation systems management and operation in Egypt. Currently, a study is being conducted for amending some of the articles in this Law to increase the penalties against on violations and water loss, while increasing the role of private sector and civil society participation (Water Users Associations) in operation and maintenance activities.

Law no 48/1982 has set forth the roles mandated to line ministries. The Ministry of Housing and Urban Communities represented in the National Organization for Po-



Second Challenge: Identifying alternatives for wastewater discharges into watercourses



Third Challenge: Identifying alternatives for industrial discharges into watercourses

table Water and Sanitary Drainage (NOPWASD) is given the responsibility of developing one or more models for liquid waste treatment units generated by industrial, domestic and other facilities in order to ensure compliance with specifications and standards. A license applicant is thus required to submit to MWRI proof that a sanitation treatment unit is in place, as well as submitting a certificate issued by the Sanitation Authority stating that they have inspected and verified the validity of the said unit.

When selecting and using chemicals for combating agricultural pests, the Ministry of Agriculture (MoA) shall ensure that using such chemicals would not pollute water streams they are discharged into, either directly through spraying, or indirectly through mixing with drainage in accordance with MoA, MWRI and MoH approved standards.

MoA shall cooperate with MSEA, while, MSEA shall, in collaboration with the Ministry of Interior (MoI) Environment and River Police, conduct ongoing inspection campaigns on the different activities along the watercourse, charge fines, remove pollution causes and take appropriate legal measures against violators.

The Ministry of Health conducts analyses in the Ministry labs following samplings from liquid wastes and treatment units. EEAA is then notified of the results that are incompliant with controls, standards and specifications governing discharges of such treated liquid waste in watercourse. Cooperation is also undertaken with the Ministry of Tourism (MoT) by requiring owners of floating housing units and tourist boats to safely dispose of their wastes or collecting them in specified sites, emptying

them and dumping them either into the sewage system or sanitation collection systems. They are prohibited from discharging their wastes into the Nile or waterways.

MSEA works in collaboration with MWRI in supervising the protection of the Nile and watercourses against pollution. They also monitor the activities that generate wastes discharged into water streams to ensure the availability of waste treatment units in such a way that comply with legally decreed specifications and standards. Environment and River Police also supervises the removal of all pollution sources.

Among the challenges facing Egypt and most countries of the world is provision of clean water and sanitation services to all citizens. In September 2000, all United Nations member states (191 states) have pledged to fulfill the Millennium Developmental Goals by 2015, which are:

- Eradicate extreme poverty and hunger.
- Achieve universal primary education.
- Promote gender equality and empower women.
- Reduce child mortality.
- Improve maternal health.
- Combat HIV/AIDS, malaria and other diseases.
- Ensure environmental sustainability.
- Develop a global partnership for development.

The seventh goal refers to strengthening environmental sustainability. This objective seeks to reduce the percentage of those who have no access to safe drinking water by 2015 by 50%. It also seeks by 2020 to achieve significant improvement in the lives of 100 million residents in poor areas. Currently, one billion persons worldwide lack access to clean water, and 2.4 billion persons suffer from the lack of basic sani-

tation services.

The Ministry of Housing and Urban New Communities in cooperation with the different governorates are responsible for the provision of potable water and sanitation infrastructure. Despite rapid population growth in Egypt, the percentage of those having access to safe drinking water has increased during the last two decades due to major investments in the water sector. According to the Annual Statistical Report for 1993-1999, 90% of houses in urban communities and 72% houses in rural areas have been connected to clean water, covering 213 city (100% coverage) and 1607 villages (32% of the total number of villages). However, 2368 villages (56% of the total number of villages) have insufficient access to water, while 238 villages (6% of the total number of villages) still have no access to drinking water. In densely populated cities, such as Alexandria, Cairo, Port Said and Suez, clean water has been connected to 91.8% of households. Rural areas, particularly in Upper Egypt, are the most areas lacking appropriate services. Households that have access to clean water in rural areas represent 59.2% only. Areas with no access to clean water satisfy their water needs through underground water wells, as well as through water peddlers, or directly from canals and the Nile.

Although the comprehensive coverage of water availability was rapid and effective, sanitation services coverage remained slow in the various areas. Sanitation network coverage rates, though improved in urban communities, are still much lower than the coverage of water supply works. Currently, 67 cities (32% of the total number of cities) and 170 villages (4% of the total number villages) have access to sanitation services. According to the Statistical An-

nual Report for 1993-1999, sanitation coverage in urban governorates has reached 66.60% of the population, while it remains lower in rural areas. Sanitation in North Egypt covers 23.5% of the population and only 9.98% in Upper Egyptian urban areas. Sanitation coverage in the densely populated cities reaches 26.84% of the population.

In areas where sanitation is not available, wastewater is usually collected in septic tanks specially designed for decomposing wastewater via organic reactions. Such tanks usually leak or flow due to non-regular emptying. Even if emptied, they are difficult to dispose of safely in appropriate sites. Sanitation is the main reason of water pollution and the creation of unhealthy living conditions.

As regards drinking water, during the last twenty years, 1900 drinking water treatment stations were built to increase water production capacity from 5.8million m³/day (120 liter/day per capita) to 18million m³/day (275 liters/day per capita) covering 90% of the population. As for sanitation, 2002 wastewater treatment plants were established to increase treatment capacity from 1 million m³/day to 8.2 million m³/day (from 25 liters/day per capita to 110 liter/day per capita).

There are 40 industrial facilities directly discharging approx. 190 million m³ of effluents into the Nile. This has affected water quality from Aswan to Cairo. Most industrial activities discharging into the Nile, including chemical, foodstuff, textile, engineering, metallic and thermal industries are concentrated in Greater Cairo; Helwan, Shubra El-Kheima, Giza, and Basateen. They produce 127 million m³ of contaminated water annually, of which 80 million

m³ are discharged into the Nile and its canals, while the rest is discharged directly or indirectly into agricultural drainage canals.

MSEA extensive efforts to control effluents discharge through continuous inspection and monitoring of such activities, as a first priority in order to reduce Nile pollution, adjusting the status of most of such activities, and seeking to achieve compliance of their liquid effluents with standard values stipulated by Law no. 48/1982, have resulted in Nile water quality improvement as revealed by recent analyses.

2-g Future Vision

Egypt water resources sector is facing many challenges. They include meeting the increasing water demand, protecting water against pollution due to population growth and the limited water resources.

One of the challenges identified by MWRI and other line bodies is the need to provide the financial resources required to implement the national program proposed to protect water and eliminate pollution by 2012. The program consists of six elements:

- Supporting industrial effluents treatment projects.
- Supporting sanitation and wastewater projects.
- Surface water monitoring networks.
- Underground water monitoring networks.
- Covering surface canals in areas penetrating residential blocs in cities, markazes and villages.
- Public awareness.

MWRI in cooperation with other concerned bodies has prepared a “National Water Policy” (until 2017) as a plan for integrated water resource management, which has been implemented partially during the last few years. The plan is based

mainly on three major elements:

- a. Optimum utilization of the available water resources.
- b. Preservation of water quality and eliminating pollution.
- c. Development of additional water resources in cooperation with Nile Basin countries.

Egypt has accomplished significant progress in strengthening its relations with riparian countries through the Nile Basin Initiative (NBI), which will maximize the benefits for the ten countries sharing the Nile Basin, particularly Egypt, being the last country situated at the mouth of the River Nile. NBI will ensure Nile protection against pollution that will possibly result from the wastewater discharged by riparian countries into the Nile or along its course down to Egypt.

The State seeks to reinforce private sector participation in the field of water resource management and maintenance in order to meet the above challenges.

Feasibility studies, capacity building and training are considered essential elements in the successful implementation of water-related programs, which in turn would require additional funding. (“Synopsis on the State of Egypt” 2000; World Summit on Sustainable Development, Johannesburg, 2002).

A policy aiming at promoting and developing farmers participation in canal and sanitation systems operation and maintenance has been implemented leading to the establishment of nearly 5000 Water User Associations. MWRI Water Information Unit was established to raise public awareness of the importance of water rationalization and its protection against pollution.

Some NGOs and popular organizations, representing the various water sector stakeholders in Egypt, play an active role in the participation in water resource management. The Egyptian Water Partnership, recently established, represents a model of such organizations. It aims to assist the government in achieving the millennium Development goals, World Summit implementation plan, the National Environmental Action Plan (NEAP) and the National Water Policy (NWP). All efforts are concerted in this partnership for direct dialogue among all sectors regarding national water issues. Sectors represented in this partnership are line ministries, the private sector, civil society and users (farmers and others), University professors and youths. The Egyptian water partnership will contribute in involving all sectors, which will accomplish interaction and the principle of participation in charting water policies, through which progress towards water management general and detailed goals can be achieved and monitored.

- Underground water.
- Lakes management.
- Protecting coastal waters.
- Developing additional water recourses
 - Surface water (Providing Nile upstream additional water in collaboration with the Nile Basin Countries).
 - Underground water (Non-renewable underground water in Eastern and Western deserts).
 - Seawater Desalination.
- Improving drinking water coverage in rural areas.
- Improving sanitary drainage coverage in both urban and rural areas.
- Good utilization of rainwater in different areas.
- Institutional development for integrated water resource management support, including broad plans for activating decentralization, the role of water users, legislative development and human capacity development.

Egypt's water resources future plan can be summarized as follows:

- Optimum water resource usage and the development of Integrated Water Resource Management Implementation Plans.
 - Improving irrigation efficiency and selecting suitable irrigation systems that rationalizes the use of water.
 - Waste water management, treatment, reuse and recycling.
 - Matching water uses to appropriate water resources.
- Preserving water quality and eliminating pollution.
 - Protecting the Nile, canals and drains.

2-h References

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