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Water as a basic human right in Egypt

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Summary

Egypt has reached a stage where the quantity of water is imposing limits on its economic development. The present share is below 1000 CM / capita / year, and it might drop to 500 CM /capita / year in the year 2025, which would indicate “water scarcity”. In addition, there exists rapid degradation in surface and groundwater quality.

There are several challenges facing water resources development in Egypt: a food security policy to feed the growing population, the generation and development of employment for a wide sector of the population, water quality degradation, the fragmentation of water management among different institutions, and cost recovery of water resources services.

Water management is fragmented among several ministries and authorities, each making either a direct or indirect contribution to water resources management. Although the Ministry of Water Resources and Irrigation (MWRI) is responsible for water resources planning and management, linkage and coordination with other stakeholders are not strong enough to eliminate conflicts. These stakeholders include governmental agencies and authorities, the private sector, non-governmental organizations, and individuals. Some of these stakeholders affect water quantity availability for various sectors, while others are more involved in water quality issues.

In 2000, the United Nations Committee on Economic, Social and Cultural Rights adopted a General Comment on the right to health. Ensuring access to sufficient safe water as a human right constitutes an important step towards making it a reality for everyone. The Millennium Declaration in 2000 included an international goal to reduce by half the proportion of people without sustainable access to safe drinking water. The Johannesburg Declaration adopted at the World Summit of Sustainable Development in September 2002 extended this goal to include sanitation as well.

In response to all the challenges that are facing water resources management in Egypt, MWRI has adopted new integrated water resources management (IWRM) policies to achieve sustainability in water resources utilization for current and future generations.

IWRM focuses simultaneously on major aspects of water resources including supply and demand management, and on quantity as well as quality management. It also considers the integration of socio-economic and environmental aspects in water management and the involvement of all stakeholders in the various management activities. Proper implementation of such policies is seriously constrained by the lack of investments to finance the different components of IWRM. MWRI has recently shifted its long-standing policy paradigm of water resources development to water demand management. The water policies adopted by MWRI consider water primarily as a human right, and contain several measures to ensure this consideration. These measures are formulated to adhere to the UN legal definition of the human right to water. It also takes into account the culture of water use in Egypt. This culture is based on the attitude of farmers and other population sectors in determining the practices of their use of water. They do not know enough about crop water requirements to limit themselves to fulfilling actual crop requirements. Thus all components - knowledge, beliefs, or experience - should be changed by the implementation of an effective scientific approach that affects their practices. However, this should go hand in hand

with other changes needed in the water distribution system to ensure a fair, timely, and sufficient distribution process.

The number of non-governmental organizations working on environmental issues in Egypt has reached more than 250. In recognizing the importance of NGOs as major contributors to environmental improvement, the Ministry of the Environment pronounced 2002 the year of the NGOs, during which several workshops were conducted to strengthen the role of NGOs in protecting the environment. There are several NGOs working in the field of water resources, specifically in the areas of rationalizing water consumption, avoiding solid waste and industrial wastewater disposal in the River Nile, and acquiring safe and clean energy through the use of organic subsurface material from animal and agriculture waste.

Donor contributions to water resources management in Egypt have attained a substantial importance over the past few decades. Donor involvement can be seen in almost all recent policy reform initiatives. A list of donors in Egypt would include USAID, the World Bank, UN organizations, the Netherlands, Japan, Canada, and Germany. Major donors such as USAID and the World Bank have also contributed to the financing of major irrigation projects.

The Nile water sector in MWRI has been strengthening ties with Nile basin countries. Several donor-funded projects matured into the latest Nile Basin Initiative (NBI). NBI brings all Nile Basin countries to work together to develop the resources of the Nile Basin for the benefit of all. NBI develops programs to work on poverty reduction, economic development and the reversal of environmental degradation. These programs should be seeking win-win opportunities between riparian countries.

1 The national water sector

Egypt has reached a stage where the quantity of water is imposing limits on its economic development. The per capita share of water is continuously declining. The present share is below 1000 CM / capita / year, a figure that, according to international standards, is equal to the "water poverty limit" for a nation. This value might drop to 500 CM / capita / year in the year 2025, which would indicate "water scarcity". In terms of water quality, the few data available indicate that there exists a rapid degradation in surface and groundwater quality.

The largest user of water in Egypt is the agricultural sector, with its share exceeding 80% of the total demand for water. In the Egyptian economy the agricultural sector contributes about 18% to the gross domestic product (GDP), and comprises about 31% of total employment. In view of the expected increase in demand from other sectors, such as municipal and industrial water supply, the development of Egypt's economy strongly depends on its ability to conserve and manage its water resources.

Developing water resources by reclaiming land has had high priority during the years 1952-97. In this period, a total of about 2.5 million acres were reclaimed. The demand for water continues to grow due to population growth, and pushes economic development. Consequently, available resources are becoming insufficient to meet the expected demand for competing users. Responding to this challenge, the government of Egypt is pursuing a two-fold policy of supply enhancement and demand management. On the supply side the government plans to develop new water resources in cooperation with riparian countries, by rainfall harvesting, and through limited desalination. Major water savings are expected from the adoption of demand management policies in the old land that encourage the reuse of drainage water, the elimination of Nile water flows to the sea, and which continue the irrigation improvement program. (FAO, CCA, 1999)

1.1 National macroeconomic setting, development objectives and water policies

Egypt lies in the northeast section of Africa, covering an area of about one million square kilometres. The current population of the country was a little over 68 Million in 2003, with a rate of population growth of about 2%. The climate of Egypt is generally hot and dry, with mild winters. Rain falls during the winter season on the northern coasts and some parts of the Nile Delta. The temperature varies between 8-18 ˚C in winter and between 21-36 ˚C in summer.

The economy of Egypt is generally dominated by the services sector which, including public administration, accounts for almost half of the GDP. Tourism and the Suez Canal are also important factors for the GDP. Agriculture as well is a key activity for a large sector of the population; however, the arable land in the country is less than 5% of the total area. The agricultural sector contributes about 17% to the GDP, and employs 31% of the total labour force (Attia, 2004). Industry and mining are also important, accounting for nearly 18% of the GDP and almost 14% of total employment in 1995/96 (EIU, 1998).

There are several challenges facing water resources development in Egypt: food security policy to feed the growing population, the generation and development of employment for a wide sector of the population, water quality degradation,

fragmentation of water management among different institutions, and cost recovery of water resources services.

Water management is fragmented among several ministries and authorities that make either a direct or indirect contribution to water resources management. The Ministry of Water Resources and Irrigation (MWRI) is the prime ministry, having the overall responsibility to authorize water use and to manage national water resources, the irrigation and drainage systems, the northern lakes and the coasts. MWRI employs more than 90,000 employees in its different implementing agencies. The other ministries and authorities contributing to water resources management are:

- Ministry of Agriculture and Land Reclamation (MALR)
- Ministry of Housing, Public Utilities and New Urban Societies (MHUNC)
- General Organization For Industrialization (GOFI)
- Ministry of Health and Population (MOHP)
- State Ministry for Environmental Affairs
- River Transportation Authority (RTA)
- Ministry of Local Development (MLD)
- Ministry of Electricity (MOE)
- Several NGOs working in rationalizing water
- The international donor community

In response to the previously mentioned challenges, MWRI has adopted new integrated water resources management (IWRM) policies to achieve sustainability in water resources utilization for current and future generations. IWRM focuses simultaneously on major aspects of water resources, including supply and demand management, and quantity as well as quality management. It also considers the integration of socio-economic and environmental aspects in water management, and the involvement of all stakeholders in the various management activities. Proper implementation of such policies is seriously constrained by the lack of investments to finance the different components of IWRM. In its ambitious institution reform program, MWRI proposed several measures to ensure the application of the UN concept of water as a basic human need. These measures are demonstrated in other sections of this paper, and are summarized in Table 2 of section 2.

Strength and weakness

There are several challenges facing water resources development in Egypt: food security policy to feed the growing population, generation and development of employment to a wide sector of the population, water quality degradation, fragmentation of water management among different institutions, and cost recovery of water resources services. In response to these challenges, MWRI has adopted new integrated water resources management (IWRM) policies to achieve sustainability in water resources utilization, focusing on the integration of socio-economic and environmental aspects in water management, and on the involvement of all stakeholders in the various management activities. MWRI proposed several measures to ensure the application of the UN concept of water as a basic human need.

1.2 Egypt's water resources: Base and potential

Egypt is an arid country with rapid population growth and rising living standards. The population was 19 million in 1947 and has since tripled, to reach about 65 million in 2000. The population is expected to reach 95 million by 2025. This problem is also emphasized by the concentration of the population on only 4% of the total area of Egypt, along the Nile valley and Delta. Availability of fresh water resources in the country is not promising, as the water resources system is characterized by its complexity and uncertain nature (Tawfik et al., 2001). The Egyptian water resources system is composed of many interacting components and intermingles with social, economic and environmental systems, which are also complex and uncertain. Fresh water resources include precipitation, Nile River flow, and groundwater from both renewable and non-renewable aquifers. Egypt also practices the use of various types of marginal quality water, such as reuse of agricultural drainage water, reuse of treated domestic wastewater, and desalinated water.

Rainfall in Egypt is very scarce except along a narrow band of the northern Mediterranean coasts, where an insignificant rain-fed agriculture is practiced. Rainfall occurs in winter in the form of scattered showers with a total amount that may reach 1.5 billion cubic meters (BCM) per year. This amount cannot be considered a reliable source of water due to its spatial and temporal variability. Sparse flash floods also occur in the Sinai Peninsula and in Upper Egypt.

Egypt receives about 98% of its fresh water from the Nile River, originating outside its international borders. This is considered to be a major challenge for Egyptian water policy and decision makers, as the river water satisfies more than 95% of the country's various water requirements (Abu Zeid, 2003). At about 6800km, the Nile River is the second longest river in the world. Its basin covers an area of about 3,000,000 square km, through ten African countries: Burundi, the Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. The average annual yield of the river is estimated at 84 BCM at Aswan, south of Egypt. The discharge of the Nile River is subject to wide variation; however, Egypt's share from the Nile water is fixed at 55.5 BCM per year by the 1959 agreement with Sudan. The Aswan High Dam (AHD) is the major regulatory facility on the river. It began operation in 1968, ensuring Egypt's control over its share of water, and guiding its full utilization. Downstream from AHD, the Nile water is diverted from the mainstream into an intensive network of canals through several types of control structures, providing water for agricultural and other uses.

Groundwater is also an important source of fresh water in Egypt, both within the Nile system and in the desert. Groundwater in the Nile aquifer is an additional source of fresh water, as it gets its water from percolation and seepage losses from the irrigated lands and irrigation canals. Therefore, its yield must not be added to the country's total water resources, but must rather be considered as a reservoir in the Nile River system with about 7.5 BCM per year of rechargeable live storage. Groundwater also exists in the non-renewable deep aquifers in the Western Desert and in Sinai. This aquifer is mostly deep, with the current total abstraction estimated at only 0.5 BCM per year.

Reuse of agricultural drainage water has been practiced for a long time period, as most drains in the Nile Valley flow back into the river's mainstream. In the Nile Delta, an

official policy for reuse of agricultural drainage water has been adopted since the late 1970s. This policy calls for the recycling of agriculture drainage water by pumping it from main and branch drains and mixing it with fresh water in main and branch canals (Abdel-Dayem, 1997).

Egypt also initiated programs for the treatment of domestic wastewater for potential reuse. Nevertheless, few wastewater treatment plants are available in large cities where wastewater collection networks exist to collect domestic wastewater. Currently, there is a volume of about 1.0 BCM of primary treated wastewater being used in irrigation in specific locations outside the Greater Cairo region. It is expected that in the near future this volume of treated wastewater will reach 2.0 BCM.

In addition to the above-mentioned non-conventional water resources, desalination is being used to provide domestic water supply for some locations along the Mediterranean and the Red Sea coasts as well as in the Sinai Peninsula.

Strength and weakness

Availability of fresh water resources in the country is not promising. Egypt receives about 98% of its fresh water from the Nile River, originating outside its international borders. The use of non-conventional water sources has been practiced for a long time in Egypt.

1.3 Analysis of demand and supply of water

The demand on water in Egypt is ever-increasing as a result of population growth and increased economic activities, as well as escalating standards of living (Abu-Zeid, 2003). Egypt is approaching an era in which these growing demands for water can no longer be met by the developed renewable Nile water supply. It is worth mentioning that agriculture has always been the core of the economic development of the country, and is considered to be the main activity for a large sector of the population. It contributes to over one fifth of the gross domestic income and consumes more than 85% of the available water resources. Municipal and industrial uses account for 15% of the total water consumption in the country, while river navigation and hydropower generation are considered as non-consumptive uses.

The Egyptian government is also pursuing a national plan for reclamation of new lands. Cultivated and cropped areas have increased in size over the past few years and will continue to increase due to the government policy of adding more agricultural lands.

Box 1: Reclamation of new land governmental plans

The Government plans to bring an additional 3.4 million acres under cultivation by 2017 to add to the existing 7.8 million acres. This will require additional water to meet the envisaged demand for horizontal growth. This may result in a deficit of water by 2017, which hopefully will be met through more re-use of water (drainage, groundwater, or even wastewater). Technologies exist to do this safely, but they require considerable funds and careful management.

The largest consumers of irrigation water are rice and sugarcane, as they have high water requirements in addition to occupying considerable areas. Currently, the average annual crop consumption use is estimated at more than 40 BCM. The total amount of

water diverted to agriculture from all sources (surface, groundwater, drainage reuse, and sewage reuse) that include conveyance, distribution, and application losses, is estimated at over 60 BCM per year. The water policies of the 1970s and early 1980s gave a significant advantage to new land development. However, recent changes in price and other policies, particularly the reduction or elimination of government fertilizer and energy subsidies, place farmers on the new land at a disadvantage. Responding to this, farm-gate prices of crops have been increased, and consequently the gross revenues of farmers have been increased.

Annual evaporation from open water surfaces is estimated to be about 3.0 BCM per year from the total water surface area of the river stream inside Egypt and the irrigation network (canals and drains). This amount varies slightly from one year to another according to climatic conditions (temperature, humidity, wind speed and solar radiation), as well as to the rate of infection of canals and drains with aquatic weeds, which significantly affect the amount of water lost.

1.3.1 Municipal water demand

Municipal water demand includes the water supply for major urban areas (216 cities) and rural villages (about 4525), and is estimated at about 5.5 BCM per year. A part of that water comes from the Nile system and the other part comes from groundwater sources. A small portion of the diverted water (about 1 BCM) is actually consumed, while the remainder returns to the system in the form of polluted sewage water. All cities are provided with piped fresh water, 42% of the villages are provided, whilst 52% of the villages are partially provided and only 6% percent are not provided. The major factor affecting the amount of diverted water for municipal use is the efficiency of the delivery networks. Recent studies show that the average efficiency is as low as 50%, and even less in some areas. The cost of treating municipal water can be reduced significantly if the efficiency of the distribution network increases.

1.3.2 Industrial water demand

There is no accurate estimate for the current industrial water requirement, especially with the new government policy to encourage private sector participation in industrial investment. The estimated value of the water requirement for the industrial sector is about 7.5 BCM per year. A small portion of that water is actually consumed through evaporation during industrial processes (less than 1 BCM), while most returns to the system in a seriously polluted form.

1.3.3 Agriculture water demand

The agricultural sector is by far the biggest water user with its share exceeding 85% of water demand. Although the country lost part of its fertile land to urbanization, this has been balanced by the expansion of agricultural areas. Expansion in agriculture is carried out horizontally and vertically through crop intensification by cultivating the land more than once a year. In 1990, cultivated land amounted to 6.92 Million Feddans (MF) with cropped areas about 12.43 MF, while in 1996 cultivated areas and cropped lands were 7.56 MF and 13.5 MF respectively.

Major crops include wheat, berseem and vegetables in winter, and maize, rice, cotton and vegetables in summer, as well as MF of perennial fruits. Sugar cane is maintained

at 300,000 feddans, which matches the manufacturing capacity in Egypt. Rice and sugar cane are the largest water consumers, followed by maize, wheat and berseem.

The crop consumptive use for the year 1999/2000 was estimated to be 41.441 BCM. The total amount of water diverted to agriculture from all sources (surface, groundwater, drainage and sewage reuse), including conveyance, distribution, and application loss in 1999/2000 was about 61 BCM. The water policies of the 1970s and early 1980s gave a significant boost to the reclamation of new lands. However, recent changes in prices and other policies, particularly the reduction or elimination of subsidized fertilizers and energy, have constituted a disadvantage for farmers on new lands.

1.3.4 Egyptian water balance

Considering the Nile basin inside Egypt as a system requires balancing its inputs and outputs. Releases from High Aswan Dam would be considered the only input to the system once we exclude the insignificant amount of rainfall on the northern coast and the volume of deep groundwater outside the basin boundaries. Recycling water along the system improves the overall efficiency of the system. The portion of water being reused along the system amounts to 12.97 BCM from reused agricultural drainage, 4.8 BCM from the renewable shallow groundwater abstraction in the Valley and Delta, and 0.7 BCM from the reuse of treated domestic sewage.

Currently, water resources development is constrained by technical viability, economic feasibility, and environmental concerns. Thus, the need for the development of additional water supply and/or demand management must be addressed in addition to the implications regarding water allocation, particularly as the government has made a major shift towards a market-driven economy.

Egypt's national water balance for an average year is indicating a typical water balance between demand and supply. The balance includes the different water supply sources in relation to the demands. Release from HAD is estimated at 60 BCM. Groundwater abstractions from the Nile aquifer amount to 40 BCM. An amount of 4.50 BCM of drainage water has been reused either directly or after mixing with fresh water in the Delta. The balance also shows an additional amount of 1.0 BCM effective rainfall and 0.7 BCM of treated sewage that have been used. Agricultural demands reached about 60 BCM, of which 40 BCM have been considered as crop evapo-transpiration. Water diverted for industry was 7.5 BCM, of which 7.0 BCM returned to the system. Municipal use is estimated at 4.5 BCM

Strength and weakness

The demand on water in the country is ever increasing as a result of population growth and increased economic activities, as well as escalating standards of living. Although the country lost part of its fertile land to urbanization, this has been balanced by the expansion of agricultural areas. Expansion in agriculture is carried out horizontally and vertically through crop intensification. Recent changes in price and other policies, particularly the reduction or elimination of government subsidies to agriculture, have placed farmers on new lands at a disadvantage.

All the cities are provided with piped fresh water, 42% of villages are provided, 52% of villages are partially provided and only 6% percent are not provided. The average

efficiency of the municipal water distribution network is as low as 50%, and even less in some areas.

1.4 Regulatory framework of water law: Laws and legislation reform

Water management needs the support of a legal framework that provides the water managers with guidelines and instruments for the planning of new developments, the allocation of water, the operation management and maintenance of the irrigation and drainage system, the management of water quality and the financing of these activities.

Relevant laws in this respect are:

- Law number 12 of 1982, concerning the issue of the law on irrigation and drainage
- Law number 213 of 1994, regarding farmer participation
- Law 48 of 1982, concerning the protection of the river Nile and other waterways from pollution; and
- Law 4 of 1994 “law for the environment”

The current applicable law No. 12/1984 and its supplementary law No. 213/1994 define the use and management of public and private sector irrigation and drainage systems, including main canals, feeders and drains. They also provide legal directions for the operation and maintenance of public and private waterways, and specify arrangements for cost recovery in irrigation and drainage works.

Law 12 and its executive regulation have been revised to take into account current government policies on liberalized crop, decentralization, and privatisation, as well as cost recovery for irrigation systems. For this purpose, a modified law was enacted to reflect the latest developments, concepts, visions and inputs related to water use management.

Strength and weakness

In light of prevailing and projected water supplies, demographic, and ecological conditions in Egypt, the laws are in serious need of review.

1.5 Institutional setting and process

There are several ministries, governmental agencies and authorities, users groups, and NGOs that are considered to be the main stakeholders in the planning and management of water resources. MWRI, the Ministry of Agriculture and Land Reclamation (MALR), the Ministry of Housing, Utilities and New Settlements (MHUNS), the Ministry of Health and Population (MHP), the Ministry of Transport, the Ministry of Local (Rural) Development, and the State Ministry for the Environment are some of the ministries involved in the management of water resources. There are some established committees, with members representing different entities, whose purpose is to coordinate and integrate activities in relation to water resources planning and management. There are also laws and regulations governing water use and the development of resources such as groundwater.

The Ministry of Water Resources and Irrigation (MWRI) is responsible for ensuring reliable quantity and quality of water at the intakes of all drinking water treatment

plants. MWRI rates the allocation of domestic water as the highest priority with respect to other water use sectors.

The agricultural sector has been playing a central role in the Egyptian economy for decades. This role was strengthened by the 1952 revolution reforms and the completion of AHD. Since building AHD, Egypt has a better control over the Nile flow, allowing an adequate water supply for agricultural land in the Nile Valley and Delta throughout the year. The Ministry of Agriculture and Land Reclamation (MALR) assumes the responsibilities of setting agriculture, land reclamation and horizontal expansion policies. MALR set these policies with the aim of reaching a certain level of food self-sufficiency, by increasing the efficiency of resource allocation and use to ensure higher production.

The Ministry of Housing, Utilities and New Settlements (MHUNS) is in charge of providing drinking water and sanitation services to all people. It is currently implementing a national strategy to expand the capacities of existing drinking water treatment plants, install new plants, implement wastewater collection networks and provide adequate sanitation facilities. MHUNS has launched several projects for the implementation and expansion of the drinking water supply and sewage collection and treatment.

The Ministry of Health and Population (MHP) is responsible for sustaining the environmental status all over the country, and suggests the general policy needed to improve environmental health in towns and villages. It coordinates its efforts in this area with concerned agencies in the following projects: methods of making potable water available for human use; methods of disposing waste (human, animal, industrial and solid wastes). The General Department of Environmental Health within MHP sets criteria for control of water pollution, food, soil and air, and sets criteria for watercourses and shores. It is in charge of conducting periodical sampling and analysis of water, mainly for municipal uses at the intakes of water treatment plants.

The Ministry of Local Development (MLD) is charged with improving local conditions and facilitating economic growth in both urban and rural communities. The ministry is also concerned with improving the quality of life of people by providing necessary funds for the implementation and expansion of infrastructure and social services.

The General Organization for Industrialization (GOFI), affiliated with the Ministry of Industry, is responsible for industrial wastewater drainage. The organizational structure of GOFI includes a General Department for Construction and Environment. This department reviews drawings of construction of new industrial units' requirements, and conditions such as the availability of wastewater treatment plants. Authorization to construct an industrial firm depends on the outcomes of these reviews.

GOFI defends, with the support of the Ministry of Industry, those firms violating the environmental law. By granting more opportunities to implement mitigation measures aimed at reducing the level of pollution in their emissions either on air or water, GOFI defends firms from being subject to severe penalties or removal. Environmental tasks performed by GOFI at its central level are also carried out by its branches in various Governorates and new industrial cities.

In June 1997, the responsibility of Egypt's first full-time Minister of State for Environmental Affairs was assigned, as stated in the Presidential Decree no.275/1997. From thereon, the new ministry has focused, in close collaboration with national and international development partners, on defining environmental policies, setting priorities and implementing initiatives within a context of sustainable development.

The River Transportation Authority (RTA) within the Ministry of Transport is responsible for monitoring river transportation, registering boats and monitoring their safety conditions and impact on water quality. RTA is also responsible for developing and improving navigation conditions within the river and other waterways. RTA is currently working on several navigation improvement projects.

The energy sector in Egypt plays a key role in the national economy. Hydropower is the third major energy resource in Egypt; most of the Nile's hydro potential within Egypt has already been exploited, generating about 13.7 TWH of electricity annually. Some studies revealed the feasibility of using mini hydro-generating facilities to make use of some degree of hydro potential along the river's main streams. Currently it is planned to develop four small hydropower stations with total installed capacity of nearly 60 MW.

Strength and weakness

Water management is fragmented among several ministries and authorities that make either a direct or indirect contribution to the water resources management. There are some established committees, with members representing different entities, which coordinate and integrate activities in relation to water resources planning and management.

1.6 Egyptian water policies

Earlier water policies in Egypt were not flexible enough to cope with uncertainties in defining the country's priorities with respect to water resources development, as well as addressing future changes in water demands. They have been characterized as being primarily resource development policies, aiming at merely satisfying current and future requirements. Water management also suffers from the fragmentation of responsibilities among different institutions. Although the Ministry of Water Resources and Irrigation (MWRI) is responsible for water resources planning and management, coordination with other stakeholders is not strong enough to eliminate conflicts. These stakeholders include governmental agencies and authorities, the private sector, non-governmental organizations and individuals. Some of these stakeholders affect water quantity available for various sectors, while others are more involved in water quality issues.

It is expected that in the near future the water supplies available from both conventional and non-conventional resources will not be sufficient to satisfy the increasing demands for water. Also, more concern is now given to water quality issues rather than water quantity. Therefore, MWRI has recently shifted its long-standing policy paradigm of water resources development to water demand management (Abu-Zeid, 1997). It has launched several policies aiming at better utilizing the limited water resources and increasing the efficiency of water use within all sectors. It has also launched projects contributing to the demand management paradigm, as well as

water quality conservation measures. There are also several programs for cost recovery, institutional reforms, laws and legislations, and stakeholders' participation.

Efficient and effective use of all water resources in Egypt both in time and space requires the formulation and implementation of appropriate water sector policies (Attia and Tawfik, 1999). Formulation of Egypt's water resources policy for the 21st century requires a major shift from the classical paradigm used in water resources planning and management to a new innovative paradigm (Abu-Zeid, 1997). Dynamic interrelationships among water resources system components impose the integrated approach on policy makers. Past experience shows that when an action or strategy is planned and implemented in isolation from other system components, disruptive impacts result. A multi-disciplinary dialogue has to be adopted in policy formulation, rather than adopting ecological, social, and economic systems as boundary conditions or constraints for the water resources system.

Recent water resources policies include different structural measures such as irrigation structures rehabilitation, improvement of the irrigation system, installation of water level monitoring devices linked to the telemetry system, expansion in the tile drainage system, etc. Several non-structural measures have also been implemented, including the establishment of the irrigation advisory service and the expansion of the water users association (WUAs) for ditches and mesqas, the establishment of the water boards on branch canals, the promotion of public awareness programs as well as the involvement of stakeholders. Laws and legislation are also considered to be non-structural measures.

1.6.1 Irrigation and agriculture sector measures

The water requirements of the agricultural sector represent the largest component of the total water demand in Egypt. Agriculture consumes more than 85% of available water resources. The rapid growth in population and changing diets as incomes increase mean that these demands will grow in the future. The World Water Vision and its framework for action highlighted the challenge of achieving water demands for food and environmental security as one of the most pressing conflicts of the coming decades (Abu-Zeid, 2003).

Box 2: The Irrigation Improvement Project (IIP)

The Irrigation Improvement Project (IIP) in the old irrigated lands is a major project implemented to improve the efficiency of water use at the mesqa (irrigation ditches) and farm levels. IIP is intended to save fresh water by reducing losses on farm level. The project also helps in encouraging users' participation and involvement in the operation, maintenance, and management of irrigation system. The framework of IIP includes rehabilitation and renewal of water distribution structures, use of pipe and raised mesqas, use of one-point collective pumping from branch canals into mesqas, and land levelling using modern techniques. It also includes modified designs for field irrigation systems and, most importantly, the formulation of Water User Associations (WUAs), which expresses the new vision for water distribution management processes.

MWRI is also expanding surface and sub-surface drainage network to prevent soil salinity and water logging. Improvement of soil conditions will have a direct impact on crop production. Cleaning open drains of weeds and the removal of silt is also

carried out regularly for open drains, while for the subsurface drains, the annual maintenance plan includes gravity flushing for collectors, and high or medium flushing for laterals.

The government is also taking leading steps in adjusting the crop pattern to meet future demands and achieve the required balance between water supply and demand. It was indicated that water productivity in some regions is low due to high water consumptive crops, which add to the low value. Government policies aiming to reduce the agriculture water consumption include:

- replacement of sugarcane with sugar beets, especially in Upper Egypt, taking into account the lifetime of current sugar factories, which were designed to process sugarcane,
- reduction of rice cultivated area to about one million feddans, which is sufficient to satisfy national demand,
- providing some potential for export,
- preventing soil salinization and seawater intrusion,
- narrowing the gap between net revenues of similar seasonal crops to enable MWRI to encourage less water consumptive crops.

MALR reviewed the horizontal expansion plan and updated it, using intensive surveying to create soil characteristics maps for parts of the Western Desert and Sinai and locate new areas suitable for reclamation. The new updated plan for Horizontal Expansion of Agricultural Land, to be completed by 2017, aims at adding 3.4 million feddans (MF) to the existing agricultural area. The Egyptian government has already started the development of three mega projects (North Sinai, Toshka and North-West Delta) to expand the agricultural land by more than 1.5 million feddan in the coming decade. MWRI took into consideration the new horizontal expansion plan in designing the national water policy up to the year 2017. The policy estimated the additional volume of water needed to meet this plan and identified the sources for it. The policy also included a set of initiatives, which must be implemented in order to meet the water demands for the new lands.

1.6.2 Drinking water and sanitation measures

Access to safe drinking water and sanitation has been identified as a basic human right. However, the problem lies not in identifying peoples right to safe and clean drinking water, but in the ability to provide this service and the size of investments offered by the government to reach the required level of provision. It is also worth mentioning that the provision of sanitation services is much more costly than provision of drinking water. The Government of Egypt has made great efforts concerning the provision of water supply and sanitation services to all urban and rural communities. The current coverage of water supply services has reached 97% for the urban population and about 70% for rural communities (Attia, 2004). Sanitary facilities are less developed, with approximately 50% of the urban population and 6% of the rural population connected to a sewerage system. Table 1 shows the production capacities of both water supply and sanitation services, along with the per capita share of these services and governmental investments on the national level. The table shows that production capacity increased from 5.8 MCM per day in 1982 to 18.2 MCM/day

in 2000. Sanitation capacity also increased from 1 MCM/day to 8.2 MCM/day. Correspondingly, the per capita share of service increased from 130 litres/day for drinking water in 1982 to 275 litres/day in 2000 and from 25 litres/day of sanitation service in 1982 to 110 litres/day in 2017. The investments in the drinking water sector increased from 18.58 billion LE in 1982 to 33.30 billion LE in 2000, and for sanitation from 23.17 billion LE in 1982 to 47.09 billion LE in 2000. Table 1 shows information concerning drinking water and sanitation services from 1952 to 2000 and their expectations for 2017 on the national level. The table also shows the expectations for the capacities and investments for the year 2017.

Table 1: The Egyptian water sector in numbers

Fiscal Year	No. of projects		Capacities (1000 CM/d)		Per capita share (Liter/d)		Investments (Mio LE)	
	Drinking water	Sani-tation	Drinking water	Sani-tation	Drinking water	Sani-tation	Drinking water	Sani-tation
Up to 1952	252	8	1269	363	55	15	86	84
Up to 81/82	857	36	5745	995	130	25	913	321
Up to 2000	271	256	1828	8283	275	110	18580	2316
Planned to 2017	3516	1197	30342	20183	300	200	33302	47092

1.6.3 Water quality considerations and measures

Egypt suffers from water pollution generally due to domestic, industrial, and agricultural activities. Water quality deterioration results in various impacts including human health hazards due to direct and indirect contact, loss of biodiversity (e.g. fisheries), and the irreversible pollution of groundwater, in addition to less water being available for different uses. Poor water quality continues to pose a major threat to human health. Diarrhoea, cholera, typhoid and schistosomiasis are the leading water-borne diseases.

The management of pollution control in Egypt is fragmented among different authorities. Some ministries have responsibilities for specific aspects of pollution control and monitoring activities, but there seems to be no coordination or organization of such activities. The result is that prevention, treatment and impact modification measures are being applied, but they are neither implemented within an integrated management framework, nor on the basis of a coordinate set of priorities. In addition, it must be realized that not all effluent flows are under control.

It has been an increasing concern of the Egyptian government to protect the Nile and the waterways. Laws and legislation have been passed to ensure the sustainability of water resources development and use, including the definition of suitability of water quality for each specific use, and the control of water pollution. Pollution control is also being achieved by establishing the water quality-monitoring network along the irrigation and drainage systems as well as in groundwater wells. The most important of these laws is Law 48, issued in 1982 and relating to the protection of the Nile and waterways from various sources of pollution. The law establishes the necessary definitions and relationships in the field of water resources. It assigns the Ministry of Health and Population (MHP) the task of performing periodical water sampling and

analysis, mainly for municipal uses at the intakes of water treatment plants. It also directs the Ministry of Water Resources and Irrigation (MWRI) to issue licenses for discharging or discarding solid, liquid, or gaseous wastes from commercial, industrial, or tourist properties, shops or establishments, or from sanitary drainage and other operations into the waterways. Moreover, increased public awareness is a key factor in building a constituency for environmental protection.

The industrial sector is responsible for pollution sources originating from industrial activities. Thus, Law 48 for the year 1982 stipulates that only treated effluents meeting specific standards can be discharged to surface or groundwater systems. In practice, few industries have licenses proving that they are meeting the standards of Law 48/1982. The reduction of direct industrial effluents to the river Nile is considered an effective prevention measure for controlling water pollution.

In the domestic sector the responsibility for pollution control lies with several institutions. Individual households, local councils, sanitary drainage authorities and Governorates all play a role in pollution control. Law 48 applies the same license obligation to domestic sources as it does to industrial sources, with an added constraint. This constraint specifies that no direct discharge be allowed into the river's mainstream, irrigation canals or the groundwater aquifer.

Strength and weakness

Linkage and coordination between MWRI and the other stakeholders are not strong enough to eliminate conflicts. It is expected that in the near future the water supplies available from both conventional and non-conventional resources will not be sufficient to satisfy the increasing demands for water. Therefore, MWRI has recently shifted its long-standing policy paradigm of water resources development to water demand management. Several policies have been launched to better utilize the limited water resources and increase the efficiency of water use within all sectors.

The Government of Egypt has made great efforts concerning the provision of water supply and sanitation services to all urban and rural communities. Sanitary facilities are less developed than piped water services, with approximately 50% of the urban population and 6% of the rural population connected to a sewerage system.

Egypt suffers from water pollution generally due to domestic, industrial, and agricultural activities. The management of pollution control in Egypt is rather fragmented among different authorities. Several laws and legislation have been issued to protect water resources from pollution.

2 Meeting the UN concept: The national water policy and the concept of water as a human right

In 2000, the United Nations Committee on Economic, Social and Cultural Rights adopted a General Comment on the right to health. This General Comment includes not only timely and appropriate health care, but also covers other factors determining good health. These include access to safe drinking water and adequate sanitation services, a sufficient supply of safe food, nutrition and housing, and healthy occupational and environmental conditions.

Ensuring access to sufficient safe water as a human right constitutes an important step towards making it a reality for everyone. The Millennium Declaration in 2000 included an international goal to reduce by half the proportion of the population without sustainable access to safe drinking water. The Johannesburg Declaration, adopted at the World Summit of sustainable development in September 2002, extended this goal to include sanitation as well. MWRI has launched several policies that aim for a better utilization of the limited water resources and an increase in the efficiency of water use in all sectors. Despite this, it is expected that in the near future the water supplies available from both conventional and non-conventional resources will be insufficient to satisfy the increasing demands for water. Also, more concern is now given to water quality issues rather than water quantity. Therefore, MWRI has recently shifted its long-standing policy paradigm of water resources development to water demand management. It has launched several projects to contribute to the demand management paradigm, as well as water quality conservation measures. There are also several programs for cost recovery, institutional reforms, laws and legislations, and stakeholders' participation. The water policies adopted by MWRI consider water in the first place as a human right, and propose several measures to ensure this consideration. These measures are explained in details in Table 2. The measures are formulated to encompass the UN legal definition of the human right to water. Parallel to the legal definition, the adopted measures also take into consideration the culture of water use in Egypt. This culture is based on the attitude of farmers and other population sectors in determining the practices of their use of water. Disregarding all expenditures paid for the new irrigation systems in new land, most farmers tend to ignore the existence of these systems and use surface irrigation instead.

They do not know much about crop water requirements to restrict themselves to fulfilling their crops’ actual requirements. Thus all components - knowledge, beliefs, or experience - should be changed by the implementation of an effective scientific approach that affects their practices. However, this should go hand in hand with other changes needed in the water distribution system to ensure a fair, timely, and sufficient distribution process. Rational practices of water use and the high economic value of water were found closely related to the farmer’s educational status and the type of irrigation system applied. The correct knowledge is a prerequisite for positive attitudes and rational practices of water use: the awareness campaigns about water value should be undertaken to impose national use of water on all users, whether in the agricultural, industrial, or other sectors.

3 List of selected NGOs

The number of non-governmental organizations in Egypt working on environmental issues has reached more than 250. In realizing the importance of NGOs as major contributors to environmental improvement, the Ministry of the Environment announced 2002 to be the year of NGOs, during which several workshops were conducted to strengthen the role of NGOs in protecting the environment. There are several NGOs working in the field of water resources, specifically in rationalizing water consumption, avoiding solid waste and industrial wastewater disposal in the River Nile, and acquiring safe and clean energy through the use of organic subsurface resulting from animal and agriculture waste.

There are several NGOs working in rationalizing water. These organizations are cooperating with both national and international organizations to seek financial support for water conservation and public awareness projects. One of the most important activities of the NGOs in the field of drinking water was the National Community of Water Campaign Program (NCWCP), which was implemented by the Arab Office for Youth and Environment (AOYE) from 1994 to 1997. The program comprised activities aimed at preserving drinking water in three Governorates: Cairo, Ismailya and Suez. The total budget of this program was 20 million L.E. in the form of a grant from USAID. This program proved successful in raising citizens' awareness of the concept of preserving drinking water. It also helped in the transfer of modern international technologies for the production of sanitary equipment for the local market.

The Water Resources Protection Society is another example of NGOs seeking to implement projects in the fields of maintenance, development and purging of the River Nile course and branches, as well as irrigation and drainage canals. Membership of this society is made up of irrigation and agriculture experts, EEAA, professors from universities and research centres, as well as political and popular figures. The society is aiming to preserve the natural state of the Nile River and the irrigation and drainage networks, and protect them from pollution. Table 3 gives a list of selected Egyptian NGOs.

Table 3: List of selected Egyptian NGOs

Name of NGO	**Responsible**	**Tel**
Arab office for youth and environment (AOYE)	Dr. Emad El Din Adly	+202 516 1519
African organ. for Nile basin studies	Dr. Salah S. Zerd	+202 337 1433
Egyptian academic organ. for environmental development	Miss Ragaa M. H.	+202 258 1865
National organ. for environmental protection	Dr. Abdallah Hegawi	+206 835 2654
Islamic organ. for development and environment (Etsa city)	Mr. Ramadan A. Gain	+202 867 46223
Egyptian organ for integrated development	Mr. Magdi Sedhom	+202 365 2135

Egyptian organ. for industry and environment	Dr. Ahmed H. Hassan	+203 425 6776
Environment friends' organ. (Alexandria)	Dr.Adel Abou Zahra	+203 582 0211
Environment and development friends' organ.	Dr. Adly Beshai	+202 7957637
Nature friends' organ.	Dr. Sami H. Gaiati	+202 245 8979
Baladi organ. (Port Said city)	Miss Aleia H. Shatwy	+206 623 386
Environmental conservation organ.	Mr. Ihab M. Ibrahiem	+204 834 1774
Renewable energy and environmental protection organ.	Miss Seham A. Amin	+206 432 1080

4 List of donor activities of governmental and non-governmental organisations

Donor contributions to water resources management in Egypt have been of substantial importance over the past few decades. Donor involvement can be traced in almost all recent policy reform initiatives. A list of donors in Egypt would include USAID, the World Bank, UN organizations, the Netherlands, Japan, Canada, and Germany. Major donors such as USAID and the World Bank have also contributed to the financing of major irrigation projects.

MWRI started to conduct a comprehensive assessment of water resources supply and demand in Egypt and of ways to cope with the socio-economic plans of the country. A water master plan project was supported by UNDP, with the aim of studying relations between supply and demand, including non-agricultural demand. The project devised scenarios to increase Egyptian water supply at Aswan. The water master plan revealed several facts that made MWRI adjust its policy to consider a demand increase of 11.7 BCM/year in the future.

Another major effort was made by the Irrigation Management System (IMS), which was funded by USAID. IMS aimed to increase the MWRI capacity to design, operate and maintain irrigation systems for effective control of Nile water. Solutions developed included on-farm system improvement, introducing continuous flow rather than the rotation system, and forming water user groups. These solutions were incorporated as part of IMS under the title of the irrigation improvement project.

One may leap to more recent donor-funded initiatives to find the following list:

- National Water Resources Plan (NWRP) 1998-2002, funded by the Dutch government.
- National Water Quality and Availability Management (NAWQAM) 1997-2004, funded by the Canadian government.
- Decision Support System for Water Resources Planning based on Environmental Balance (DSS) 1998-2000, funded by the Italian government.
- Water Resources Result package, Environmental Policy and Institutional Strengthening Identified Quality Contract (EPIQ-WRRP) 1997-2000, funded by USAID.
- The Monitoring, Forecasting and Simulation Project 1990-2002, funded by USAID.
- Ground Water Resources in Egypt (GWS), funded by the Dutch government.
- Water Boards Project (WBS), funded by the Dutch government.

The objectives and aims of few projects are described below to illustrate donor impact on water resources policy setting and management reforms. NWRP aimed at developing a national water resources plan, describing how Egypt will safeguard its water resources in terms of both quality and quantity. The plan also addressed how to use water resources optimally from both socio-economic and environmental perspectives. Specific objectives were: to provide input of the water component for the country investment plans of 1997-2002 and 2002-2007; to create strategic

planning procedures within MWRI, enabling analysis of policies and investments in the water sector; and the creation of coordination mechanisms among water stakeholders.

The NAWQAM project aims at developing a coordinated national system for sustainable water resources management system in Egypt. This aim is to be realized through several objectives. First, to develop the MWRI capacity to prepare comprehensive status reports on water quality and availability. Secondly, to develop the professional capacity of water quality and availability organizations, in order to effectively prepare policy options and take operational decisions based on improved national level data, including environmental analysis. Other objectives of NAWQAM are to rationalize water quality monitoring activities into a sustainable national program, and to utilize applied research and pilot projects to prepare guidelines for national strategies and action plans.

The above-mentioned two projects both address national level policy formulation on the issues of both water quality and quantity. Last on the above list is the project for forming water boards. The water board project illustrates another policy shift, supported by the donors, towards the privatisation of water management and also increased user participation in water issues.

The project's aim is to form eight water boards at the branch level in Sharkia, Kafr El-Sheikh, Qena and Alexandria. These boards will operate and maintain the canals. The project will attempt to expand the concept to the district level. Another thirty-two boards established in Fayoum carry out small rehabilitation works and control weed. In Fayoum, twenty-two of these boards formed a federation at the feeding canal level. Below is a summary of recent foreign fund contribution to water management projects.

In all the above projects, the focus was local, with little or no influence on regional cooperation with other Nile Basin Countries. Parallel to these "local-focus" projects, the Nile water sector in MWRI has been strengthening ties with Nile basin countries. Several donor-funded projects matured into the latest Nile Basin Initiative (NBI). NBI brings all Nile Basin countries together with the aim of developing the resources of the Nile Basin for the benefit of all.

Table 4: NBI projects, donors and required funds

Project	**Interested Donors**	**Fund (Mio US$)**
Nile Trans-boundary Environmental Action	GEF, Canada, Netherlands	39
Nile Basin Regional Power Trade	Norway, Sweden, Finland, Denmark	12
Efficient Water Use for Agricultural Production	Netherlands	5
Water Resources Planning & Management	Denmark, GEF, UK, Germany, Norway	28

Confidence Building & Stakeholder Involvement	Canada	15
Applied Training	Netherlands, Sweden, Norway	20
Socio-Economic Development & Benefit Sharing	UK, WB (DGF)	11
Total Million U.S. Dollars		130

NBI depends on developing programs to work at poverty reduction, economic development and the reversal of environmental degradation. These programs should be seeking win-win opportunities between riparian countries. The Nile basin countries were split into two groups, according to the interests and nature of the problems facing each country, the eastern Nile group and the Nile equatorial lakes group. Only Sudan and Egypt are members of both groups, because, as downstream countries, they are affected by everything that takes place in both groups. Donors are extremely interested in NBI as a precedent for the transformation of sources of conflict into cooperation mechanisms, alleviating poverty and bringing development to some of the poorest countries in the globe. Donors' interest has been evident in the willingness to contribute to NBI projects, as we can see in Table 4.

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