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Water as a human right: The understanding of water in the Arab countries of the Middle East - A four country analysis

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Foreword

In November 2002 the United Nations Committee on Economic, Social and Cultural Rights issued the General Comment No.15 of 2002 which declares water as a human right as follows:

"Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights."

The General Comment is a device that has been used by the United Nations to amplify the rights set out in its Covenants. The General Comment No. 15 of 2002 was issued against a background of increasing fear that water becomes an exclusive commodity not taking into account its nature as an often scarce resource in quality and quantity and the minimum water need of every human being.

Over one billion persons are lacking access to a basic water supply, while several billion are lacking access to adequate sanitation. In developing as well as in developed countries the right to water is still not recognized in a comprehensive manner determined by continuing contamination, depletion and unequal distribution of water.

According to the UN Committee, the principal elements of the right to water are availability, quality and accessibility. Supply must be sufficient for regular personal and domestic use including drinking, sanitation, food preparation and personal and household hygiene. Enough water should be available in all remote rural areas as well as in temporary dwellings in deprived urban areas. Water must be affordable to all. The obligation of States is to respect, protect and fulfil the right on water without dependence on if the water supply is organized by the public or a private company. Therefore the state has to set up and run an appropriate regulatory system, each state is expected to recognize the right on water within the national political and legal system.

With this policy paper based on a four country analysis regarding the human right of water in selected Arab countries of the Middle East the Heinrich Böll Foundation wishes to strengthen the UN concept of human right on water, and to contribute to a full realization of the right to water in these respected areas.

An informed and critical discussion about the state parties commitment to the human right concept between legislatures, civil society and governments is necessary. The Heinrich Böll Foundation intents to force International Financial Institutions to take the right to water into account in their lending policies, credit agreements and other measures. Agreements concerning trade liberalization should not decrease or inhibit a state's capacity to ensure the full realization of the right to water.

Barbara Unmüßig

President of Heinrich Böll Foundation, Berlin, Germany

September 2004

Preface

The water problem in the Middle Eastern region is a highly controversial political issue, a significant component of the Arab-Israeli conflict in general, and the ongoing Israeli-Palestinian conflict in particular. But water is not only a controversial issue between Israelis and Palestinians. The overexploitation of the waters of the Jordan River by Israel again and again creates serious tensions with the Hashemite Kingdom and the Israeli-Syrian controversy about the access to the Lake Kinneret for Syria has blocked any peace agreement until today. And the water dispute between Israel and Lebanon (Wazzani River) is one of the main reasons of confrontations in the southern part of Lebanon. The reason for all these conflicts is the mere fact that the location of groundwater reservoirs is not identical with the course of national borders and rivers and lakes are divided by boundaries, meaning that two or even more states have to share the same aquifers and surface waters.

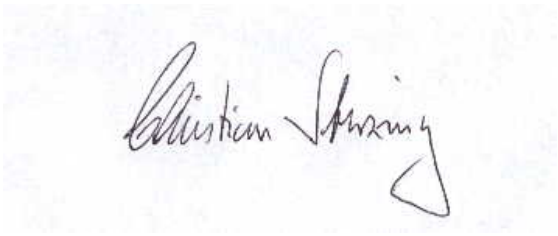
But even where cross-border problems don't exist national sovereignty is no guarantee for a just access to water and therefore for an implementation of water as a human right. In the Arab countries dealt with in this study the lack of accessibility of water for the poor and disadvantaged groups may create serious societal problems and in the long run will affect the domestic stability in the different countries. Therefore water as a human right in the Middle East is an explosive issue in national and international respect and has an impact on the questions of social justice and political stability as well as the regional peace dynamics. That is the reason why the Arab Middle East Office of the Heinrich-Boell-Foundation in Ramallah/Palestine has put one of the priorities of its work to water issues, because we believe in and therefore support peaceful solutions. The complexity of water issues in the Middle East is created by the fact that questions of international law and human rights, social justice and national conflicts, gender equality and sustainable development are intertwined.

Is the solution for the water problems in the region impossible without peace? The water problems of the region are too serious and too pressing, so no one can postpone their solution until a final peace agreement will be worked out. A heavy price for leaving water arrangements to the final status negotiations would have to be paid by the people who lack sufficient water now. Today not only the regional scarcity of water and its just distribution is a problem. The overuse of scarce resources - over-pumped wells and waste of water - and the low standard of sewage and solid waste treatment have created severe problems of pollution and a deterioration of the water quality. If nothing is done in the near future many aquifers in the region will be spoiled permanently. And in the entire region the human right to water is far from being implemented for all parts of the population. In the light of these developments just waiting for peace means condoning human rights violations and irreversible damage to the scarce natural resources..

Therefore the water problem in the Middle East has a short term and a long term dimension. In the current situation immediate measures have to be taken to reduce the dangers of pollution and to improve the water rights of people, i.e. equal rights of access to the water resources especially for the Palestinians in the occupied territories, for marginalized groups and people in the remote areas of the Arab states.

On the long run of course the water issues have to be part of the final status agreement. It is interesting to note that in the Oslo Accords (1993/1995) between Israel and the PLO the treatment of the water issues remained incomplete and were left for the final status negotiations – like the most controversial problems of Jerusalem, the refugees, and the settlements.

Everybody in the region knows that the allocation and control of water resources are vital for survival and therefore are a source of direct conflict and political - sometimes even military - confrontation. Misallocation of water is not only a matter of political power or international law, but a violation of a human right. In a region where water resources are limited and in danger the awareness of interdependency regarding water issues should force everyone to cooperate. More and more people in the region - and hopefully their governments as well – are aware of the cross-border nature of the water resource and the responsibility to share and to protect it jointly. However, this knowledge and therefore the awareness of the need to cooperate are only growing very slowly.



Christian Sterzing

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September 2004

1 Setting the project scene

1.1 Objective

The United Nations has deemed 2003 the International Year of Fresh Water. Last March the World Water Forum was held in Japan to remind the World of an increasingly developing crisis. Half of the world's population is living in unsafe sanitary conditions without access to clean water. A report, drawn up by the World Commission on Water for the 21st Century, estimates that three billion of the world's most deprived people live without access to proper sanitation. One billion of them have no access to safe water at all.

The international community has affirmed the human right to water in a number of international treaties, declarations and other documents. Most notably, the UN Committee on Economic, Social and Cultural Rights adopted in November 2002 a General Comment on the Right to water setting out international standards and obligations relating to the right to water.

Based on the UN concept of water as a human right for selected Arab countries in the Middle East (Egypt, Palestine, Jordan, Lebanon) it is analysed if and to what extent these concepts are acknowledged. Each country study aims to identify the scale of knowledge of and commitment to the UN concept in the region and is meant to identify the main areas of concern in each country regarding water as a human right.

The paper summarizes the main challenges facing strategic and coordinated action towards the UN concept of water as a human right, identifies what types of processes and institutions needs to be developed to meet the challenges of the concept and provides best practise examples from countries that have shown innovation.

1.2 Project partners

This project is a collaborative effort of all research partners.

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1.3 Methodology and analytical framework

The analysis methodology consisted of the following components:

1. *country case studies* following a *common reporting framework* for each of the four countries:

Strategic and coordinated action for each of the four countries was framed by common analytic components. The framework is presenting reporting principles and specific content to guide the preparation of the country reports and hopefully represents the main aim of the projects to identify the scale of knowledge of and commitment to the UN concept in the region.

Analysing the water sector for each country, strength and weaknesses regarding the criteria of the water as a human right concept were identified.

The four country studies were prepared by the project partners each specialized in national water issues of the selected countries.

Box 1: Common reporting framework for country analysis

The national water sector

National macro-economic setting, development objectives and water policies

Water resource assessment: Base and potential

Analysis of demand and supply of water

Regulatory framework of water law

Institutional settings and process

Principal stakeholders, their roles, interests and conflicts

Meeting the UN concept: The national understanding of water

The national water policy and the Human right concept of water

Evaluation of UN criteria

Areas of concern and opportunities

List of NGOs

List of donor activities of governmental and non-governmental organizations

References and further information

2. a *country survey* focusing on criteria of the UN concept for water as a human right:

The General Comment 15 on the right to water sets the criteria for the full enjoyment of the right to water to guideline an evaluation as follows:

- Availability of sufficient and continuous water supply
- Quality of water
- Accessibility of water and water facilities and services: Physical accessibility of water, Economical accessibility, Non discrimination against marginalized areas or groups, Information on water issues

3. a *synthesis report* summarizing the results of the country studies.

2 Water as human right: the concept

For human development access to sufficient water regarding quality, quantity and economy is vital. Today more then 1.2 billion people lack access to an adequate supply of water, more then 2.4 billion people lack access to adequate sanitation. More then 2.4 million people die annually from water related diseases due to an absence of a qualitatively safe water supply; most of them are children. (UN 2003, WHO 2003)

With population growths in many parts of the world, especially in urban areas, freshwater resources are affected by increasing pollution and overuse of existing natural resources resulting in a growing scarcity in quality and quantity of water. A raising competition among the different users and uses of water is the consequence.

The human right approach to water puts the peoples need first regarding water use and promotes human-centred water resource development based on a coherent framework of binding legal norms and accountability. It aims to empower individuals to achieve their full potential of and the freedom to take up opportunities in using water.

2.1 Introduction into the human right concept

The term “human rights” refers to those rights that have been recognised by the global community in the Universal Declaration of human rights, adopted by the United Nations (UN) Member States in 1948, and in subsequent international legal instruments binding on states. The consensus on human rights reflects a global moral conscience. (WaterAid 2003)

Although legal instruments at the international and national levels have recognised and confirmed human rights, the law is not the source of these rights. Human rights are not granted by any human authority or government, but are derived from the essential dignity and nature of humankind. The list of internationally recognised human rights covers all those rights essential for human survival, physical security and development in dignity. There is no hierarchy of rights and all rights should be regarded as being of equal priority. Denial of one right invariably impedes enjoyment of others, leading to the recognition by UN Member States that human rights are indivisible, interdependent and inter-related (UN 1993, WaterAid 2003, Häusermann 1997)

The human rights approach is especially used to challenge the economic and social injustice, particularly toward indigenous peoples, women’s groups, advocates of children, and disabled people.

In summary, a human rights approach to development is one which (WaterAid 2003)

- puts people first and promotes human-centred development
- stresses liberty, equality and empowerment
- recognises the inherent dignity of every human being without distinction
- recognises and promotes equality between women and men, between minority and majority
- promotes equal opportunities and choices for all so that everyone can develop their unique potential and have a chance to contribute to development and society

- promotes national and international systems based on economic equity, equitable access to public resources, and social justice
- promotes mutual respect between peoples as a basis for justice and conflict prevention and resolution.

Human right treaties (covenants, pacts or conventions) are contracts signed by states which are legally binding. They impose mutual obligations on the states. Human rights treaties have been adopted by states worldwide and represent a global consensus about how individuals should be treated in accordance with their inherent rights and dignity. Six core human rights treaties do exist, which are confirmed in international law. [1] Lobbying groups have also adopted human rights texts: The League of Arab States has adopted human rights treaties open to signature by their respective member states.

There are various mechanisms within the UN human rights system to submit complaints of human rights violations: procedures to bring complaints directly under international human rights treaties and special procedures for filing complaints guided by bodies. The Commission on Human Rights and the Economic and Social Council have established what are known as Special Procedures of the Commission on Human Rights. These are a number of additional procedures and mechanisms, undertaken either by "working groups" composed of experts acting in their individual capacity or by independent individuals known as "Special Rapporteurs", "Independent Experts", or "Special Representatives". In 1997, the UN Commission on Human Rights entrusted an individual expert, Mr. El-Hadji Guissé, with the task of drafting a working paper on human right approach to water focussing on the promotion of the realization of the right of everybody's access to drinking water supply and sanitation services.(WaterAid 2003)

2.2 The human rights approach in water related issues

The right to drinking water is defined as the right of every individual to have access to the amount of water required to meet his or her basic needs. This right covers access by households to drinking water supplies and waste-water treatment services managed by public or private organisations. There is a discussion ongoing if this right covers water intended for commercial, industrial or agricultural uses as well. (UN 2002a)

The human right on water has been explicitly recognised in several international human rights treaties[2], especially in the *International Covenant on Economic, Social*

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[1] The six core human rights treaties are:

The International Covenant on Civil and Political Rights, adopted in 1966 and which entered into force 23 March 1976;

The International Covenant on Economic, Social and Cultural Rights, adopted in 1966, entered into force 3 January 1976;

The International Convention on the Elimination of All Forms of Racial Discrimination, adopted in 1965, entered into force 4 January 4 1969;

The Convention on the Elimination of All Forms of Discrimination Against Women, adopted in 1979, entered into force 3 September 1981;

The Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment, adopted in 1984, entered into force 26 June 1987;

The Convention on the Rights of the Child, adopted in 1989, entered into force 2 September 1990

[2] The human right on water is also protected in times of conflict under the Geneva Conventions.

and Cultural Rights[3] and other international binding laws and regulations[4]. To monitor the implementation of that treaty an independent expert committee, *The Committee on Economic, Social and Cultural Rights* was established. This committee was responsible for elaborating the content and obligations attached to the right to water in its *General Comment No 15*, "The right to water" (articles 11 and 12 of the *International Covenant on Economic, Social and Cultural Rights*). The Committee defined the right to water as follows: (UNHCGR 2002)

"The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses."

Significantly, the Committee stated that:

"The right to water contains both freedoms and entitlements. The freedoms include the right to maintain access to existing water supplies necessary for the right to water, and the right to be free from interference, such as the right to be free from arbitrary disconnections or contamination of water supplies. By contrast, the entitlements include the right to a system of water supply and management that provides equality of opportunity for people to enjoy the right to water."

Doing so the Committee recognized that water itself was an independent human right.

The right to drinking water means that all persons, without discrimination, must have access for their basic needs to a sufficient quantity and quality of water supplied. The basic need for water must be economically affordable especially for the poor, and not dependent on if a public or private entity supplies the water. States must take all necessary measures to enable the poorest people to enjoy the human right on water, e.g. introducing subsidised water prices.

Governmental obligations with regard to the human right on water can broadly be categorized in obligations to *respect, protect, and fulfill.*

[3] ratified by 146 countries

[4] According to the European Council on Environmental Law, water is above all a social good, that is, a resource that forms part of the common heritage of humanity. Water is also seen as an economic good of great value, but which cannot be treated as a mere commodity like other consumer goods. The Council stresses that access to drinking water must not be subject to market forces dominated by the profit motive.

Box 2: Categorization of governmental obligation with regard to the human right on water

Respect. The obligation to *respect* requires that States Parties refrain from interfering directly or indirectly with the enjoyment of the right to water.
Protect. The obligation to *protect* requires that States Parties prevent third parties such as corporations from interfering in any way with the enjoyment of the right to water.
Fulfill. The obligation to *fulfill* requires that States Parties adopt the necessary measures to achieve the full realization of the right to water.

Source: WHO 2003, UN 2002b

The General Comment 15 affirms that (WaterAid 2003):

"The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights".

Hence, it is recognized that this right has already been recognized in a wide range of international agreements.

Regarding the normative content of the General Comment it is stated that the right to water comprises both:

- *"Freedoms"* - such as the right to be free from interference through, for example, arbitrary disconnections or the contamination of water supplies, and
- *"Entitlements"* - including the right to a system of water supply and management that provides equality of opportunity for people to enjoy the right to water

Furthermore it is stressed that water should be treated as a social and cultural good, and not primarily as an economic good.

General Comment 15 reaffirms the margin of discretion allowed to States Parties under international human rights law, at the same time stressing that states are obliged to utilize:

"All appropriate means, including particularly the adoption of legislative measures in the implementation of their Covenant obligations."

States obligations regarding the right to water and acknowledgements of constraints due to the limits of available resources are recognized as well but it is clearly stressed, that :

"States Parties have a constant and continuing duty under the Covenant to move as expeditiously and effectively as possible towards the full realization of the right to water"

The General comment calls for guidelines on the three main areas in the implementation of the right to water at the national level, does not identify details on how to do so. These three areas are as follows (WaterAid 2003):

- The formulation, implementation and monitoring of legislation, strategies and policies;

- The identification and application of suitable, sufficiently disaggregated indicators and benchmarks for monitoring States Parties compliance with their obligations and progress towards the full realisation of the right to water
- The provision of access to effective judicial or other appropriate remedies at both national and international levels for any persons or groups who have been denied their right to water

Furthermore international obligations concerning the right to water are outlined. These include (WaterAid 2003):

“Positive” obligations of States Parties - for example, to ensure that the right is given due attention in international agreements, or the special responsibility of the economically well developed States Parties to provide aid and international assistance to poorer states parties

“Negative” obligations, such as refraining at all times from imposing embargoes or similar measures that prevent the supply of water, as well as goods and services essential for securing the right to water

The General Comment also stresses the fundamental importance of ensuring access to adequate sanitation and States Parties obligation to progressively extend safe sanitation services, particularly to rural and deprived urban areas, taking into account the needs of women and children.

Non-state actors obligations are stressed as follows (WaterAid 2003):

- Co-operate effectively with States Parties in relation to the implementation of the right to water
- Incorporate human rights law and principles into both policy and action; for example, the right to water should be taken into account in any lending policies, structural adjustment programmes or development projects
- Give priority to the most vulnerable or marginalized groups of the population in the provision of aid and the distribution and management of water and water facilities

Defining water as a human right leads to a broader basis for advocacy work for the water needs of human beings. Utilising the right to water means: (WaterAid 2003)

- Paving the way for translating the right to water into specific national and international legal obligations and responsibilities;
- Raising attention towards water management all over the world;
- Identification of minimum water requirements and allocations for all;
- Setting priorities for water policies centred around the water needs of human beings;
- Catalysing international agreements on water issues and, thus contributing to resolutions of watershed disputes and conflicts between different users
- Emphasising the governmental obligation to ensure sufficient access to water and sanitation.
- Providing a basis for lobbying towards water needs on the basis of political commitments

All human rights are indivisible. They are inter-related. A lack of water and sanitation clearly has an impact on the enjoyment of other human rights, such as the rights to education, health and work, which form an essential basis for poverty elimination and human development as well.

Recognizing water as a human right creates the political will to solve the water crisis, lowering poverty and raising health by establishing a partnership between the human rights and the water sector community.

3 Analysis of UN criteria

The following chapter analyses the UN criteria given in the Comment and intends to identify the main shortcomings regarding the human right concept. For detailed numbers and figures as well as special issues please see the country case studies.

3.1 The criteria of the UN concept

Availability

Regarding physical access the Comment states that "*a water supply is sufficient and continuous for personal and domestic uses, such as drinking, personal sanitation, washing of clothes, food preparation, personal and household hygiene"* if it follows at least the basic access defined in the WHO guidelines (Please see ANNEX I:). It needs to be taken into account that some individuals and groups may also require additional water due to health, climate, and work conditions. (UN 2002b) Regarding the WHO guidelines for each of the countries, it can be stated that there is a lack of information to fulfil the needs for an evaluation of the WHO guidelines.

Water quality

Water is often also scarce in quality. The water supplied must be safe regarding water quality for domestic use aspects as well.

The Committee refers to the WHO Guidelines for drinking water quality (WHO, 1993) which are meant to guide governments to develop national water quality standards to be sufficient to fulfil all human beings needs.

Accessibility

Regarding the Comment water and water facilities and services must be accessible to every human being. It identifies four overlapping dimensions of accessibility, defined as follows (UN 2002b):

- Physical accessibility:

"Water, and adequate water facilities and services, must be within safe physical reach for all sections of the population. Sufficient, safe and acceptable water must be accessible within, or in the immediate vicinity, of each household, educational institution and workplace. All water facilities and services must be of sufficient quality, culturally appropriate and sensitive to gender, life-cycle and privacy requirements. Physical security should not be threatened during access to water facilities and services."

WHO Guidelines for water availability mentioned above are serving as the guiding document in assessing that criteria as well.

- Economic accessibility:

"Water, and water facilities and services, must be affordable for all. The direct and indirect costs and charges associated with securing water must be affordable, and must not compromise or threaten the realization of other Covenant rights."

In general, water service is affordable, when not more then 2% of the average family income needs to be spent for water. (AWWA 2000)

Non discrimination against marginalized areas or groups

"Water and water facilities and services must be accessible to all, including the most vulnerable or marginalized sections of the population, in law and in fact, without discrimination on any of the prohibited grounds." (UN 2002b)

Governments are obliged to take steps to remove any de facto discrimination that could impede enjoyment or exercise the right to water. They have to give special attention to those individuals and groups who have traditionally faced difficulties in exercising the right to water, e.g. women, children, minority groups, indigenous peoples, refugees, asylum seekers, internally displaced persons, migrant workers, prisoners and detainees.

Information on water issues

All states are obliged to make information about water freely accessible, "*including the right to seek, receive and impart information concerning water issues.*" (UN 2002b)

3.2 Evaluation of the UN criteria

EGYPT

Criteria	Current statistics and / or situation	Comments
Availability of sufficient and continuous water supply	Per capita availability of fresh water decreases with time (per capita fresh water = 815 CM/year) It is expected to drop to only 500 m^3 in 2025 Egypt share of Nile water is fixed by 55.5 bm^3/year Rainfall is very limited only on the northern part of delta.	Participate in the Nile basin imitative to decrease the river water losses for the benefit of all basin countries Rainfall & flash flood harvesting Potential increase of utilization to 12.0 BCM/year Desalination is actually practiced in the red sea coastal area to supply tourism villages and resorts with adequate domestic water supply Expand utilization of non-conventional sources potential increase of agricultural drainage reuse = 7.5 BCM/year potential increase of treated sewage water reuse = 4.5 BCM/year
Water quality	Increasing rate of high pollutants in network of canals and to less degree in the river Nile. Some black spots are present along the Nile River and the irrigation drainage network. Gradual increase in groundwater contamination (due to use of pesticides/ fertilizers/ mixed salt fresh water) in the rechargeable Nile aquifer	Prevent untreated or semi treated municipal and industrial waste water from discharging into drains and sometimes directly into the Nile river and canals. Prevent water discharging in the Nile river in upper Egypt Decrease the leaching of fertilizers and pesticides from agriculture

Accessibility of water facilities and services:		
Physical accessibility	High rate of population increase about 2% annually High rate of urban expansion Low efficiency of the municipal water distribution net work (leakage losses) Water quality degradation	First priority should be given to municipal water demand: Surface water supplies (83%) groundwater supplies (117%) Increase safe piped water coverage 97% for urban population 70% for rural population Increase sanitary facilities coverage for rural population
Economic accessibility	High investment in capital costs of municipal and sanitary services. High costs for operation and maintenance of the municipal and sanitary distribution networks Low income of population, especially in rural areas High level of unemployment High level of illiteracy	
Non-discrimination	Low investments and poor services for population in rural areas Poor maintenance and misuse of facilities in rural areas	Better allocation of budgets and investments for urban and rural areas Use of mechanism for incentive distribution for national use of fresh water in rural areas.

Information accessibility	Information are difficult to obtain due to poor dissemination systems and low investment in informatics industry	Raise public awareness for informatics technology Invest more in information dissemination Invest more in building communication facilities
Water for food	Annual net deficit in the agriculture trade balance about 3.03 billion US$ The shortage in food supply reached about 7.7 Million tons representing 30% of total demand Increasing Gap between Supply and Demand for Food The amount of food aid that is given to Egypt from donor countries has been declined sharply in the last decade	Provides subsidies to four main food items bread, wheat flour, and sugar and edible oil. Bread and wheat flour are available to all Egyptians while sugar and edible oil are distributed through ration cards The number of subsidy card holders reduced from 79% in 1994 to 65% in 1999 as a result of the government policy to reduce food subsidies where the total budget cost of food subsidies reached 4 billion L.E. (about 1.5% of GAP) Increase self-sufficiency ratio of major crops Increase of self-sufficiency ratio of wheat to be 75% through improving both the supply and demand for wheat Expand the use of mixing wheat and maize (80% wheat and 20% maize) in producing baladi bread to reduce the demand for wheat Increase the self-sufficiency ratio of edible oil to 26%

Water for environmental hygiene (the right to health)	Direct release of industrial effluents to the river Nile Low sanitation coverage Low level of public awareness	Stop 32 main industries from dumping its water to the river Nile Strengthen environmental laws and legislation The industrial sector has allocated about 2.4 billion LE in the last decade on wastewater treatment projects to comply with the environmental regulations Building national network for water quality monitoring
Water for households (the right to adequate housing)	Safe water for municipal use is provided to 97% of urban areas and population, 70% of rural areas and population.	Increase investments in building municipal and sanitary facilities Sanitary facilities to be increase for rural areas Increase expenditure on operation and maintenance of the distribution systems Raise public awareness for rationalizing the use of fresh water
Water for securing livelihoods (the right to work)	Increasing rate of unemployment Un-efficient and non adequate treatment elements Low level of capacity building	Increase the rate of implementing treatment plants Organize training programs for young professional about operation and maintenance of municipal and industrial facilities and networks.

Sectoral water distribution	Per capita cultivated land has been declined over time from 0.51 feddan in 1897 to 0.23 feddan in 1960 and to 0.11 feddan in 2000 Share of agricultural sector has been declined to 14% of GDP Share of industrial sector is 33% of GDP Share of services sector (including government) is 51% Increasing demand for water in all sectors Total agricultural water demand = 61 bm^3/year Crop consumptive use = 41.441 bm^3 Municipal water demand = 4.6 bm^3/year Industrial water demand = 7.53 bm^3/year	Increase agriculture land area by 3.4 mf by year 2017 Encourage private sector participation in industrial sector development Expand the use of thermal power plants in electricity generation Liberalization of agriculture sector Navigation and hydropower generation are only by-products of water released for other purposes
Management of available resources	Cultivation of intensive water demand crops Low on-farm efficiency High transmission losses in the irrigation network Low level of public awareness of water scarcity Centralized water management controlled by the government	Overall efficiency of Nile water use is high due to multiple reuse of drainage, shallow groundwater, and wastewater Decrease gradually the rice area and restrict it to 700 thousands feddan Keep the sugarcane area constant at 300 thousand feddan to satisfy the existing sugar mills capacity and gradually increase the area of sugar beet to compensate the limitation on sugarcane area Increase agriculture productivity by 40 % annually

		Expand the iip project to cover all agriculture land Institutional reform of water sector Increase water users participation in the management process: -National water resources plan -Water user associations -Water boards
Cost recovery of water services	Increasing budget for O&M of water management The Government is almost the sole source of funding for water resources management projects	Annual budget of MWRI increased from L.E. 2.39 billion in 1997/98 to L.E. 4.46 billion in 2003/04 Annual budget of MALR has been increased from L.E. 3.35 billion in 1997/98 to L.E. 6.88 billion in 2003/04

JORDAN

Criteria	Current status	Comments
Availability of sufficient and continuous water supply	97% of population is linked to public water supply systems, with an average of two days supply per week	The public water supplies are not sufficient for households consumption, demand is rising for bottled and tanked water
Water quality	Figures and statistics are variable. Independent assessment show that more than 50% of spring waters is biologically contaminated and a high salinity level. Surface water is not adequate for drinking	More investments in water treatment plants are being developed. More emphasis on brackish water desalination for drinking purposes and reuse of treated wastewater for agriculture.
Accessibility of water, water facilities and services		
Physical accessibility	100% of urban and 87% of rural population served with piped water. Many rural households have cisterns	Huge amounts of investments are needed since most reliable water resources are far from major human settlements. Treatment plants are well distribution all over the country.
Economic accessibility/ affordability	Domestic piped water prices are within the affordability of the Jordanian poor. The supply is not continuous and the water prices for bottled water and tanked water is 8-10 times more than piped water.	Water supply is still considered as subsidized by the government; the discontinuity of water supply forced people to buy bottled and tanker water. Privatisation of water supply network and utilities had a minor impact on the economic affordability

Non-discrimination	Water supply in rural areas is only 8% less than urban areas. No significant geographical discrepancies are there.	With increasing population and decreasing resources, a discrepancy in water rights between the rich and poor could be evident with privatisation processes.
Information accessibility	Good media coverage of water issues and some awareness activities by civil society. Databases of water present in public and research institutes.	Vital information and data not accessible to public or even independent researchers.
Water for food	Agricultural practices add to water exploitation. Increasing agricultural water tariffs leaves family farmers in a non-competitive state with modern industrialized farmers/investors	Stringent bylaws to monitor water abstraction from agriculture water wells causes unrest in farmer communities. Deep agricultural reforms are needed
Water for environmental hygiene	Badly treated wastewater is a major cause of environmental degradation. Basic water flows are decreased in all aquatic ecosystems.	Reduced amounts of available water contribute to health and contamination problems, especially in rural and urban areas with low sanitation levels.
Water for households (the right to adequate housing)	More than 90% of households connected to water network. Inadequate maintenance conditions in poorer areas.	All new households are required by law to have water collection cisterns,
Water for securing livelihoods (the right to work)	Industrial water demand is on the rise. The prices for industrial and commercial water is high (about 1.0 per CM)	More allocation of industrial water on the expense of irrigation water, priority shift to industries.

LEBANON

Criteria	Current Statistics and/or Situation	Comments
Availability of sufficient and continuous water supply	Only 16% have high satisfaction of needs with 74.2% and 9.8% classified as intermediate and low, respectively	No information about continuity of flow and rationing hours.
Water Quality	Up to 70% of the water sources are contaminated by either microbial or chemical agents	Water authorities chlorination units functional but the secondary and tertiary networks deteriorated
Accessibility of water, water facilities and services		
Physical accessibility	79.2% have access to public network, 16% are connected to public network or private network and an artesian well, and 4.7% are not connected to any network	Secondary and tertiary networks are deteriorated and were not subject to adequate rehabilitation.
Economic accessibility	Price per cubic meter ranges from USD1 to USD 2.5 for underground water. Public network fees USD 130-USD 150 per year for 1 CM/day	Not affordable for all households and tendency to increase share through illegal actions
Non-discrimination	Remote areas of Akkar and Hermel are mostly affected by the coverage of the public network.	Political strength affects the accessibility
Information accessibility	Existing data are inadequate, but mostly not for public use.	Political dimensions control the accessibility to information
Water for food	Limited to rural areas for food production and processing. Major consumer of water (>60%)	Irrigation techniques and networks should be improved to reduce losses

Water for environmental hygiene (the right to health)	Sewage treatment exists in very few villages. Sewage water is causing pollution of ground and seawater.	Health problems are become more frequent due to contact with polluted water
Water for households (the right to adequate housing)	n.n.	n.n.
Water for securing livelihoods (the right to work)	Industrial consumption about 12% of total while Agricultural is about 70%.	Need to support irrigable areas currently rain-fed only. Industrial consumption needs revision for unaccounted sources

PALESTINE

Criteria	Current statistics and/or situation	Comments
Availability of sufficient and continuous water supply	42.3% of localities have a continuous water supply; 19.2% partial. 26.3% of households have cisterns in the West Bank.	~40% of served localities suffer from water shortages. 22% of population not served with piped water.
Water Quality	West Bank: Good quality 89.9% Gaza Strip: Good quality 28.7%.	Unsafe and unacceptable water quality in the Gaza Strip. There is also a potential for soil and groundwater pollution from agro-chemicals, industrial activities, and improper disposal of wastewater and solid wastes.
Accessibility of water, water facilities and services		
Physical accessibility	55% of West Bank localities served by piped water – 88% of population. 95% of Gaza Strip localities served by piped water.	Most urban areas have piped water supplies – although not always reliable and continuous. Many villages are not able to become connected to a piped water network because of a lack of access to water resources.
Economic accessibility	Price per cubic meter of water for Palestinians is about 5 NIS. Tanked water is 5-6 times more expensive, reaching 25 NIS per CM	The cost of water is high, even though there is a graduated tariff system. The current socio-economic conditions make paying utility bills very difficult. The rural villages – and even some urban areas – are forced to buy tanked water at very high prices.
Non-discrimination	Services low in small villages and refugee camps.	These places suffer most from the Israeli measures of collective punishment and oppression.

Information accessibility	Water resources data base exists Some public awareness in schools and during specialized workshops	Data not easily accessible to public.
Water for food	Household gardens increasing in number. Agricultural lands being left unplanted	Water for irrigation minimal. No increase in allocations since 1967. Access to agricultural land restricted.
Water for environmental hygiene (the right to health)	Environmental conditions often poor due to improper disposal of wastewater and solid wastes – and lack of readily available water supply.	Public health problems increasing due to poverty, lack of water and facilities for proper hygiene, and deteriorating economic conditions.
Water for households (the right to adequate housing)	City households with water supply 70% Villages and refugee camps not all connected to piped water.	Inadequate housing conditions increasing due to lack of services and infrastructure and building destruction.
Water for securing livelihoods (the right to work)	Industrial water supply 8% of total.	Socio-economic conditions deteriorating. No increase in water allocations for industry expected in near future.

4 Main concerns and development objectives regarding the UN concept

The UN concept for water as a human right was used as a tool for analysis using the criteria given within the concept. The main concerns and development objectives regarding the UN concept in general and evaluating the country studies which has been identified are as follows:

4.1 Indicators and benchmarks

Indicators can provide a broad, yet succinct, description of the condition of a water sector. They can describe and track changes in key aspects as well as in the sector configuration and conditions.

The UN concept lacks a coherent system of indicators to evaluate a water sector. Often problems arise in certain areas, which are difficult to access by the suggested WHO guidelines making it difficult to identify inequalities and discrimination faced by people, which impede their development. A comprehensive indicator system and corresponding benchmarks could help to overcome these shortcomings.

4.2 Information lack

Good and accessible information is the basis for making decisions about water resources. To evaluate the water sector detailed information are needed.

Information and data availability varies from country to country. Most concerns exist regarding data accuracy, reliability, consistency and deficiencies.

4.3 Poor governmental commitment to the human right concept

Water governance refers to a range of political, social, economic and administrative systems that are in place to regulate the development and management of water resources and provision of water services at different levels of society. Effective water governance is a prerequisite to fulfil the human right on water.

Regarding the governmental commitment to the human right concept it can be stated that there is no single legal norm in any of the countries evaluated serving as a binding instrument for the human right on water although national governments are obliged to fulfil international commitments on human rights. Governmental obligation to fulfil international law regarding water in general depends on political interests and economic viability.

4.4 Low awareness of people of the right on water

People are in general not aware of their right to sufficient water supply in quality and quantity. People often simply do not know about their right. Education and empowerment could serve as a way out and a starting point for political engagement.

Stakeholders such as NGOs play an important role in encouraging dialogue among people towards their awareness of the right to water.

4.5 Growing awareness of water problems and water saving possibilities

In all countries a growing awareness of water as a finite resource were identified, but still work needs to be done. Often water is seen as a political issue rather than a basic need for life.

Several methods and tools are available to promote water awareness to create an environment to support effective water policies and an understanding of water issues, which should be applied.

4.6 Discrimination of marginalized groups

Discrimination is still in place depending on political power, especially discrimination of people living in remote areas and social groups with low economic capacity.

4.7 Growing number of people who cant afford water

In each of the countries analysed a growing number of people exists who cannot afford a minimum of water supplied. Often people with no or low access to water are affected, living in poor neighbourhoods who must buy water from private vendors at high water prices. A free provision of a certain amount of water or providing of water at an affordable level to serve basic needs should be obligatory.

4.8 People centred approach

As expected for a human rights approach, the UN concept for water as a human right is characterized as a sole people-centred approach to development, not recognising the “water rights” of environment in an equal manner.

A people centred approach is preferable to a top-down approach which was traditionally in place with water systems imposed on the people by governmental and professional sectors. It is more effective, efficient and less costly. But water is also needed to maintain and recreate nature and environment. The amount of water for peoples' use needs to be balanced with the needs of the environment.

5 The role of NGOs in the realization of the human right on water

5.1 Possible fields of NGO activities

Internationally active NGOs could contribute in several ways to the realization of the right to water.

The identified possible fields of activity are as follows:

- Promoting human right concepts by raising awareness and informing on aspects of the right to water and on how citizens can claim that right and assist others in fulfilling it;
- Building capacities among local groups to monitor the commitment and work of local government and therefore contributing to ensuring that an adequate policy is in place, and that the policy is implemented;

- Supporting local service provision by raising awareness to water as a limited resource, e.g. awareness campaigns, informing and training, especially in schools for instance in the management of community water supplies.
- Contributing to the development and promotion of international standards, benchmarks and indicators on the right to water;
- Documentation and highlighting of violations of the right to water;
- Advocating in international and regional forums on behalf on those who have had their right to water threatened or violated.

5.2 Pre-condition for work

Especially in Palestine, but in all other countries as well, the political situation is affecting much work and engagement of NGOs in water issues. During the last decade working on water issues became a key NGO working concept in most of the countries of the Near East. Environmental NGOs are the main player; NGOs which are affiliated with political parties are recently only exceptionally engaged.

The fact that several NGOs are running regional offices in different countries is seen as a great advantage in contributing to the realization of the human right concept on water. Precondition for solving the ongoing water crisis is cooperation between the affected states, primarily if they are using the same water resources. Cooperation between Israel and its Arab neighbours is seen as a precondition for each future project. Sensitivities of the Arab partners in doing so needs to be carefully taken into account.

Depending on the project content, a suitable project partner needs to be identified. Numerous NGOs have been identified in each country by the project partners which certainly are willing to cooperate.

Sufficient financial sources need to be provided.

6 References

(Only the references of the synthesis report are listed. Please see the country case studies for further references.)

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ANNEX I: WHO Indicators for physical water access

Table 1: Service level and quantity of water collected

Service level	**Distance/time**	**Likely volumes of water collected**	**Needs met**	**Intervention priority and action**
No access	More then 1 km/ more then 30 min round trip	Very low (often below 5 Liter/capita/d)	Consumption can not be assured, Hygiene practise compromised, basic consumption may be compromised	Very high Provision of basic service
Basic access	Within 1 km/within 30 min round trip	Average unlikely to exceed approximately 20 Liter/capita/d	Consumption should be assured, Hygiene may be compromised, Laundry may occur off-plot, e.g. away from home	High Hygiene education Provision of intermediate level of service
Intermediate access	Water provided on plot through at least one tap (Yard level)	Average of 100-200 Liter/capita/d	Consumption assured, Hygiene should not be compromised, Laundry likely to occur on-plot, e.g. within the confines of the household	Low Hygiene promotion still yields health gains Encourage optimal access
Optimal access	Supply of water trough multiple taps within the house	Average of 100-200 Liter/Capita/day	Consumption assured, Hygiene should not be compromised, Laundry will occur on-plot	Very low Hygiene promotion still yields health gains

Source: : (Howard 2003

ANNEX II: Curriculum Vitae of project partners

KAREN ASSAF

ARAB SCIENTIFIC INSTITUTE FOR RESEARCH AND TRANSFER OF TECHNOLOGY, PALESTINE

Most professionals in the water sector in the Middle East recognize Karen's contribution in water research and water management and understanding of its multiple uses. Since she moved to the Palestinian area of the West Bank 27 years ago from her last position as a loss prevention specialist in the water pollution problems at Shell Oil Company in Houston, many of the current Palestinian water experts were either taught, trained or had joint water research and development projects with her.

With a Ph.D. in Environmental Science/Hydrology and a dissertation on water recharge from the University of Texas at Houston, Dr. Karen Assaf started on the right footing when she entered the water deficient Middle East region. Recharge was the key for joint cooperation of ideas with no conflict between Palestinians and Israelis. She has taught at local universities (Birzeit and the Arab University of Jerusalem – called Al—Quds University) and worked for many years with an international NGO in implementing over 65 town and village water projects and 40 health clinics in both the West Bank and Gaza Strip. Dr. Assaf published many articles, books, and reports on various aspects of water management and lately put forward the concept of the water usage cycle, instead of the traditional water cycle.

Dr. Assaf was accredited by many honours, such as Board membership in the International Water Resources Association, the UNESCO and ESCWA Mideast water experts groups and a USA National Academy of Science committee, Palestinian representation in the Multilateral Water Resources Group, an Advisor to the Palestinian Water Authority, and consultant on environment and water for the National Scientific Research Centre of Palestine. She chaired many international water and environment conferences. All these recognitions she received despite the fact that she is not an indigenous Palestinian. She functions from a small office in a rented municipality building on top of the most crowded vegetable market centre in El-Bireh-Ramallah, the centre of the West Bank under the name ASIR, the Arab Scientific Institute for Research and Transfer of Technology, which is an NGO with a multi-disciplinary board that she established with her Palestinian husband Professor Said A. Assaf in 1981. .

BAYOUMI ATTIA

RESOURCES TECHNOLOGY BUREAU AND ENGINEERING CONSULTANCY, EGYPT

Bayoumi Attia has over 30 years of experience in all aspects and phases of water resource planning investigations. His experience also includes significant expertise in hydrology, computer modeling, management information systems and decision support systems.

He has severed as project director for several complex water resource studies with critical sensitive public and environmental issues.

He has served in assisting the Minister of Ministry of Water Resources and Irrigation (MWRI) in all activities related to the planning of the water development projects in Egypt. This includes directing all planning efforts and providing the necessary supervisory control for overall plans and coordination to complete the projects on time and within the allocated budget.

To achieve his assignments *Mr. Attia* has worked directly with many of the official water concerned authorities, as well as non-government interest groups and members of the general public putting to the best use his skills of communication and negotiation.

He had a major contribution in preparing Egypt's Water Master Plan issued in 1981 and updated in 1985 (35 technical reports).

He took the responsibility of preparing the Water Policy of the Ministry of Water Resources and Irrigation towards the 21st Century (up to year 2017).

He was selected as a representative of Egypt in the confined international committee for the preparation of the ministerial declaration of the 2000's World Water Forum.

He was a member of the Egyptian official delegation who attended World Water Forum held in Hague (the Netherlands) in March 2000.

He has undertaken several consultancy tasks (shown in details under "Major Consulting Jobs" title) for both national (IDSC, EEAA, MALR/APRP) and international organizations (IBRD, FAO, ESCWA, USAID, IDRC).

ALI DARWISH

GREEN LINE ASSOCIATION, LEBANON

Ali Darwish, a key member in one Lebanon's environmental NGOs, has a broad knowledge of the major problems and constraints facing the natural resources in the country.

After earning his Ph.D. in Agricultural sciences, he returned to his country to pursue his career. Throughout his activities with the organisation Green Line he was responsible for the coordination of activities in a programme to develop a monitoring system for protected areas, which was extended to other areas.

In addition to his part-time work as the project manager for the National Action Programme to Combat Desertification with the Ministry of Agriculture and UNDP, He works as a freelance consultant for a number of international organisations.

Mr. Darwish is also active in a number of national and international panels and organisations, such as the International Planning Committee for Food Sovereignty and the World Conservation Union (IUCN).

BATIR WARDAM

IUCN REGIONAL WATER PROGRAMME IN WEST ASIA AND NORTH AFRICA, JORDAN

Batir M. Wardam is a Jordanian environmental researcher working currently in the IUCN regional Office for West, Central Asia and North Africa (WESCANA) in Amman. He holds a Master's Degree in Ecology, and has practical experiences as an environmental researcher and communicator with the World Bank, Global Environmental Facility (GEF), UNDP and IUCN projects in Jordan.

He has written 8 books and authored many articles and reports in environmental issues in Jordan. He has established the Environmental Watch Programme in Jordan and is currently a columnist in two Jordanian newspapers and some regional newspapers and magazines.

SIMONE KLAWITTER

POLICY ADVISOR, GERMANY

With more then 10 years experiences with many water agencies, Simone Klawitter, a German national, has served in various capacities and locations of the Water and Sanitation sector as policy advisor, consultant, academic and volunteer.

Recently her work focuses on water pricing, institutional aspects, good governance and human rights aspects in the water sector in the Middle East, East Europe and Germany on behalf of different governmental and non-governmental organizations.

From a background in Physics, Environmental Law and Economics, she is the author of several publications on different aspects of water and sanitation services as well as sustainable development.

SUPPLEMENT: Country Case Studies

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Countries: Egypt, Jordan, Lebanon, Palestine

Egypt

Water as a basic human right in Egypt

By Dr. Bayoumi B. Attia, Egypt, Advisor to the Ministry of Water Resources and Irrigation (MWRI) for Water Resources Planning, Resources Technology Bureau and Engineering Consultancy (RTB)

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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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Jordan

More politics then water: Water rights in Jordan

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Objective

This study is being prepared for the Heinrich Boll Foundation (HBF) as a part of a series of regional case studies on water as a human right in the Middle East, based on the UN concept of water rights adopted in the General Comment no. 15 in November 2003.

The international community has affirmed the human right to water in a number of international treaties, declarations and other documents. Most notably, the UN Committee on Economic, Social and Cultural Rights adopted in November 2002 a General Comment on the Right to Water, setting out international standards and obligations relating to the right to water. The human right to water recognizes the essential nature of water for human life. It also highlights the fundamental nature of the problem: there is enough clean water for everybody but the poor, the vulnerable and the marginalized are denied equal and affordable access.

The aim of this study is to analyse the extent to which the concepts of water rights are acknowledged in each country. The study aims to identify the scale of knowledge and commitment to the UN indicators in the country and to identify the main areas of national concern regarding water as a human right. This study will also analyse whether the on-going global discussions on water rights are influencing the country's water policies and strategies.

The knowledge resources for this study were derived from the analysis of Jordanian water policies and strategies, and from studies of the state of water resources, and the management plans and measures adopted by various stakeholders associated with water management in Jordan**.**

Summary

This study analysed the state of knowledge and context of the UN right to water concept criteria in Jordan. The country is considered one of the ten most water-scarce countries in the world, and the demand for water resources is on a rising curve due to population growth and over-exploitation, as well as pollution of available water resources.

Despite the scarcity of natural resources, and the very low per capita water average share of 160 CM annually, about 95% of the population of Jordan is served by the public piped water supply. This supply is not reliable and continuous. With an average of two days' supply per week, this has increased the demand on high price bottled water and tanker water for household use and thus put more pressure on the household water bill.

Water quality figures and statistics are variable. Independent assessments show that more than 50% of spring water is biologically contaminated, with a high salinity level. Surface water is not adequate for drinking**.** More investments in water treatment plants are being developed with particular emphasis on brackish water desalination for drinking purposes, and re-usage of treated wastewater for agriculture**.**

In general, domestic piped water prices are affordable for the Jordanian poor. But the supply is not continuous, and the water prices for bottled water and tanked water are 8-10 times that of piped water.

Water supply is still subsidized by the government, and the price paid by the consumer does not reflect the full cost of its demand management. Privatisation of the water supply network and utilities had a minor impact on the affordability of water for consumers, but with increasing population growth and decreasing resources a bigger impact could be foreseen in the future.

Water supply in rural areas is only 8% less than in urban areas. No significant geographical discrepancies are evident**.** With an increasing population and decreasing resources, a discrepancy in water rights between the rich and poor could develop with privatisation processes.

Agricultural practices exacerbate water exploitation. Agriculture consumes about 70% of available water resources and constitutes only 6% of the Jordanian economy. Increasing agricultural water tariffs leave family farmers uncompetitive in contrast with modern industrialized farmers**.** Stringent bylaws to monitor water abstraction from water wells for agricultural purposes cause unrest in farming communities, provoking strong political and social resistance.

By surveying the current state of knowledge on water issues and policies in Jordan, it is clear that the vision and criteria of water rights as stipulated by the UN General Assembly in 2003 are not directly integrated into the Jordanian water policy, at least in theory.

The declaration itself is not well known amongst Jordanian citizens and researchers alike. The concept of water as a human right, and the various UN criteria, should be better promoted by public awareness campaigns, especially by NGOs.

Although the concept is not integral to Jordanian water policy, many of its criteria and objectives are being advocated by various institutions in the country. Accessibility and continuous supply are considered to be the highest priorities in the water sector in Jordan. Despite natural scarcity, regional conflicts and increasing population, Jordan has managed to supply around 95% of its population.

The concept of water as a human right would be widely endorsed by the Jordanian public and decision-makers as well. The country is facing a severe water shortage, and the government has already practically indicated its commitment to bringing a stable water supply to all Jordanian citizens by investing highly in the water sector. The civil society, community and academic bodies are viewing water as an essential priority, and the integration of the water rights concept would have a positive steering role for policy making and everyday activities, including consumption behaviour.

It is recommended that a comprehensive assessment of the socio-economic dimensions of the right to water should be conducted in Jordan, and a portfolio of suggested interventions should be developed to monitor and support the integration of the water rights concepts. This is necessary due to the complexity of political, social, economic and environmental aspects of water resource management in the country.

Introduction

The Hashemite Kingdom of Jordan was named after the River Jordan when the country gained independence from British mandate in 1946, and this link has been very apparent throughout the modern history of the country. If one country's fate in this world is linked directly to its water resources, this country should be Jordan.

With a per capita availability of 160 CM /year of fresh water, Jordan is ranked among the world's ten most water scarce countries (UNESCO World Water Development Report 2003). Nature has not been generous to Jordan in terms of water resources. Jordan is a semi-arid country with scarce rainfall, erratically patterned. Politics has added to the pressure on Jordan's water resources. During the period 1948-1991, partly due to political turmoil in the region, the population of Jordan doubled 9 times, exerting heavy pressure on water resources.

The political tension in the Middle East did cast its shadow on Jordanian water resources by causing political and military conflicts over shared water resources, especially with Israel. Some Arab and Israeli analysts suggested that the six-day war of 1967 was an attempt by Israel to gain control of the rich groundwater resources in the West Bank and the upstream of the River Jordan. The Jordanian-Israeli peace treaty in 1994 contained a special annex on shared water allocations, but the implementation of this agreement has been tied to the shifting political relations between Jordan and Israel. Even now, the Jordan River has more religion and politics in it than water!

Facing such existence-threatening challenges in terms of water resources, Jordan realized soon enough that it had to come up with creative and stringent policies to conserve its water resources, and reform its water sector in order to meet the needs of its population, its economy and its ecological integrity. Jordan is now emerging as a regional model in applying a package of measures to sustainable manage its meager water resources. This package of measures include policies, technologies, non-conventional resources, awareness and structural reforms that have helped the Government of Jordan to provide access to improved water sources for about 95% of its population in 2002. Still many challenges remain to be tackled.

1 The national water sector

1.1 National macroeconomic setting, development objectives and water policies

Without a doubt**,** water scarcity is the single most important natural constraint to Jordan's economic growth and development. Rapid increases in population, agriculture and industrial development have placed heavy demands on water resources. Jordan's population reached 5.3 million in 2003 and is growing at a very high annual rate of 3.6 percent.

Due to the variable topographic features of Jordan, the distribution of rainfall varies considerably with location. Rainfall intensities vary from 600 mm in the north west to less than 200 mm in the eastern and southern deserts, which form about 91% of the surface area.

The average total quantity of rainfall on Jordan is approximately 7200 MCM/year, varying between 6000 and 11500 MCM/year. Approximately 85% of the rainfall evaporates into the atmosphere, the rest going into rivers and wadis as flood flows, and recharging groundwater.

Groundwater recharge amounts to approximately 4% of the total rainfall volume, whilst surface water amounts to approximately 11% of total rainfall volume.

The water scarcity issue is not only due to nature and poor resources, but is largely a man-made problem caused by politics in the region.

When Jordan gained independence in 1946 the water resources totalled 1,000 MCM per year, providing an annual per capita average of 3,000 CM. If the population growth in Jordan were to have remained normal, the country would have reached a population level of 3.0 million by 2002 compared to 5.0 today. The population explosion in Jordan has been a direct cause of the creation of Israel in 1948 and the influx of Palestinian refugees from their homes during that period.

A similar effect occurred again in 1967, when Israel occupied the Palestinian West Bank and forced a new wave of refugees into Jordan, placing even greater demands on the country's limited water resources. The military results of the war have meant that Jordan no longer controls its water rights from the Jordan River. It was not until the peace treaty in 1994 that Jordan managed to regain some of its water rights, though with no compensation for the loss of its water resources for the previous 27 years, or for the pressure imposed on its other resources by the high population growth.

To add more political turmoil in the region, the Iraqi invasion of Kuwait in 1990 and the resulting Gulf War forced more than 300,000 Jordanian citizens to return to the country from the Gulf region where they had had their careers and residency.

All this political and humanitarian drama has stretched the water resource of the country to their extreme limit, and eroded the rights of the Jordanian population to water. It was always an uphill battle for the Jordanian Government and other stakeholders to meet the ever-increasing demand on water in the country.

Strength and weakness

Jordan has a chronic shortage of water resources due to natural occurrence of water and rainfall. The country's natural water cycle is an “integral” weakness in terms of water resource availability. To add more pressure, political instability in the region has contributed to an unnatural population growth, caused by the influx of refugees from various Middle East wars.

Such challenges, however, forced Jordan to identify at an early stage the need for proper water management. In the 1960s and 70s, while most Arab nations were "enjoying" an unsustainable water management and allocation system, Jordan was forced to create institutions, develop technologies, identify solutions and raise awareness to better manage its water resources. This early start has been a major strength component in developing the future water policies of the country, by working from the very beginning on sustainable management of its resources.

1.2 Water resource assessment: Base and potential

1.2.1 National water management policies

Due to the increased water demand, the Ministry of Water and Irrigation (MWI) adopted a Water Strategy in 1997 and supplemented it with different water policies in four water sectors, aiming to balance water demand and supply, with an emphasis on giving a major role to the private sector. The four policies are related to: groundwater management, irrigation water, water utilities and wastewater management. The Government of Jordan also embarked upon a privatisation program. The goal was to increase the efficiency of management, and attract private investment into the economy.

The groundwater management policy addressed the management of groundwater resources, covering development, protection, and reducing abstraction from each renewable aquifer to sustainable rates. The irrigation water policy addressed irrigation water including agricultural use, resource management, technology transfer, water quality and efficiency. It stated that irrigation water should be managed as an economic commodity, that water price has to cover at least operation, maintenance, and, as far as possible, capital costs, and that different prices should be applied to different water quality. The strategy specified also preferential rates for small-scale farmers in the Jordan Valley where the income is lower than other regions in the country.

The utility water policy stated that the MWI will continue as a governmental organization and will be responsible for policy formulation, decision making, national water planning, water resources monitoring and studies, and integrating water information systems. According to this strategy, the Water Authority of Jordan (WAJ) will begin separating its bulk water supply and retail delivery functions, and move these functions and services into the private sector via commercial enterprises.

With respect to private sector participation, the policy states that the government of Jordan intends to transfer infrastructure and services from the public to the private sector in order to improve the performance and efficiency of the water sector. The use of management contracts and other private sector participation in water utilities was introduced through this policy. Recovery of capital costs, and BOT systems, became

part of all water management policies. The MWI then introduced different prices for different qualities and uses of water. Profitable markets (tourism, industry) pay the full water cost. The water policy states that existing water distribution systems should be rehabilitated and enhanced.

1.2.2 Water resource assessment

The potential for water resources in Jordan ranges from 1,000 to 1,200 MCM, including recycled treated wastewater. Water resources consist primarily of surface and groundwater, with treated wastewater being used on an increasing scale for irrigation, mostly in the Jordan Valley. Renewable water resources are estimated at about 750 MCM per year, including groundwater at 277 MCM/year and surface water at 692 MCM/year, of which only 70% is economically usable. An additional 143 MCM/year is estimated to be available from fossil aquifers. Brackish aquifers are not yet fully explored, but at least 50 MCM/year is expected to be accessible for urban use after desalination.

Groundwater resources

Domestic supply of water to Jordanian population depends mainly on groundwater aquifers. Those aquifers, however, are under severe pressure from the agricultural sector, which consumes about 70% of resources, and the rest is used for municipal and industrial consumption. It is noteworthy that the contribution of agriculture to the Jordanian GDP is only 6%.

Groundwater is considered to be the major source of water in Jordan, and the only source of water in some areas of the country. Twelve groundwater basins have been identified in Jordan. Most basins are comprised of several groundwater aquifer systems. The long term safe yield of renewable groundwater resources has been estimated at 275 MCM/Yr. Some of the renewable groundwater resources are presently exploited to their maximum capacity, and in some cases beyond safe yield. Overexploitation of groundwater aquifers, beyond the annual potential replenishable quantities, has and will contribute significantly to the degradation of groundwater quality in the exploited aquifers, and endangers the sustainability of these resources for future use.

The main nonrenewable groundwater resource in Jordan exists in the Disi aquifer in the South, with a safe yield of 125 MCM/Year for 50 years. Other nonrenewable groundwater resources are estimated at an annual safe yield of 18 MCM.

Box 1: Disi Aquifer- Exploitation of non-renewable resources

The Disi groundwater fossil aquifer is Jordan's strategic reservoir of fresh and high quality drinking water. Due to the scarcity of drinking water resources and the continuous salination of most groundwater basins, the Jordanian government has focused on the Disi aquifer for its future supply of drinking water resources. The Disi aquifer is located 320 Km south of the capital Amman, and any project to transfer water for drinking purposes to Amman would need a huge investment to build a water carrier to bring water to the thirsty capital. The MWI has developed a proposal for building this water carrier (pipeline) and is still seeking international funding.

Developing this carrier is a strategic water management objective for Jordan. It is the

highest priority project among a package of mega-projects proposed and implemented by the government of Jordan to alleviate water scarcity threats to the population.

The Disi is a precious resource. It is a sandstone aquifer with an average recharge age of thousands of years and is classified as a fossil aquifer, although the average annual recharge is 50 MCM. The present extraction rates from Disi for the supply of drinking water to Aqaba for domestic and industrial needs and local agriculture use is about 90 MCM. The water table in the aquifer is decreasing by 0.2 m/Year. The local irrigation uses are for a group of high-tech farms of export-oriented cash crops as well as grains. This process is exploiting the Disi high-quality water, since the irrigation of 1.0 Kg of wheat requires 2.5 CM of high quality water from Disi. Irrigation runoff is also threatening to deteriorate the quality of water in the aquifer.

The exploitation of water resources from the Disi aquifer for irrigation purposes is proving to be a non-sustainable and cost-ineffective practice. Until the water carrier is built to use Disi water for drinking purposes, this precious resource is being wasted.

Surface water resources

The three major surface water systems in Jordan are the Jordan, Zarqa and Yarmouk, but all have become highly undependable. For the Jordan and Yarmouk Rivers, this is due to upstream diversion and over-pumping by Syria and Israel, leaving Jordan with the rest. The Zarqa River system has been severely affected with water pollution from industries in the Amman-Zarqa area, which includes 70% of Jordanian small-medium sized industries.

Until the peace treaty, Jordan had not been able to tap these sources fully, because the three riparian states did not have a water-sharing agreement, due to the technical state of war that existed between Jordan and Israel.

The King Talal Dam is Jordan's largest aboveground reservoir, but it faces two problems. Erratic surface water levels often reduce trapped levels to below the total capacity of 86 MCM. Also, pollution from factories that dump untreated waste into tributaries leading to the dam is raising salinity, chemical, and metal levels.

Wastewater resources

Treated wastewater, generated at sixteen existing wastewater treatment plants, is an important component of Jordan’s water resources. Due to the topography and the concentration of urban population above the Jordan Valley escarpment, the majority of treated wastewater is discharged into various watercourses, and flows downstream to the Jordan Valley, where it is used for irrigation. Currently around 55 MCM of treated wastewater is used for restricted irrigation purposes in the country. The MWI forecasts state that the amount of wastewater used for irrigation should reach 232 MCM by 2020, especially in the Jordan Valley.

The existing wastewater treatment plants are over-used beyond their design capacity due to increased inflow of wastewater. This has reduced the quality of treated wastewater, and this “resource” has not been effectively used to gradually replace freshwater resources in agricultural uses.

Water quality

Water quality in Jordan has deteriorated due to various sources of pollution, and over-abstraction resulting in salination. The Water Authority, Ministry of Environment and Royal Scientific Society in Jordan implemented a joint programme of water quality monitoring in the country. Reports indicate that:

- About 70% of spring water has biological contamination
- Surface water shows high fecal coliform counts from non-point pollution sources, including wastewater treatment plants operating over capacity
- Water resources have a significant level of toxicity
- Industrial discharges are improperly treated or untreated.
- Over-abstraction of groundwater for irrigation has reduced the water table by 5 meters in some aquifers and tripled salinity.
- Unregulated fertilizer and pesticide application has increased nitrates and phosphorus in water supplies.

Strength and weakness

The big challenge facing Jordan in terms of water scarcity and deterioration of quality has led to an early development and implementation of a stringent national water policies package, aiming at conserving available resources and developing new resources. The legislative and institutional framework of the water sector in the country is considered to be relatively developed, compared to other countries in the region. Various water policies have been developed and contain reforms in important sectors such as irrigation water, introduction of public-private partnerships in water infrastructure and services, and conservation of groundwater resources.

This package of policies and laws has been developed to tackle the chronic weaknesses of the natural water resource base. The country's water resources are scarce, subjected to many sources of pollution, and face a high rise in demand due to economic development and population growth.

The national water policies consider wastewater to be a resource for irrigation rather than "waste" from households and industrial processes. However, the low quality of treated wastewater has until now not made this option practical, and wastewater has not replaced precious freshwater resources in irrigation except for a small percentage of irrigation activities in Jordan Valley.

1.3 Analysis of demand and supply of water

Sustainable water supply in Jordan is limited, whereas demand is rising rapidly. The demand in the year 2002 was around 1,000 MCM, of which 450 MCM was derived from surface water while the rest came from renewable and non-renewable groundwater. To meet the deficit between supply and demand, the groundwater aquifers are mined at a rate of 200 MCM annually. This corresponds to about 160% of the aquifers' sustainable yield.

A model of water demand developed by the MWI and the World Bank in 2001 indicated that water requirements will continue to increase as a result of increasing population, including the cumulative impact of past refugees, rising living standards,

industrial development and an increase in scale and intensity of cropping activities in the Jordan Valley.

The present annual water demand amounts to 10% of the annual total rainfall on the country. Almost all the economically viable surface water resources in Jordan have been harnessed, mainly for irrigation purposes. The few remaining sources will be relatively expensive to develop. The groundwater resources of the country are over-exploited; some basins have been completely depleted and the rest, if present trends persist, will run dry within a few years. The depletion of groundwater resources is increasing the salinity of the remaining available water, and so action must be urgently taken to prevent this over-pumping.

Currently, it is estimated that sustainable annual water supply per capita in Jordan is less than 200 CM. Increasing water demand for domestic and industrial purposes is expected as a result of the high population growth rate, and improvements in living standards and the anticipated developments in the tourism and industrial sectors. The amounts of water used for irrigation may have to be reduced in order to satisfy such needs. Increased effectiveness in irrigation, and reallocation from irrigation to other uses, could provide sufficient renewable water to meet the growing domestic demand, at least for the next decade.

The predictable water deficits are high and increasing. Because some potential renewable resources are so expensive to harness, the volume of economically available water is far lower than what could be harnessed annually. Jordan is likely to suffer severe water-rationing early this decade.

The main reason for this high use of water in agriculture is related to the low quantity of surface water available for agriculture, and the fact that the small percentage of land which receives more than 300 mm of rainfall is almost entirely covered by urban development, leaving only dry land to be cultivated. This is exacerbated by the low soil quality and high evaporation rates.

The industrial sector uses around 60 MCM annually and is still growing. The main industrial base in Jordan is the mining and extractive industry, especially for phosphates, cement and potash. All these industries are highly water demanding. Other small-medium scale industries have been suffering from shortages in water supply and increase in their costs. They have opted for more water-conservation efforts in industrial processes by recycling their wastewater streams wherever feasible. The water shortage has also been a limiting factor in the establishment of new industries, as well as expansion of some high-potential energy industries like oil shale.

According to an interesting statistic, the energy sector industries in Jordan (crude oil, natural gas extraction, crude oil refining and thermal plants) use less than 1% of the nation’s annual freshwater supplies. Such a low rate of water consumption is achieved by adopting effective and appropriate designs and the use of seawater for cooling systems.

Jordan is pursuing an economic liberalization system that has resulted in the establishment of many qualified industrial zones (QIZ), and the emergence of new industries following the signing of a free trade agreement with the United States in 2000. This thirst for more investments in the industrial sector is expected to increase the industrial demand for water.

Water losses from the supply network, which suffers from both corrosion and damage, are significant. The unaccounted-for water associated with the municipal and industrial network exceeds 50%, and is most likely to be due to leakages and overflows from reservoirs, unreliable meters and meter reading problems. The overall water losses in the agricultural sector are estimated to be 45%. These losses are unacceptably high in view of the existing water shortages. Thus, the government must act quickly to reduce such losses. This will save not only water, but also the energy required to pump it up from deep wells.

It is very clear that Jordanians are using the minimum amount of water needed to sustain life, not only because they are extremely concerned about water use, but more importantly due to water shortage itself.

1.3.1 Water management and demand projections

Total supply of water is expected to increase from 363 MCM in 2005 to 1287 in 2020, based on the assumption that all projects included in the water Investment programme 2000-2010 are implemented without delay. The relative share of municipal and industrial supply would increase from 35% of total water use in 2005 to 52% in 2020.

In the same period, the MWI model forecasts an increase in the recycling of wastewater from 67 MCM in 1998 to 232 MCM in 2020, with a parallel reduction in groundwater abstraction by 122 MCM/year, which is necessary to reduce/eliminate the current overexploitation and protect aquifers from salination. However, even if all the projects and measures included in the Investment programme were to be implemented, the net increase of available supplies by 385 MCM/year would not keep pace with the increase in water requirements by 442 MCM/year.

Table 2: Summary of water supply (MCM/year)

Year	**Municipal and industrial**	**Agricultural**	**Total supply**
1998	275	623	898
2005	363	679	1042
2010	486	764	1250
2015	589	693	1283
2020	660	627	1287

Total water requirements are expected to increase from 1205 MCM in 1998 to 1647 MCM in 2020. The demand will increase mainly due to increased municipal and industrial demand from 342 MCM to 757 MCM. This increase will be triggered by population growth and higher municipal water requirements per capita due to higher living standards. In agriculture, overall demand is expected to increase slightly from 863 MCM in 1998 to 890 MCM in 2020. This is mainly due to planned higher cropping intensity in the Jordan River Valley.

Table 3: Water requirements (MCM/year) 1998-2020

Year	Municipal and industrial requirements	Agricultural requirements	Total requirements
1998	342	863	1205
2005	463	858	1321
2010	533	904	1436
2015	639	897	1536
2020	757	890	1647

The difference between supply and demand is likely to decrease in the coming 10 years, provided that all projects were implemented. This is of course unrealistic, and the actual situation may witness another increase in deficit in the second decade of the century due to population growth and the exhaustion of most available resources. Drinking water needs will face shortfalls, but since such needs are given top priority in the government's policy, water availability for agriculture will decline in the coming decades.

Table 4: Water demand and supply projections

Year	Total demand	Total supply	Deficit
1998	1205	898	-307
2005	1321	1042	-279
2010	1436	1250	-186
2015	1536	1283	-254
2020	1647	1287	-360

1.3.2 Impacts of water scarcity:

Environmental impacts:

The continuous need for water resources to meet rising demands has had a great impact on the Jordanian environment. The use of groundwater aquifers has dried up a big percentage of aquatic ecosystems in the country. The Azraq Oasis, a wetland of international importance, dried up in 1985 due to the high exploitation of its water resources for domestic and agricultural uses. A series of international rehabilitation projects invested in the restoration of wetland ecological features, but it never regained its natural state.

Most of the cities and towns in Jordan are located on or near wadis that used to have perennial water flow emerging from springs. The human settlements depended on the streams and springs for their water supply, and with population growth the springs' capacity was exceeded and the springs almost dried up.

To look for alternatives, wells were dug to exploit renewable and non-renewable groundwater, which resulted in both decrease of the water table and increased salinity of aquifers.

Wastewater flows from treatment plants and wastewater collection systems damaged groundwater resources to a large extent. Most of the current wastewater treatment plants are working beyond capacity, and their resulting effluent is polluting the environment.

Economic impacts:

With increased demand, the country's financial resources were exhausted in developing an infrastructure for water collection, transfer and treatment infrastructure. The country is now full of water collection and transfer pipes moving groundwater from distant locations for domestic use in big cities and human settlements. Such investments in infrastructure increased the real cost of water delivery. As the balance of cost was to be subsidized by the Government, this stretched the national budget, but was kept in control until a major economic crisis occurred in 1989. After that crisis, Jordan went through a tough structural adjustment process that reduced public subsidies and expenditures. After 14 years of implementing the Structural Adjustment Programme, government support for various resources and commodities has been reduced or eliminated (in the case of oil, bread, etc.) but water is still the last "resource" publicly subsidised. However, the active privatisation system in Jordan finally reached the water sector in 1999, and a system of public-private partnerships in water management was developed which maintained Government control over resources and transferred operations to the private sector (see Box 2).

Box 2: Privatisation of water and wastewater systems in Amman

In 1997, the Government of Jordan embarked upon a privatisation program, the goal being to orientate Jordan's economy towards private sector participation and so better present Jordan to the international financial community. The specific objectives of the programme included improving the efficiency of the public sector and consolidating it, attracting private investment, and shifting into a market economy.

Based on this trend**,** WAJ, one of the authorities of the MWI, entered into a four-year management contract with a consortium led by the French Suez Company on April 1999, for all water and wastewater related services in the Amman Governate. This service area represents 37% of the total population of Jordan, 9% of the total area, and 43% of the total number of subscribers, as well as 37% of the total water consumption in the country.

The privatisation programme of the Amman water system included the maintenance of water pipes and prevention of leakages, maximizing utilization of resources, whilst keeping public control on water resources and regulations despite handing over utility operations. Ownership of the assets remained with MWI and the government of Jordan is still in charge of fees and tariffs. The experience of privatisation has resulted in better maintenance of the water system networks, continuous control by the government on water resources and has not resulted in social setbacks or economic sufferings.

Social impacts:

The social impact of water scarcity has been most notably documented in the agricultural sector. Most of the rural communities in Jordan depend on agriculture as a main source of income. The reduction of water supply, coupled with unsustainable agricultural practices, resulted in less water available for small farms and low-middle income farmers.

The MWI introduced a system of restrictions on water supply for agriculture in the Jordan valley, and that resulted in less production and vulnerability of crops during drought periods.

In Jordan's agricultural environment, it takes about 6 MCM of irrigation water per year to support a family of six with the head of household working in agriculture or related services. This quantity of flow is capable of providing rural job opportunities, and of creating ancillary jobs in urban areas that cater for agricultural inputs, transport, and retailing services. It is estimated that a million CM of water is capable of creating 200 jobs in rural areas. The availability of sufficient irrigation water helps stop the rural population from adding to overcrowding in urban areas and supports the traditional livelihoods of rural families. Provision of this amount of water is, however, proving to be a difficult option, with the ever-increasing demand and the low efficiency of agricultural practices in some situations. Creative responses have to emerge to support the rural social fabric in terms of agriculture and household water supply (see Box 3)

Box 3: Rural women initiative for household water security

The Jordanian rural communities suffer most from lack of water, and they are being challenged on a daily basis with the task of securing clean water and sanitation for households, farms and small businesses.

Efforts in community-based water management are always a major priority in Jordanian water policies. Experiences at the community level for the optimal use of water resources are spreading all over the country, based on successful demonstrations. One such example of community-driven initiatives has been documented in the village of Rakin, south of Jordan.

As in all Jordanian rural communities, women are bearing the responsibility of household management, with a basic reliance on water gathering and utilization. Most of the households in the area depend on their own cultivation of basic food supply, with the availability of water resources constituting the essential ingredient in household food security.

Insufficient supply of water for human and livestock consumption and irrigation is considered a major problem. Rakin gets piped water once every two weeks for six hours only, which does not meet even the inhabitants' basic requirements. Water has to be expensively purchased in the form of tankers and bottled water products. Without cisterns as storage facilities, the households are not able to store all the water that is delivered by tankers even though families have to pay for the total amount.

The women's co-operative of Rakin, with support from the GEF Small Grants Programme, managed to introduce a system of revolving loans in the village to help women build water harvesting cisterns to collect rainwater for agricultural uses. This

initiative secured a sustainable resource of clean water in households to provide for irrigation and food security, reducing the cost of buying water from tankers, and the water consumption bill in households, while increasing water consumption rate and providing a living example of local communities' ability to secure their water rights through participatory and innovative social responses.

Strength and weakness

Jordan is facing an ever-increasing deficit between water supply and demand. This deficit should be neutralised if the many projects developed under the national water strategy are implemented. As reality does not show such outstanding results, the country will need to undergo a profound water demand management reform in order to sustain the priority water needs. The water strategy has specified drinking water as the main priority in allocation, followed by industry and agriculture.

Based on the projections of population growth and economic/industrial development in the coming 20 years, the water allocated for agriculture will continue to decrease in quantity and percentage, and gradually be replaced with treated wastewater for irrigation purposes.

The major strength of the Jordanian demand management system is the big investment in developing new water resources and expanding existing water treatment plants to meet the needs of the various users.

The water scarcity in the country has had many environmental, economic and social effects, ranging from destruction of natural aquatic ecosystems to reducing the livelihood options for small-scale family farmers in the rural areas.

1.4 Regulatory framework of water law

Currently there are six major laws governing the management and use of water in the country:

The Water Authority Law (no. 18 for 1988):

This law created the Water Authority in Jordan in 1988, and is still the most comprehensive legislation dealing with water issues. It sets the responsibilities of the WAJ as full control of the monitoring and management of water resources. The law gives WAJ the authority to direct, regulate and license the construction of private wells. The law considers all water resources in the country to be state-owned property. Any person who attempts to use water resources without a license from the WAJ can be fined, according to the law.

The Jordan Valley Authority Law (no. 30 for 2001)

This law controls the use of water resources in the Jordan Valley, the main centre of agricultural activities in the country. It also sets guidelines on land ownership and farming activities in the Jordan Valley. It has full authority over water resources, and the right to settle any disputes in water allocation. The law gives JVA the mandate to manage any project in the region in a commercial way, with the exception of water resources development and irrigation projects.

The Ministry of Water and Irrigation bylaw (no 54 for 1992)

This bylaw created the MWI in 1992. It provides the Ministry with full responsibility for water and public sewage in the Kingdom. The bylaw established a special directorate in the Ministry called the Citizen Service Directorate which assumes the functions of conducting studies, designing enlightened strategies of education and information provision, which aim at the minimisation of water consumption in houses, factories and agriculture.

The groundwater bylaw (no. 85 of 2002)

This important bylaw was established in 2002 to meet the urgent need for conserving the country's scarce and depleting groundwater resources. In this bylaw the ownership of the groundwater wells was maintained to lie with the state. Even land ownership does not mean ownership of groundwater resources. The WAJ will issue a license to use water within limits of extraction rates. According to the bylaw the MWI determines the maximum quantity of underground water permitted to be extracted annually from each ground water basin, within the limits of safe yield. The strict clauses of the bylaw clearly reflect the severity of the groundwater situation in the country, and the uncompromised authority of the state in controlling this resource and preventing its over-exploitation. However, the number of illegal wells is still rising, to more than 400.

Temporary environmental protection law (no 1 of 2003)

This law established the Ministry of Environment, which evolved from the previous General Corporation for Environmental Protection (GCEP). The new Ministry was given coordinating, rather than administrative and management authority, over water resources.

Drinking Water Standards:

The drinking water standard in Jordan (No. 286:2001) is based on the WHO drinking water standards. The standards were raised in 2001, after a major drinking water pollution outbreak occurred in Amman in the summer of 1998 due to a malfunction of the capital's major drinking water treatment plant. The standard includes specific measures to be undertaken in case of the occurrence of pollution in drinking water samples, and the frequency of testing samples that is directly correlated to the number of people served by the water supply.

Overview of legislation and water rights:

In a nutshell, the legal framework for water rights in the country can be summarized as follows:

- All water resources available within the boundaries of the Kingdom, whether they are surface or ground waters, regional waters, rivers or internal seas are considered State-owned property, and shall not be used or transported except in compliance with the Water Authority Law.
- Legal rights to water are given to the owners of private wells and to governmental institutions other than the WAJ through licenses issued by

the WAJ, while the WAJ is presently developing its resources without licensing.

- The "owners" of private wells should pay full-use tariff to the WAJ and adhere to abstraction limits for renewable and non-renewable aquifers.
- There are water rights on surface water and springs that are registered in the Department of Land & Surveys.
- There are rights of using the water of wadis given to owners of livestock or small farmers in remote areas.

Strength and weakness

The country has in place a robust and integrated set of legislation and regulations. In the last ten years, many amendments have been introduced to old laws, and new legislation has been developed mainly for the purpose of regulating water use and ensuring a safe limit of extraction by enforcing specific use regulations, especially for groundwater.

The state ownership of all natural water resources has been useful in the sense of ensuring strict regulation and monitoring, but has deprived some rural populations of the rights of using local water resources.

The drinking water standards are based on WHO guidelines, and are considered to be strict, aiming at ensuring safe quality for drinking purposes.

1.5 Institutional setting and process

Since the establishment of the Kingdom, many laws were issued regarding water management. The first "generation" of laws and regulations focused on the Jordan River Valley, and the first comprehensive law was enacted in 1959, creating the East Ghor Canal Authority to manage water systems for irrigation purposes in the Jordan Valley. A separate law was created to care for the supply of municipal water to cities and other human settlements by the Central Water Authority in the same year. In 1965 the two merged to form the Natural Resources Authority. Another legislation in 1974 created the Domestic Water Supply Corporation, and in 1977 the Jordan Valley Authority was created.

The most comprehensive and drastic law emerged in 1983. It created the Water Authority, which had all the responsibilities of water management, with the exception of irrigation projects. All issues related to water management were thus handed over to this new institution.

Another step was taken in 1988 when the Ministry of Water and Irrigation was created and brought under its umbrella both the Water Authority and the Jordan Valley Authority.

The utility water policy stated that the MWI will continue as a governmental organization and will be responsible for policy formulation, decision making, national water planning, water resources monitoring and studies, and integrating water information systems. According to this strategy, the Water authority of Jordan (WAJ) will begin separating its bulk water supply and retail delivery functions and move these functions and services to private sector and commercial enterprises.

In the year 2003 a new Ministry of Environment was formed in Jordan. The new ministry has been developed as a monitoring and guiding authority on environmental issues. All of the rights over water management, allocation, use, monitoring and infrastructure were retained by the Ministry of Water and Irrigation and its institutional components (Water Authority and Jordan Valley Authority)

Basic research in water management is widely spread between Jordanian universities and research centres. Almost every university in Jordan has a department of water resources related to agriculture, engineering, geology and biology. The number of basic research papers on water resources and management is high. This thrust in research has not been well utilised by media and NGOs to increase public knowledge on water issues.

Jordan has one of the most advanced civil society structures in the Arab world. There are more than 15 NGOs, which work directly or indirectly on water issues. The activities of NGOs range from awareness projects to implementing community projects with technical support from international organizations and national research centres. A variety of water management projects have been implemented by NGOs especially in water harvesting, water reuse and sustainable agriculture.

Strength and weakness

The Ministry of Water is the only public institution mandated with all water management activities in the country. Under the umbrella of the Ministry two sub-organizations deal with specific water issues: the water authority (drinking water and wastewater) and the Jordan valley authority (water resources in Jordan valley). This structure has minimized contradiction, inter-governmental conflicts and enhanced coordination in water management.

The strong academic base of research has helped in developing scientific and human resources in water management disciplines and the activities of the various NGOs have also assisted in involving the local communities in water management and awareness efforts throughout the country.

The main weakness in the institutional set-up of water management lies in the system of integration and coordination between various institutions. As noted in many areas in the Arab world, and not only in the water sector, collective and strategic planning and coordination between various institutions is weak, especially in the exchange of knowledge and experiences.

1.6 Principal stakeholders, their roles, interests and conflicts

As water is the limiting resource for development in the country, many stakeholders are involved in the debate on water management policies and decision-making processes.

In the public sector, the MWI and the Water Authority are responsible for collection, management and distribution of water resources to all users.

Water users constitute a wide spectrum of social and economic categories, including consumers (households), farmers, industries, commercial entities (tourism sector), and land owners. The struggle over water resources allocation is increasing due to scarcity and increasing demand.

As a result of the MWI's policies, the main water users whose share will decrease are farmers. The agricultural sector is pushing hard to protect its water resources and debate the government's policies in raising tariffs and decreasing amounts of water allocated to farms. The MWI has recently introduced a system of charges for groundwater use by farmers and raised the costs of groundwater use in agriculture. This decision, an utmost priority for decreasing groundwater exploitation, was met with strong resistance from farmers. In 2003 an employee in the MWI was shot and injured while performing his duties in closing down an illegal water well. Some of the influential tribes using groundwater resources opt for violence and political pressures against the MWI for maintaining their current use, or misuse of groundwater resources.

The MWI has been accused, by some traditional political and social forces, of attempting to degrade the livelihoods of rural Jordanians by decreasing agricultural water allocations. Much attention was focused on the high number of illegal groundwater wells used by big industrial farms owned by influential political and social figures in the country, who do not adhere to the maximum allowable level of water withdrawal and do not pay back water costs to the government.

2 Developing towards the UN concept

2.1 Water rights in national water policies

Jordan has developed a robust package of policies, guidelines and legislation to deal with water issues. This package of policies has been centred on facing the fact of water scarcity and developing measures to manage water resources in a sustainable manner.

The MWI developed a water strategy and a set of four sector policies in 1998, which now govern the state approach to water resource management. A brief discussion of the policies is presented here.

2.1.1 National water strategy

The water strategy starts with the recognition of linkages between the increase of population and decrease in water resources in the country. This linkage appears in all the thinking behind the strategy, which puts the main focus on the priority to provide clean, sufficient water for domestic uses. The strategy sees the other main problems of water utilization with special focus on illegal groundwater exploitation as an immediate cause for water depletion.

The strategy considers water as a “natural resource” and states that the full potential of surface water and groundwater shall be tapped to the extent permissible by economic feasibility, and by social and environmental impacts

The strategy states that wastewater shall not be managed as "waste". It shall be collected and treated to standards that allow its unrestricted reuse in agriculture and other non-domestic purposes, including groundwater recharge. In a clear link to the basic rights of water for domestic use, the strategy’s first priority was the allocation of the basic human needs. Expensive additional water has municipal purposes as a first priority in allocation, followed by tourism and industrial purposes.

For groundwater resources, the strategy states that mining of renewable groundwater aquifers shall be checked, controlled, and reduced to sustainable extraction rates. Mining of fossil aquifers shall be planned and carefully implemented.

In the right to information context, the strategy states that the public shall be educated through various means about the value of water for them, the well being of the country, the sustainability of life, and for economic and social development.

The right to food is linked to agricultural uses, and as agricultural needs go down the priority list the resources available for agriculture are being reduced in quantity, and also in quality since more emphasis will be given to wastewater reuse in agriculture.

2.1.2 Groundwater policy

The groundwater policy is highly justified, frequent reference to the over-exploitation of groundwater resources, and it emphasizes on the sustainable use of aquifers and the state ownership of groundwater resources. The policy sets specific objectives and principles for groundwater use and management. Particular emphasis has been placed on the potential of brackish water desalination for drinking purposes.

On resource development, the policy states that development of groundwater reservoirs shall be commenced only after careful studies are made of the potential of each, and observation wells installed in carefully chosen locations to monitor the reservoir during exploitation.

The policy makes clear that the priority of allocation of groundwater shall be given to municipal and industrial uses, to educational institutes and to tourism. These purposes are deemed to have the highest returns in economic and social terms.

The policy states also that expropriation of use rights arising from legal use of groundwater, or of water rights established on springs rising from groundwater reservoirs shall not be made without clear higher priority need, and fair compensation. Moreover, priority shall be given to the use in irrigated agriculture of those reservoirs whose water quality does not qualify them for use in municipal and industrial purposes.

2.1.3 Irrigation water policy:

The irrigation water policy focuses strongly on the lack of balance between population growth and water resource availability. It tackles the contentious issue of agricultural allocation of water resources from various perspectives to reach a sustainable balance of allocation system.

The policy clearly states that irrigated agriculture provides most of the agricultural production in the Kingdom and offers the highest percentage of agricultural jobs and other jobs in support services. It also strongly emphasizes the role of wastewater since it states that because of the huge imbalance in the population - water resources equation, the treated wastewater effluent should be added to the water stock for use in irrigated agriculture. It will constitute a substantial percentage of the irrigation water in future years.

On the sustainability of the irrigated agriculture sector the policy states that:

1. Existing areas of irrigated agriculture shall be allocations according to the chances for sustainability. No diversion of its waters to other uses shall be allowed without providing a replacement source fit for agricultural use unrestricted by health and public health considerations.
2. Sustainability of agriculture shall be compromised only if it threatens the sustainability of use of ground water resources. Potential pollution of underlying aquifers or the depletion thereof is among the reasons that can prompt such a compromise.
3. Surplus surface water during the wet season shall be provided to farmers through the irrigation networks, free of charge, to leach soils, especially to those farms that are irrigated with treated wastewater in the dry season.
4. In remote sparsely populated areas, and after satisfying the local municipal and industrial needs from unallocated water resources, water resources shall be allocated to agricultural production including livestock.

The policy sets specific principles for the on-farm use of irrigation water. These principles include that crop water requirements in the various micro-climatic zones of

the country shall be experimentally determined, taking into consideration the prevailing different water qualities.

There is a direct emphasis on the quality of agricultural water and health criteria. The policy states that when treated wastewater is a source of irrigation water, care should be taken, to the maximum extent possible, to have the quality improved to standards that allow its use for unrestricted irrigation. This can be achieved through blending with fresher water sources. The same applies to the potential use of drainage water or brackish water sources. However, farmers should be apprised of the potential quality of irrigation water so that their choice of crops is made with the necessary background information and knowledge.

The policy includes "new" principles for the pricing of irrigation water. It states that irrigation water shall be managed as an economic commodity that has an immense social value. Like other water resources, irrigation water is a national commodity owned by society at large without prejudice to existing water rights. The water price shall at least cover the cost of operation and maintenance, and, subject to some other economic constraints, it should also recover part of the capital cost of the irrigation water project. The ultimate objective shall be full cost recovery subject to economic, social and political constraints. Due consideration shall be made of any water rights as established by law. Moreover, differential prices can be applied to irrigation water to account for its quality.

2.1.4 Water access and supply

Despite the severe scarcity in resources, the Jordanian population enjoys a relatively high level of access to drinking water resources. Statistics and figures used by national and international development organizations show a high percentage of access to piped drinking water.

The UNDP-Government of Jordan joint national development assessment report 2002 states piped drinking water reaches 95% of the Jordanian population ranging between 87% in rural areas and 97.6% in urban areas with an average per capita share of 170 CM annually which corresponds to 90 Litres per day.

The UNDP Human Development Report (HDR) for 2003 monitors the progress in the implementation of the Millennium Development Goals through various sets of indicators. The MDG number 6 and 7 focus on "ensuring environmental sustainability" with water and sanitation as one of its indicators.

Statistics used in the report show that the percentage of rural population with sustainable access to an improved water resource decreased from 92% in 1990 to 84% in 2000. The figures for urban population are 99% and 100%. Moreover, all Jordanians living in urban areas have access to improved sanitation. Urban population constitutes 78% of all of the Jordanian population. These are high figures relative to other developing countries with water scarcity.

The statistics for access to drinking water resources are summarized in Table 5 below

Table 5: Access to water supply and sanitation services in Jordan (as % of total) (1990-2000)

Indicator	**Rural 1990**	**Rural 2000**	**Urban 1990**	**Urban 2000**
Population with sustainable access to improved water resource	92	84	99	100
Population with access to improved sanitation	n.n.	n.n.	100	100

Despite the increase of the municipal water supply in the period 1993-2003 by 9.2%, the per capita consumption of municipal water declined by 40 % from 150 Litre/day in 1993 to 90 Day/day in 2003. The reason for this decline is the increase of the population in Jordan in the same period from 3.99 million to 5.2 million.

Water loss in the network is high. Around 50% of the total municipal water supply is still unaccounted for. However, the privatised water authority has started since 2003 to replace about 60% of the water network in Amman to reduce the significant loss from 50% to 20% in 2005.

Despite the fact that 95% of the households are connected to the piped network of WAJ, Jordan has been implementing a rationing program since 1988. During the summer period, the households receive water once or twice per week for 12 to 24 hours. This rationing program obliges the households to invest in water tanks. It is estimated that about 30% of the households in Amman receive additional water in summer from private dealers and pay at least the official price of JD 2 / CM up to about ten times the price of water supplied by WAJ.

A household study in east Amman and 14 villages in the Northern regions of Jordan showed that households in Amman pay between 1% of their family income for water (including purchase of water from water tankers) in winter and 2.9% in summer, while the households in the rural areas pay 0.7% to 1.4% respectively. These rates may not be very high compared to international rates. However, a large proportion of these households does not receive sufficient water and must therefore buy water from private dealers.

As a result of the rationing program, the households bear other indirect costs for water such as investments in water tanks in the houses and on roofs, pumping costs, etc. By considering these costs in the calculation, the households in Amman water spends is 4.6% of their family income in summer and 2.3% in winter, and in the rural areas 2.3 and 1.5% respectively.

2.1.5 Water valuation in Jordan

Domestic water

Although the infrastructure of water supply in Jordan reaches a high percentage of population, the reliability of water supply is not considered adequate. Households in Jordan receive water either once or twice a week and in many occasions citizens are

forced to buy water from tankers whose price can reach up to 2.0 Jordanian Dollar/CM.

Moreover, municipal water in Jordan is used by the domestic and commercial sectors, public institutions, as well as by small industries that are connected to the public water system. The municipal water requirements are determined by population growth, industrial development, urban concentration and income increase.

Water valuation is used by the Ministry of Water as an economic tool for better efficiency in water allocation. The Jordan's Water Utility Policy (MWI, 1997) seeks to move towards full cost recovery and to use a water tariffs mechanism to promote cost recovery considering water quality, end users as well as economic impacts on the various economic sectors.

Cost recovery is a matter of pricing. The price of water in Jordan does not cover its'. In the case that water prices were to be raised to reflect the value of water, these prices should at least cover all fixed costs.

Indirect water valuation has been applied for irrigation water through restriction of water use in crops of low value that consume high quantities of water. In the municipal water sector, tariffs have been developed and executed to cover operation and maintenance costs as well as to reduce water consumption and wastage. However, these tariffs are not based on a valuation of municipal water through assessing the willingness and affordability of the consumers to pay for water.

For social and political reasons, comprehensive water valuation, as demanded by economists, has not yet been implemented in Jordan. Some areas in the desert, such as in Aqaba governorate, Mafraq governorate, etc, are still supplied with municipal water free of charge.

Table 6: Tariffs for municipal water

Consumption (CM)	**Water cost JD/CM**	**Service Cost JD/CM**	**Monthly bill**
0-20	-	-	3.00
40	0.120	0.039	6.6
70	0.337	0.142	33.7
100	0.533	0.239	77.5
120	0.664	0.304	116.5
>131	0.850	0.392	According to consumption

Note: Price of 1.0 CM for non-household use is 1.0 JD with a service cost of 0.560 while the minimum rate for a bill is the consumption of 5 CM, Source: Water Authority of Jordan, 2002. q = Quantity, 1 JD = 1,000 Fils = $ 1.412

These tariffs show a fixed rate for a 0-20m^3 block, with a minimum of 5m^3 and an increasing price for each additional consumed cubic meter of municipal water. This is

based on the calculation that the minimum water consumption of a household per quarter of a year in Jordan is 20 CM.

The current pricing structure for municipal water was devised on the basis of cost recovery for maintenance and operation costs. However, the water tariffs in Jordan were structured in such a way as to guarantee the minimum needed consumption at a subsidized fixed price per CM and to recover these subsidies from customers with higher consumption, assuming these larger consumers to be wealthier. It is designed to hopefully cover the service costs while providing necessary amounts affordable for the poor. The progressive pricing is at the same time a controlling mechanism on water wastage. The charges for water and wastewater are primarily based on the amount of water consumed.

Even with the on-going privatisation of municipal water utilities in Amman, the Government of Jordan is still subsidizing the water sector. This subsidization has decreased gradually from a maximum of 59.13% of the total costs in 1995 to a minimum of 39.03% in 2000.

Water markets

Due to the state ownership of water resources, and the complex and comprehensive water network in the country, the commercial private water market is relatively small. This water market, however, grew in importance since a major water pollution incidence hit Amman in the summer of 1998. The psychological effects of this pollution prompted a boom in the bottled water industry. This is comprised of, firstly the market for bottled water, where various companies, that generally own private wells, extract the water according to a licence issued by WAJ, pay JD 0.25 /CM to WAJ, distil it in reverse osmosis plants, and sell it in bottles of 0.25 to 1.5 Litre through marketing channels at JD 0.20-0.30 / 1.5 Liter.

Also there is the market of mineral distilled water (small reverse osmosis machines) in small shops scattered in the Jordanian cities. The ‘water shops’ use municipal water from the piped network and sell it after distillation as mineral water in containers of various sizes at JD 0.04-0.1 / Litre.

In addition to that, the market of water from private wells where water is sold to tankers at JD 0.55 /CM is rising, as well as the market of tankers where customers are provided with water at JD 2 /CM in Amman governorate and JD 1.75 / cm in other governorates.

Agricultural water pricing

The disparity between water exploitation and agriculture's contribution to GDP is straightforward. Agriculture consumes the highest amount of the Kingdom's water resources — 650 MCM out of an available 900 MCM — but contributes only 6% to Jordan's JD 2.5 billion GDP. Only half of that is generated by irrigated agriculture.

Accordingly, Jordan has recently introduced a strict system of tariffs for groundwater abstraction in agriculture, which is being met with high resistance from farmers and agricultural lobbies.

The Government’s policy to permit the digging of agricultural wells is to encourage the citizens in the desert and villages to stay on their lands and engage in agriculture.

The purpose of this policy is to curb migration into the main cities and in pursuit of governmental jobs.

Since 1994, the Ministry has been installing water meters on agricultural wells. Meters of the same type and origin have been installed so that maintenance and replacement can be easily undertaken either at the cost of the Ministry or the owners of these wells. The concerned Ministry's authorities monitored these meters over 8 years and could list the actual pumped water from each well. The percentage of agricultural wells in Jordan on which water meters are installed is an estimated 94% in different parts of the country.

According to the Groundwater Control Act, the owner of a well, which is not equipped with a water meter, is deemed in breach of the conditions of the well license. In this case, a note is made out to prove the violation against the owner and the extracted water is assessed on the basis of the cultivated area, the type of crop, and the water needs of each acre per year.

As the volume of water used by Jordan's municipal and industrial sector increases, wastewater volumes will increase. Therefore, Jordan's Wastewater Management Policy (MWI, 1997) demands that the treatment of wastewater shall be targeted towards producing effluent suitable to be reused in irrigation in accordance with WHO and FAO guidelines, as a minimum. The sale price of treated wastewater, only for irrigation, is 10 fils / CM and is to cover at least the operation and maintenance costs of the wastewater treatment.

Opponents of reducing water for agriculture have urged the government to bear in mind the socio-economic importance of the sector. They contend that reducing water allocated to agriculture would destroy the livelihood of many families and increase the already high unemployment rate, which is officially estimated at 14%, and unofficially at 27%.

The measures have already had their socio-economic impacts on family farms in Jordan. With rising water bills, and the decrease in prices of most crops, many family farmers in the Jordan valley were forced to sell or lease their lands to wealthier "farmers" or investors, who applying modern technology, and opting for cash crops, have no problem with the water price. This shift in the social fabric will have many socio-economic consequences in the near future, especially on the family and household food security in rural areas in Jordan.

2.1.6 Water quality monitoring

The WAJ has implemented a comprehensive and strict water quality monitoring system since 1998. The laboratories operated by the WAJ analyse an average of 40,000 samples on an annual basis and perform about 100,000 chemical, physical, microbiological and radiological tests. The WAJ issues monthly reports on water quality to the MWI**.**

Another water quality monitoring programme is operated with the Ministry of Health focusing on health-related parameters. The Royal Scientific Society in Jordan performs water quality testing for the Ministry of Environment, while the Water and Environment Research Center in the University of Jordan performs selected water monitoring tests for research purposes and consultations**.**

2.1.7 Water information systems

The Ministry of Water and Irrigation, the Ministry of Health, the Ministry of Environment and the Royal Scientific Society all have a wealth of information and data on water resources. A water information database has been established within the MWI. This information, however, is available neither to the public, nor to independent researchers, NGOs and media.

For NGOs, researchers, the general public and media to gain access to water information, they need to rely on published research, papers, articles, progress reports, Internet and other sources of information. The Jordanian citizen and civil institutions do not receive, or monitor the results of water quality testing unless an official statement or a public document is published containing selected information.

There is a great need for making knowledge and data on water issues more publicly available. Many NGOs and media outlets have tried to bring the available knowledge to the public. Most impressively, awareness and education projects implemented by some NGOs and even the MWI have made an impact on reforming the water consumption habits of the citizens. Many households, organizations and academic institutes have installed water saving devices and reduced their consumption rates.

2.2 Scale of knowledge of and commitment to the UN concept

The Government of Jordan is committed to achieving the MDGs, including 100% access to clean and improved water resources and is actively pursuing this goal. On the other hand, there is no official recognition and monitoring of the right to water indicators and criteria developed by the UN.

The Ministry of Water has developed various strategies for the water sector but has not linked any of these to the right to water criteria. In addition, both NGOs and research institutions are not well aware of the concept. To the knowledge of the author of this study, this is the first attempt in Jordan to assess and analyse the UN right to water indicators.

2.3 Areas of concern and opportunities

2.3.1 Main Concerns for water rights in Jordan

By surveying the current state of knowledge on water issues and policies in Jordan, it is clear that the vision and criteria of water rights as stipulated by the UN General Assembly in 2003 are not directly integrated into the Jordanian water policy, in theory.

The declaration itself is not well known among Jordanian citizens and researchers alike. The concept of water rights and their various criteria should be better promoted by public awareness campaigns especially by NGOs.

Although the concept is not integral to the Jordanian water policy, many of its criteria and objectives are being advocated by various institutions in the country. The great emphasis on water accessibility and continuous supply is considered to be the highest priority in the water sector in Jordan. Despite natural scarcity, regional conflicts and increasing population, Jordan has managed to supply around 95% of its population

with piped water for drinking purposes. This has entailed a huge amount of investment in infrastructure and even subsidizing water prices.

The increasing population and decreasing water resources has led the Government of Jordan to introduce drastic changes and reforms in its water management. The changes have been most clear in the introduction of privatisation and private-public partnerships in water utilities and infrastructure management to increase water use efficiency.

Other interesting reforms have been adopted in the irrigation water sector, such as increasing irrigation tariffs and forcing owners of wells to adhere to abstraction rates specified by the Government. The increased tariff on irrigation water is causing many family farmers to lease their lands to richer investors with a resulting degradation of agricultural lifestyles in rural areas.

2.3.2 Water Rights in Jordan: Areas of opportunity

As a new global concept with ethical and socio-economic implication, the right to water can be further promoted and assessed in Jordan through a package of integrated interventions at the political, institutional, strategic, local community, civil society and academic levels**.**

The concept can be widely endorsed by the Jordanian public and decision-makers as well. The country is facing a severe water shortage, and the government has already indicated in practice its commitment to bring water supply to all Jordanian citizens by investing heavily in the water sector. The civil society, community and academic communities are taking water as an essential priority and the integration of the water rights concept would have a positive steering role for policy making and everyday activities and consumption behaviours as well.

Many areas of opportunity are available for the integration of water rights concepts and dimension in the Jordanian water sector.

Maintaining water accessibility and supply to all the Jordanian population remains the big challenge facing all stakeholders in Jordan. Meeting this challenge requires investments in infrastructure, securing non-conventional water resources, and enhancing water treatment capacity to relieve pressure for irrigation water. The Government of Jordan has managed to establish strategic partnerships with many international donors to support water demand and supply programmes in the country. This support is expected to continue with the government's proven ability in resource mobilization and strategic planning.

Improving the quality of water is also an issue of resource mobilization and investment in treatment plants use of non-conventional water resources (desalination, brackish water, etc…) and increasing the re-allocation of cleaner water resources for drinking purposes at the expense of irrigation water which shall depend, in the long term on treated wastewater. Enhanced monitoring programmes should to maintain adequate quality and enable rapid reaction to emerging pollution risks.

Affordability of water to all sectors of the community is a function of water pricing. The trend to privatisation and public-private partnership is gradually increasing the water tariff for consumers. With population growth and diminishing resources the

adoption of the right to water concept will be pivotal to secure and maintain social justice and minimize social impacts of water privatisation schemes.

There will always be a great potential for developing a comprehensive information and awareness programme to disseminate vital information on water resources to the public. The large amount of information stored and maintained in public institutions and academic centres should be processed to useful and handy knowledge for the benefit of the public. The right to adequate information is an integral component of human rights and has a major role in the implementation of the right to water concept.

It is recommended that a comprehensive assessment of the socio-economic dimensions of the right to water be done in Jordan, and a portfolio of suggested interventions be developed to monitor and support the integration of the water rights concepts in Jordan due to the high complexity of political, social, economic and environmental aspects of water resource management in the country.

3 List of major institutions working in water related issues in Jordan

3.1 Governmental ministries

Ministry of Water and Irrigation

Mission and objectives:

The Ministry of Water and Irrigation (MWI) is the official body responsible for overall water planning and management, the formulation of national water strategies and policies, research and development, information systems and procuring financial resources.

Contact information:

Ministry of Water and Irrigation

P.O. BOX 2412

5012 Amman

Tel.: +962 6 5680100

Fax: +962 6 5680075

E-mail: Info@mwi.gov.jo

Website: www.mwi.gov.jo

Ministry of Environment

Mission and objectives:

The Ministry is the official body responsible for promoting the protection the environment, the improvement of its various elements and the execution of this policy in co-operation with the relevant authorities.

Contact information:

Tel.: +962-6-5350149

FAX: +962-6-5355487

P. O Box: 1408 Amman - 11941 – Jordan

www.moenv.gov.jo

Jordan Valley Authority

Mission and objectives:

Jordan Valley Authority (JVA) is a governmental Organization responsible for the social, environmental and economic development of the Jordan Rift Valley. It is responsible for the management of water resources in the Jordan Valley, which are the key resources of Jordan's agricultural sector.

Contact information:

Jordan Valley Authority

Shomisani

5012 AMMAN

P.O.BOX 2769

Tel: +962-5689916

E-Mail: skhuzai@mwi.gov.jo

www.mwi.gov.jo/Jva/Master.htm

Water Authority of Jordan (WAJ)

Mission and objectives:

WAJ carries full responsibility for water and sewerage systems and related projects in Jordan.

In order to achieve all the objectives intended by the law, the Authority shall exercise the following responsibilities and tasks:

1. Survey the different water resources, conserve them, determine ways, means and priorities for their implementation and use
2. Develop the potential water resources in the Kingdom
3. Regulate, and advise on, the construction of public and private wells, investigate ground water resources.
4. Study, design, construct, operate, maintain, and administer water and public sewerage projects
5. Draw up terms, specifications and special requirements in relation to the preservation of water and water basins.

Contact information:

Water Authority of Jordan/Head Quarter

Tel: +962-06-5669965 *(Direct)*

+962-06-5680100

Fax: +962-06-5679143

P.O.Box: 2412/5012

www.mwi.gov.jo/WAJtemplatef4.htm

3.1.1 Governmental research and academic centres

Water and Environment Research Centre-University of Jordan

Mission and objectives:

The main objectives of the Centre are:

- Creating a fruitful and scientific atmosphere to help and improve the abilities and qualities of faculty members, assistants and technicians working in WERSC.
- Conducting scientific research related to promoting and managing water resources and protecting the environment subject to Jordanian conditions.

- Knowledge and technology transfer in addition to providing technical consultation to the local community in areas related to water and the environment.

Contact information:

University of Jordan

Amman, Jordan

Tel: +962 6 5355000

Fax: +962 6 5355560

Email: water1@ju.edu.jo

www.ju.edu.jo/centers/water.htm

Royal Scientific Society

Mission and objectives:

The leading Jordanian scientific centre for research and advancement of technology, its Environment Research Center (ERC) is responsible for monitoring the water quality in Jordan.

Contact information:

Dr. Bassam Hayek, Director of ERC.

E-mail: b.hayek@rss.gov.jo

P.O.Box: 1438 Al-Jubaiha 11941, Jordan

Tel: +962-6-5344701

Fax. +962-6-5344806

www.rss.gov.jo/rssinitiative3.html

Badia Research and Development Programme - the Higher Council for Science and Technology (BRDP)

Mission and objectives:

Their objective is the sustainable development of the Badia zone in Jordan. The programmes include research and development in areas such as biodiversity, water-related issues, socio-economy and population dynamics. It promotes the quality of life of the people without changing their life style. The Programme conducts extensive research and assessment of surface and groundwater resources in the Jordanian Badia.

Contact information:

Mr Mohammed Shahbaz

Director, Research & Development

Al-Jubieha St.

P O Box 36

Amman 11941

Jordan

Tel: +962 (6) 534-0401 (ext. 255) or (6) 533-5284 (direct)

Fax: +962 (6) 535-5680 or (6) 534-0589

Email: brdp@hcst.gov.jo

Website: www.badia.gov.jo

Center for the Study of the Built Environment (CSBE)

Mission and Objectives:

The Center for the Study of the Built Environment (CSBE) is a non-profit, private study and research institution that aims at addressing those challenges that affect the built environment in Jordan and beyond. CSBE is therefore an interdisciplinary center that addresses areas including environmental studies, urban design and planning, conservation, architecture, landscape architecture, and construction technologies. The center is implementing pioneering projects in grey water reuse and water scarcity gardens.

Contact information:

P.O. Box: 830751 Amman 11183 Jordan

Tel: +962-6-4615297

E-mail: postmaster@csbe.org

www.csbe.org

Queen Rania Al-Abdullah Centre For Environmental Sciences & Technology

Mission and objectives:

To participate in the national and international efforts towards achieving sustainable development by preserving the environment and its natural resources against improper use/overuse and pollution in an integrated manner that takes into consideration economic growth and other factors through education, research and services. The center has a special program of research on water issues.

Contact information:

Jordan University of Science and Technology

Irbid 22110

Jordan

E-mail: qracest@just.edu.jo

Tel: +962-2-7201000 Ext.: (22393)

Fax: +962-2-7095044

www.just.edu.jo

Jordanian Environmental Watch Programme (JEWP) – Al Urdun Al-Jadeed Research Centre

Mission and objectives

This watch program, considered as a forum for dialogue on policies related to environment, is concerned with organizing scientific conferences, seminars,

workshops and training courses as well as research studies and reports about the environmental situation and conditions. The centre plays a useful role as a platform of debate in the Jordanian environmental community.

Contact information:

P.O. Box 940631

Amman 11196

Jordan

Tel: +962-6-553-3113/4

Fax: +962-6-553-3118

Email: adababseh@ujrc-jordan.org

www.ujrc-jordan.org/English/JEWP/JEWP_in_Brief.htm

3.1.2 Non governmental organizations

Jordan Environment Society (JES)

Mission and objectives

Created in 1988, the Society is an NGO which is engaged in activities in different areas of protection of the environment and the promotion of sustainable development. It aims to provide training, carry out research and spread environmental awareness to all levels of the community. Special water awareness programmes are being conducted by JES.

Contact information:

PO Box 922821

Amman 11192

Jordan

Tel: +962 (6) 569-9844 / 568-2229

Fax: +962 (6) 569-5857

Email: jes@go.com.jo

www.jes.com.jo

Jordanian Royal Ecological Diving Society (JREDS)

Mission and objectives:

To protect and preserve the biodiversity of marine ecosystems, especially endemic species, from habitat degradation due to uncontrolled industrial, commercial and urban development. It implements many water management and awareness programmes in Aqaba.

Contact information:

Jordan Royal Ecological Diving Society

PO Box 831051

Amman 11183

Jordan

Tel: +962-6-567-6173

Fax: +962-6-567-6183

Email: siam@jreds.org

Website: www.jreds.org

Jordanian Society for Desertification Control and Badia Development (JSDCBD)

Mission and objectives:

Mission is to combat desertification in Jordan by undertaking the necessary research to explore its causes and the means to control it and to undertake the necessary steps such as integrated studies and scientific research related to the Badia environment as a whole, and trying to adopt a parallel policy for development. There are special activities in the field of water harvesting.

Contact information:

Al-Jami'a Street

PO Box 910994

Amman 11191

Jordan

Tel: +962 (6) 565-1081

Fax: +962 (6) 565-1082

Email: jsdc@index.com.jo

Royal Society for the Conservation of Nature (RSCN)

Mission and objectives

In recognition of its national and international responsibilities the RSCN seeks to conserve and enhance wildlife and wildlife habitats whilst actively promoting an understanding of the natural environment, its protection and its interdependence with people. The RSCN is Jotrdan’s leading biodiversity protection organization, and it is reponsible for managing protected areas including its water resources and wetlands.

Contact Information:

PO Box 5169

Amman 11183

Jordan

Tel: +962-6-533-9089 / 535-7931 / 535-0456

Fax: +962-6-534-7411

Mobile: +962-7-742-2122

Email: irani@rscn.org.jo

www.rscn.org.jo

Friends of the Earth (FoE)

Mission and objectives:

Mission is to promote better understanding of the sensitive environment we live in and the diverse biodiversity of various ecosystems, both nationally and internationally, by improving and strengthening environmental education. The FoE trains students on surface water monitoring in Jordan. The program includes a complete Hydrology protocol that requires students to regularly and scientifically measure amounts of precipitation, this data which is then archived and available for viewing

Contact information:

Mr Raouf Dabbas

President

PO Box 1554

Amman 11118

Jordan

Tel: +962 (6) 551-4430 / 553-9601 / 552-6422

Fax: +962 (6) 551-4431

Mobile: +962 (7) 952-4024

Email: foe@nets.com.jo

Email: neet@nets.com.jo

www.foe.org.jo

3.1.3 Multistakeholder programmes

Water Effeciency and Public Information for Action (WEPIA)

Mission and objectives:

A multistakeholder programme for awareness and demonstarting best practices, policies and technologies in efficient water use and reuse in Jordan. The programme works with many public and civil organizations in Jordan.

Contact information:

P.O.Box 850561

Amman 11185

Tel: +962-6-5527893/5

Fax: +962-6-5527894

e-mail: aed@joinnet.com.jo

4 List of donor activities: Major donor agencies working in water sector in Jordan

Many donor organizations are active in supporting water projects in Jordan. Due to scarcity of water resources, and the urgent need to deliver water supply to the growing population, the majority of water projects in Jordan have been directly linked to water demand management, wastewater treatment and reuse, developing non-conventional water resources and strengthening public sector institutions.

The following paragraphs describe the major donors in Jordan and their water profiles.

USAID

The USAID is by far the biggest donor to the water sector in Jordan. Since 1990 the USAID has build a strategic partnership with the MWI and other institutions in Jordan and invested heavily in developing water demand and supply projects, especially in infrastructure. Projects have been categorized in three major sectors.

1. Stronger water institutions:

Since 1998, USAID focused on strengthening water institutions providing on improving data collection and analysis, and installing new information management systems for the Ministry of Water and Irrigation (MWI), the Water Authority of Jordan (WAJ) and the Jordan Valley Authority (JVA) and developing key water policies.

During 1999, USAID designed and began a new water policy implementation program focused on reducing groundwater depletion and optimizing the reuse of treated wastewater.

USAID also initiated a new program to encourage private sector participation in the water sector and to strengthen the government's capability to develop, contract and manage major infrastructure projects. With USAID assistance, the MWI has developed a major BOT wastewater project and a private sector management contract for the Wadi Mousa water and wastewater facility.

In the agriculture sector, USAID is providing a variety of technical assistance focused on restructuring irrigation tariffs and increasing cost recovery for JVA. In collaboration with other donors, USAID is also engaged in policy dialogue with the Government of Jordan (GOJ) on the need for significant structural reforms in the irrigated agriculture sector.

2. Increased efficiency in the use of water resources:

Improving the use of existing water supplies will help stretch scarce water resources even further. This includes reducing losses due to physical leaks, contamination and poor irrigation practices.

In response to a drinking water crisis in 1998, USAID provided emergency assistance to allow the Zai Water Treatment Plant, which serves 40 percent of Amman, to reopen after an instance of contamination. USAID subsequently funded longer-term improvements to the Zai Plant. These improvements enabled the plant to effectively treat the water and operate at full capacity throughout the summer of 1999, a period of severe drought.

Furthermore, to ensure that the quality of water supplied to consumers meets national standards, USAID is financing the upgrading of the environmental health laboratory of the Ministry of Health, including the purchase of analytical equipment and staff training.

USAID is also funding a portion (18 of 43 zones) of a multi-donor program to rehabilitate and restructure the entire water network of Amman and it is also rehabilitating ten contaminated springs and wells throughout the country.

Support of a pilot program to enable irrigation extension agents to work directly with farmers in the Jordan Valley to reduce irrigation water use and increase yields is also one of USAID's initiatives in Jordan.

Finally, a new water education and media program carried out by a U.S. NGO in partnership with Jordanian NGOs has been initiated in 2000.

3. Improved quality of wastewater:

Improving the quality of wastewater is also a USAID priority. Four major projects are currently in the design or construction phase.

Design is underway for wastewater conveyance and treatment facilities in the north Jordan Valley and for expansion of the wastewater facility in Aqaba. Construction at both sites is expected to commence in early 2001. These two projects will help Jordan meet its commitments under the 1994 Peace Treaty with Israel to reduce pollution in the Jordan River and the Gulf of Aqaba.

USAID has supported the construction of a new wastewater treatment plant to replace the current plant at As-Samra, which is greatly overloaded. This project is being designed as a BOT with a grant component from USAID. The total cost of the project is 170 Million US $ and will serve 2.2 million people in Jordan.

GTZ

GTZ is a private, not for profit, limited liability company, that implements technical assistance projects for the Government of Germany, primarily the Ministry of Economic Cooperation and Development. In addition, GTZ implements technical assistance projects for other governments such as those governments of Saudi Arabia and United Arab Emirates.

In Jordan, GTZ has supported projects in the areas of rural development/ agriculture, water, institutional support, public administration, and recently environmental support.

On-going projects in the water sector:

1. Operation and Maintenance Support to the WAJ/ Greater Amman

Under this project a financial accounting system was developed for Greater Amman. Furthermore, preparatory measures for the management contract in Amman were undertaken. More recent activities concentrate on the Irbid Governorate. The project is expected to continue till 2004.

2. Strategic Planning in the MWI

This project aims to develop a digitized water masterplan for the whole country. Using the digitized masterplan the government can map the changes as they happen as long

as the information is updated in a timely and proper manner. This project will end in March 2004.

3. Use of Brackish Water in the Jordan Rift Valley:

This project started in 1997 aims to assess brackish springs, wells and Wadis in the Jordan Valley to see if they can be used in irrigation. Under this project guidelines for sustainable use of brackish water will be developed as well as recommendations for adequate and supportive operation of the JVA main supply system.

4. Improvement of Watershed Management:

This project is a rural development project, which aims to improve the livelihood of rural people in the Karak area by providing the villagers with small loans to construct water-harvesting wells.

5. Water Resources Management in Irrigated Agriculture:

This project, which was implemented with the JVA and the MOA since May 2001, aims to improve the efficiencies of the secondary and tertiary irrigation systems (before the farm gate). This may include the creation of water user groups/associations that can play a role in the planning, operation and management of the irrigation system.

World Bank

The World Bank Group is one of the world's largest sources of development assistance. It works in more than 100 developing economies with the primary focus of helping the poorest people and the poorest countries.

On-going projects

1. Amman Water and Sanitation Management Project (AWSM):

The objective of this $149.2 million project is to improve the efficiency, management, operation and delivery of water and wastewater services for the Amman Governorate. It will also lay the groundwork for a sustained involvement of the private sector in the overall management of these services.

The project consists of the a) provision of an Operator under a performance-based Management Contract (MC) to manage the water and wastewater services in Amman Governorate; b) providing the Operator with funds built into the MC for essential O&M; c) provision of finance for capital investment to rehabilitate and restructure the water supply system as well as upgrading and extending water and sewerage services in Amman; and d) TA for institutional restructuring and improving managerial capacities at WAJ as well as measures to monitor and audit the Operator's performance.

2. Disi/Amman Water Conveyor (DAWC):

The project aims to provide an adequate and reliable supply of bulk water to meet the needs of M&I consumers in Greater Amman. It consists of the development of two well fields, transmission facilities (pump stations and 320 km of pipeline), reservoirs, monitoring and control equipment. All facilities will be constructed and operated under a Build, Operate and Transfer (BOT) contract with a 20-year concession, and with costs recovered from consumers.

The project cost is estimated at $730 million, however, the selected sponsor would be responsible for proposing the financing plan, including contingency financing on a limited recourse basis. Financing is expected to be: around 25% from private equity investors; with the balance from commercial bank debt under World Bank's guarantee, export credits, international financial institutions, and Government support through official loans/grants.

3. Middle Governorate Water Supply and Sanitation:

Funding for this project ($470,000) is provided by JICA. The project will assess the water supply and sanitation investments needed in the middle governorates, prioritize them and develop a policy framework.

Study to Assess Options for Regulatory Reform in the Water Sector in Jordan: $650,000 has been allocated for this study that will assess the regulatory laws in Jordan in the sector. Request for Proposals is ready and will be put out shortly.

Proposed Projects:

1. Jordan Rift Valley Improvement Project (JRVIP):

The project aims to improve the productivity of water use in the existing irrigated areas in the Jordan Valley, ensure appropriate reuse of treated marginal quality water and related environmental protection and improve sustainability of irrigation services. It consists of irrigation water management and institutional improvements as well as development of plans for the reuse of marginal quality water and environmental management. The financing package consists of loans and grants through the World Bank, Global Environment Facility, and donors active in Jordan.

European Union

At the latest meeting of the €o-Mediterranean Foreign Ministers a new MEDA financial assistance package for the EU's partners in the Mediterranean was launched. Thereafter, bilateral relations with Jordan were strengthened and new EU grant and loan agreements worth over 200 € million were signed. Jordan also benefits from a host of EU-funded regional institutions and relief and rehabilitation programs.

On-going projects in the water sector

1. The Amman Water Improvement Project:

This 5 million € project signed in 2000, aims to improve efficiency, management operation, and delivery of water and wastewater services in the Greater Amman area by setting up the Project Management Unit (PMU) at the MWI. The PMU is set up as an autonomous entity supervised by an executive management board headed by the Minister and it is responsible for the follow-up of the entire Greater Amman Water Sector Improvement program.

2. Water Sector Intervention Project:

This 13.735 million € project aims to rehabilitate and improve the domestic water supply in Karak and Tafilah as well as wastewater effluent re-use for Karak and Kufranje.

3. Rehabilitation of Drought Affected Communities in Jordan:

This 1.5 million € project is being implemented by CARE International. It aims to help rural communities in the south of Jordan improve their overall food security situation by diversifying their food intake through planting and production intended for domestic consumption. Project activities include rehabilitation of springs, cisterns and small-scale farm irrigation systems; women revolving fund; agricultural revolving fund and rangeland demonstrations.

In addition, as an outcome of the Jordan-Israeli peace treaty the EU provided funds for conducting two studies:

1. Water Storage Capacity in the Jordan River and the Jordanian Wadis
2. Water Conveyance between the Jordan Valley and the Population Centers in Northern Jordan (Irbid).

Euro-Mediterranean Water Information System (EMWIS)

Established in 1996, EMWIS is an information and knowledge exchange tool between the €o-Mediterranean partners. Its objective is to provide partner countries with an instrument for collection, treatment and dissemination of information. Initially, activities will target documentation, training, research and development, institution building and data processing. Currently 4 EU countries and 9 Mediterranean partners, including Jordan, have joined the program. For additional information visit web site http://www.emwis.org.

Italian government

Prior to the signing of the 2000-2002 Bilateral Agreement in January 2000 between the Government of Jordan and the Government of Italy, the only project funded by the Italian Government was:

1. The Greater Amman Rehabilitation Project:

The Government of Italy (GOI) is providing approximately US$17 million for this multi donor effort that aims to reduce technical water losses in the Amman network. Tender documents were issued in 2000 and the contract was awarded to the Italian EMIT firm.

Under the new Bilateral Agreement between the GOI and the GOJ, Italy will provide approximately US$80 million of soft loan assistance and US$5 million of grant money to Jordan. A large part of this money is for the water sector as it is recognized in the agreement as a priority area. The following projects have been identified:

2. Construction of Three Wastewater Treatment Plants for the Camps and Surrounding Villages of Jeresh, Talbieh and Suknneh:

US$ 22 million are allocated for this project which falls under Jordan's Social Productivity Program. The project will construct sewer networks, household connections, pumping stations, and wastewater treatment plants as well as develop a plan for effluent reuse for agriculture. Tenders for the design of the wastewater system for Jeresh and Suknneh were published, and the tender documents for construction and supervision will be issued soon.

3. Construction of the Naur Wastewater Treatment Plant:

This project is outlined in the 1997- 2011 Water Sector Investment Program prepared by the MWI. US$14 million are allocated for this project under the Bilateral

Agreement, the GOJ providing an additional US$17 million under a debt swap agreement. This project is still in the formulating stage.

In addition to the above, the GOI under the bilateral agreement is financing the upgrading of the Ministry of Health laboratories as well as implementing a project that aims to environmentally improve the Zarqa landfill.

Japanese International Cooperation Agency (JICA)

The Cooperation Agreement between the Government of Jordan and the Government of Japan was signed in 1985. Assistance funds were provided through the Japanese Embassy. In 1991, JICA office opened in Amman. However, with the rising incomes in Jordan, it is expected that grant aid to Jordan will cease within the coming three years.

On-going projects in the water sector

1. Improvement of Water Supply System to Greater Amman:

The project aims to double the Zai treatment plant's capacity to 90 MCM/year at an approximate cost of $70 million. Construction started in mid – 1999 and completion is expected in Nov. 2001.

2. Water Resources Management Plan for the Hashemite Kingdom of Jordan:

In February 2000, a study team was formed in Jordan to carry out a two-year study that builds on the previous GTZ data bank. The plan will be completed and presented by the end of the year.

5 References and further information

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On the regional level:

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On the global level:

UNESCO (2003): World Water Development Report.

UNEP (2002): Global Environmental Outlook 2002

UNDP (2003): Human Development Report 2003

WHO (2003): “The Right to Water”, WHO publications

5.2 Online knowledge resources on Jordan Water

Organizations working in water issues:

Ministry of Water and Irrigation

www.mwi.gov.jo

Water Strategies and Policies

http://www.mwi.gov.jo/main%20topics/water%20Strategy/master.htm

National Water Master Plan

http://www.mwi.gov.jo/main%20topics/NWMP/nwmp.htm

Water Investment Plan

http://www.mwi.gov.jo/Investment%20plan/main-page/InvestmentPlan.htm

National Water Action Plan

http://www.mwi.gov.jo/main%20topics/action%20plan/Action%20Plan.htm

Private sector participation

http://www.mwi.gov.jo/main%20topics/Privatization/Privatization.htm

Regional Cooperation

http://www.mwi.gov.jo/main%20topics/Regional%20Cooperation/Regional%20Cooperation.htm

Water resources in Jordan

http://www.mwi.gov.jo/main%20topics/Water%20Recources/Water%20Resources.htm

Water quality in Jordan

http://www.mwi.gov.jo/main%20topics/Labs/Labs/labs.htm

Water and public awareness

http://www.mwi.gov.jo/main%20topics/Public%20Awareness/Public%20Awareness.htm

Water legislation in Jordan

http://www.mwi.gov.jo/main%20topics/Legislations/Legislations.htm

Water Standards

http://www.mwi.gov.jo/main%20topics/Standards/Standards.htm

Water projects

http://www.mwi.gov.jo/Project/Master-Project.htm

Dams in Jordan

http://www.mwi.gov.jo/Others/Dams/Dams-Master.htm

Red Sea-Dead Sea canal

http://www.mwi.gov.jo/Investment%20plan/A.Investment%20projects/A.1%20Technical%20Assistance%20Projects/3-Red%20Sea%20–%20Dead%20Sea%20Canal%20Project%20(RSDSC).htm

Disi Amman Water Conveyor

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Water Authority in Jordan

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Lebanon

Water as a human right:
Assessment of water resources and water sector in Lebanon

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Summary

Lebanon is the richest country in the Middle Eastern region in its water resources. The country receives about 9 billion cubic metres of rainfall more than half of which is lost as runoff and evapotranspiration as a result of the topography and the length of the dry season. Despite this, Lebanon suffers from a shortage of water for irrigation, domestic and industrial uses. This deficit is mainly due to a historical negligence on the part of the government before the 1975 conflict and the lack of planning in the rehabilitation after 1991.

Although Lebanon has accessed the Convent on Economic Social and Cultural Rights as early as 1976, and has signed and ratified most other related conventions, the ten-year master plan for the water resources management was only launched in the year 2000. Until date, the works were initiated on only one dam of the more than 30 planned dams and hill lakes. The lack of financial resources in a heavily indebted country and conflicting interests of politicians are the major barriers facing the implementation of the plan.

In terms of demand, the irrigation water needs account for more than 60% of the total while the domestic and potable water requirements account to about 30%. The irrigation sector depends highly on the ground water supply from artesian wells that were dug during the last 2 decades. Since 1995, many irrigation canals were rehabilitated by the government using international loans and a few US-based NGOs with funding from USAID. These NGOs have supported also installing some major lines for domestic water in deprived villages of Northern and Southern Lebanon and the Bekaa.

The domestic water supply and quality, though improving as compared to the previous periods, is still inadequate. The major reason is that the domestic water network is in an increasingly deteriorating situation at the distribution level. Only the primary supply lines and partly secondary ones were rehabilitated. This leads to significant losses in water quantities, infiltration of pollutants and impurities into the corroded pipes from the sewage lines and the surroundings. As a result of these problems, as much as 20% of the total households have no access to water through the public network. More than 80% of the households have a low to intermediate satisfaction of water needs in terms of quality and quantity. A report by UNICEF (2000) indicates that more than 70% of the water resources in Lebanon are polluted. This is an alarming figure that signals to long-term effects.

Despite these problems, the public discussion on the right to water and its human right context is very weak and reaction of people to these problems is absent.

Within the public sector, the policy and capacity building of water issues was intensified during the last 2 years through support from the US and EU.

Numerous actions need to be taken to alleviate the constraints facing a sound implementation of the integrated master plan for water resources in Lebanon. The major needed steps are awareness and capacity building at both the institutional and public level, in addition to intensive lobbying at the political level.

1 The national water sector

Lebanon is a small country situated at the eastern end of the Mediterranean Sea. Its area is about 10450 km2 with about 210 km of coastline and an average of 50 km depth. Lebanon is considered to be a mountainous country with narrow fertile plains on the coastline and between Mount Lebanon and Anti-Lebanon, the two chains running along the country from north to south. The total agricultural area is estimated at about 30% (360,000 ha) of the country and half of it is cultivated.

The total population is estimated at 4.4 million as the last census was conducted more than 40 years ago. The annual population growth is estimated at 1.4%.

Lebanon has suffered from a civil war from 1975-1991 that has devastated its infrastructure and its socio-economic constellation. In addition to the war related demographic changes and internal rural-urban migration, it is estimated that about half of the population has left the country during the war to destinations in Europe, North and South America and Australia.

As of 1991, intensive reconstruction efforts have been concentrated around Beirut and the major cities. Agriculture, being historically not as important as tourism and commerce for the overall economy, has not been given adequate attention in all its sectors. This has led to an increasingly deteriorating socio-economic situation in rural areas.

The worsening economic situation and the increasing debt reaching about US$ 35 billion has practically frozen most development efforts in all sectors. The impact of this situation will be discussed later.

1.1 Background, geography and climate

Lebanon has a reputation among its neighbours for the abundance of its water resources. A relatively mountainous terrain consisting of two parallel mountain ranges that run north to south, and between them the Bekaa Valley, the country exhibits contrasting physiological features and well-differentiated geomorphologic regions. In this context, the country can be divided into four main regions from west to east:

- A relatively flat and narrow fertile coastal strip with an average width of 2 to 3 km running north to south, and reaching the shoreline on many occasions.
- The “Mount Lebanon” chain parallel to the coastline with mean elevations of 2,200 m and peaks upwards of 3,000 m above mean sea level (*amsl*).
- The Bekaa Plateau, a very fertile and rich land depression at an average altitude of 900 m *amsl*, with a length of 125 km and a width varying from 7 km in the south to nearly 20 km in the north.
- The “Anti Lebanon” mountain chain, bordering Syria and also running in a north-south direction east of the Bekaa Plateau and reaching elevations of 2,800 m *amsl* at Mount Hermon.

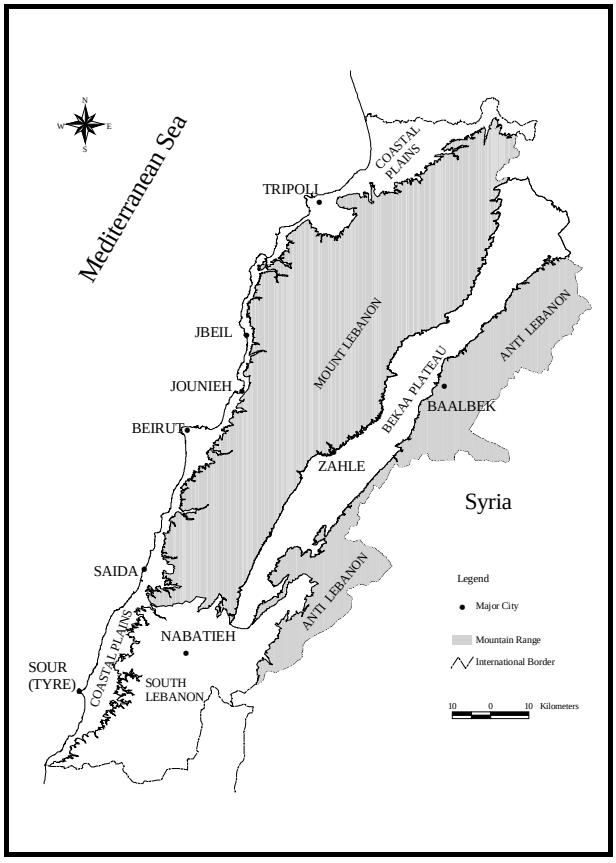

Figure 1: Physiography of Lebanon (El Fadel, 2001)

Lebanon's climate is generally Mediterranean, with abundant (>80%) rainfall during 4 – 5 months (November – March) in the winter and followed by hot dry summers. Its topographical features result in heavy precipitation along the coastal plains and much less in the interior, and this rain shadow explains the notable difference in vegetative cover between the greenery of the coastal areas and the dry landscape of the interior. Snow is frequently present in areas higher than 1,500 m above sea level. Precipitation varies spatially, as well as temporally. Precipitation in the highlands averages 1,500 mm/year, and the mountain peaks along the western ranges receive about 2,000 mm. Annual average precipitation in the northern Bekaa region, near Hirmil, is about 250 mm; in Ba'albeck, 550 mm; and in Karoun and Marje'youn, 700 mm. Yearly precipitation along the coast is 830 mm in the north, 800 mm around Beirut, and 700 mm in and around Sour (Tyre) in the south (Amery, 1998).

According to the national meteorological service, eight eco-climatic zones could be defined, with rainfall being the principle criterion. These zones are distributed as follows: (National Action Programme to Combat Desertification, 2003)

- The coastal strip including the three northern, central and southern coastal zones,
- The Mount Lebanon with two northern and central zones varying in precipitation,
- The inlands that are divided into three zones, the northern and central (semi-arid) and the western Bekaa (more continental with higher precipitation).

Geologically, the country's fissured and fractured limestone formations have the ability of snowmelt and rainwater to percolate and infiltrate deep and feed into the underground aquifers. Ultimately, the water in these layers either

- remains stored and may be exploited through wells while others remain untapped in deep layers;
- reappears as surface waters, at lower elevations, in the form of seasonal fresh water springs (nearly 2,000) that feed into various streams (nearly 40);
- forms underground springs discharging near the coastline or the sea or is lost to deep layers and may reappear in the groundwater of neighbouring countries.

Strength and weakness

Lebanon's topographical features result in an unequal allotment of precipitation along the coastal plains and the interior of the country resulting in differences in vegetative cover of the green coastal areas and dry interior. In general average precipitation should be sufficient for human needs if adequately managed.

1.2 Water resources and water balance in Lebanon

A number of streams (14 to 17 depending on the source of information) are classified as perennial rivers, while the remaining ones are considered seasonal. These perennial rivers are distributed as follows (Figure 2):

- Thirteen rivers flow westwards from their source in the heights of Mount Lebanon towards the Mediterranean Sea. These rivers have an average length of less than 60 km;
- El Kabir is a coastal river that traces the northern border of Lebanon with Syria;
- The Litani river drains the southern Bekaa plateau, transverses the southern edge of the Mount Lebanon range and discharges into the Mediterranean towards the south;
- The Hasbani river originates from springs in the northern bases of Mount El Sheikh (Hermon) and flows through Hasbaya to join in winter the Wazzani.
- The Wazzani crosses the southern border and forms one of the tributaries of the River Jordan; and
- El Assi (Orontes) river flows northwards into Syria draining the northern Bekaa resources and flows to discharge in the Mediterranean towards Iskenderun in Turkey.

There are various reports regarding the water balance in Lebanon that are in agreement on some issues and contradict on others. Given its topographical situation, Lebanon does not receive any surface water from the neighbouring countries.

The country consists of two principal hydrological regions:

- The Mediterranean (or coastal) watershed, with an area of about 5 500 km2, which gives rise to 12 perennial rivers from the western slopes of the mountain ranges, flowing from east to west and emptying into the sea;

- The interior watershed, with an area of 4 700 km², which is the source of the Litani, Assi (Orontes), and Hasbani/Wazzani rivers (Amery, 1998).

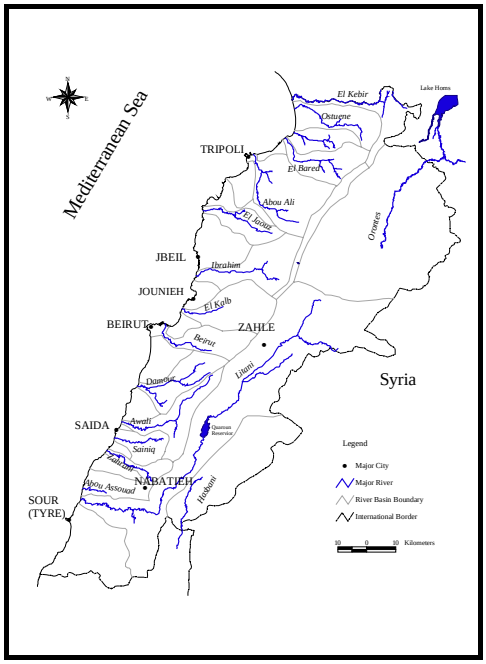

Figure 2: Major river basins in Lebanon

(El Fadel, 2001, based on Directorate of Geographic Affairs maps)

Furthermore, the country could be divided into some 40 drainage basins of permanent or intermittent streams, whose flows depend on the topography of the watershed and the size of the mountain reservoirs that their sources feed (Fawaz 1967).

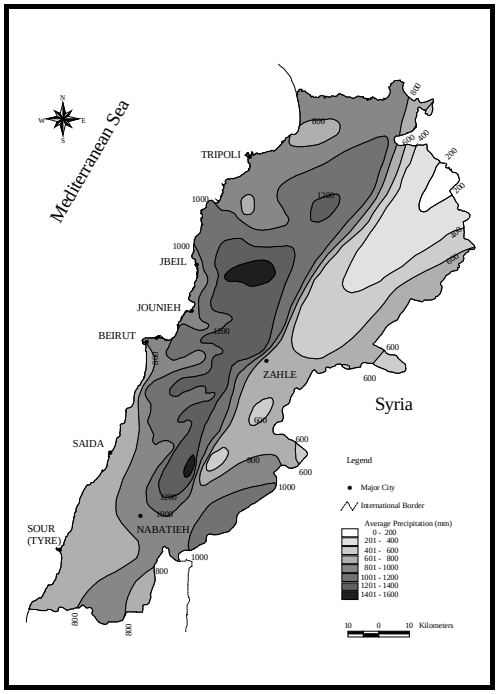

Figure 3: Mean annual precipitation in Lebanon (Directorate of Geographic Affairs)

Table 1 shows two estimates of the water budget in Lebanon. Both estimates show that about 50% of the average yearly precipitation is lost through evapotranspiration. Other losses include surface water flows to neighbouring countries (almost 8%) and groundwater seepage (12%) leaving around 2,600-3,300 MCM of surface and groundwater that is potentially available.

Table 1: Hydrological budget of Lebanon: two perspectives (MCM/Year)

Factors	**Water budget - Litani Water Authority (Comair 1998)**	**Water budget (Mallat 1982)**
Total precipitation	+8,600	+9,700
Evapotranspiration	-4,300	-5,075(a)
Percolation to groundwater and flow into the sea	-880	-600(b)
Flow into Palestine		
Hasbani/Wazzani River	-160	-140
Groundwater flow to Hulah and northern Palestine	-150	n.a.
Flow into Syria		
Assi River	-415	-415
Kabir River	-95	-95
Net available surface water	+2,600	+3,375

Source: Comair (1998) and Mallat (1982), a) Includes groundwater seepage in Lebanon and from South Lebanon into Palestine and the sea. , b) Excludes water flow into the sea.

Groundwater contributes a significant component of the total water presently demanded in Lebanon. Thousands of government and privately owned wells, distributed all over the country, provide about 30-40% of all the water being furnished for domestic and industrial use and for irrigation. Furthermore, additional amounts of water may be eventually developed through surface storage and are estimated at about 540 MCM per year, while those likely to be made available by proper management of the ground water aquifers is about 1,500 MCM (UNDP Groundwater Study, Mission of 1962-69 cited by Macksoud, 1998). This figure is close to that reported by FAO indicating that a total volume of 1,360MCM distributed in 8 major aquifers. (?)

Lebanon possesses an additional important water resource whose capacity and modes of exploitation are yet to be determined. Along the littoral zone, sub-marine springs discharge millions of cubic metres annually into the Mediterranean. The estimates of these quantities range from 250-1000 MCM (Jaber, 1995; Khawlie 2000 and Shaaban, 2001 as cited by Abdallah, 2001.

Strength and weakness

Theoretically and despite the climatic and geological factors, if well managed, the available water resources should be sufficient for fulfilling the basic needs of the Lebanese people, whether for irrigation or for domestic use. The seasonality of most rivers and the fact that significant quantities of water are shared with Syria and Palestine, are barriers facing the exploitation of those resources.

1.3 Water demand and supply

Many Lebanese politicians declare Lebanon as the worst country in the region with respect to the management of its water resources. Water has been historically mishandled as a resource in Lebanon. Currently, water resource use is approaching unsustainable levels because of a lack of effective management policies coupled with increased consumption resulting from the population growth, increasing needs for agricultural purposes, and industrial development that have led to an uncontrolled exploitation of groundwater and surface resources.

Despite the abundance of water resources, more than 50% of the Lebanese territories are desertification/land degradation prone areas and that for many reasons, the most important of which is unsustainable land and water resources management.

Agriculture is by far the largest consumer of water in Lebanon accounting for more than two-thirds of the total water demand, reaching upwards of 85 percent in certain predominantly agricultural regions. This may increase the cost of water resource management, and diverts valuable water resources from other potential uses especially the supply of potable water. Other activities that exert additional water demand are recreational activities (water parks, resorts and sports).

Table 2: Estimated (a) water consumption and projected water demand in Lebanon (MCM/Year).

Year	**Domestic**	**Industrial**	**Irrigation**	**Total**
1966	94	n.a.	400	494
1990 (b)	310	130	740	n.a.
1996	185-368	35-70	669-900	889-1,338
2000 (c)	280	400	1,600	2,280
2015	900	240	1,700	2,840

Sources: Jaber (1997); Comair (1998a); Al Diyar Newspaper, 6 Jul 1995, 5 Dec 1996. (a) Water consumption data, with the possible exception of the 1966 data, are estimates. (b) An Nahar Newspaper, 25 Feb 1996. (c) Nasir Nasrallah, Director General of the Litani Water Authority (An Nahar, 25 May 1996).

In 1966, the domestic and industrial sectors consumed 94 MCM of water, and the agricultural sector consumed 400 MCM (Table 2). By the mid-1990s, Lebanon was estimated to consume at least 890 MCM/Year of water, close to 50% of which was drawn from aquifers. Other estimates indicated that, in 1994, water utilization was

1,293MCM for agricultural (67.7%), domestic (28.4%) and industrial (3.9%) usages (FAO, 2002).

1.3.1 Irrigation consumption

Of all the 360,000 ha arable land in Lebanon, 146,000 ha was rain fed in 1996, while the irrigation potential is estimated at 177,500 ha. The total irrigated area increased from about 23,000 ha in 1956 to 54,000 ha in 1966, decreased to 48,000 ha in the early 1970s, and then increased again to approximately 67,000 ha in 1983 and 87,500 ha in 1993.

According to studies conducted by the Food and Agriculture Organization of the Nations and by the United Nations Development Programme, the irrigated area of Lebanon is expected to rise to 170,000 ha by 2015, and this will require 1,700 MCM/year (Table 2). However, this projected demand could be reduced to 1,300 MCM/year with the implementation of water saving methods (Jaber 1997). According to a report by METAP (2002), the water allocated for irrigation will decrease from 85% to 61% of the available resources.

In the absence of real integrated irrigation schemes on other rivers such as the Assi, Kabir, Hasbani, Wazzani, El-Bared and others, the main source of irrigation is the Litani River and the Litani-Awali network. Estimates indicate that still about 45.7% of the irrigation water comes from springs, artesian and recharge wells.

There are plans to irrigate 6,000 and 4,000 ha, respectively, in the Hermel and Akkar regions of the northern Bekaa from the Assi and Yammouneh schemes. A total of 33,000 ha are included within the irrigation schemes in the regions of southern Lebanon. This includes 1,200 ha near Saida and the currently irrigated area of 6,000 ha in the Kassmieh region. In the coastal plain, rivers and aquifers can irrigate 58,000 ha.

1.3.2 Industrial consumption

Little data is available on the current or expected water needs of the industrial sector in Lebanon. The available data indicates that the Lebanese industry supplies 60 to 70 percent of its needs from groundwater. In 1996, an estimated 71.4% of all industrial water used in the country was drawn from underground sources, and the remainder was drawn from surface sources.

As shown in table 2 above, the industrial use of water, which was at 400 MCM in 2000, will decrease to 240 MCM in 2015. Hardly any water recycling facility exists in the industrial facility and this is mainly due to the low cost of water extraction as compared to recycling.

1.3.3 Domestic water consumption and quality

The daily domestic water consumption was estimated at 165-205 litres/day per capita in the mid-1990s. The Lebanon report for the millennium development goals states an estimated consumption of 60 litres/capita/day, as compared to a 160 litres theoretical daily average reported in other studies.

This figure is expected to reach 215 litres of which 30 MCM come from aquifers in the Damour region and 50 MCM comes from those of Jeita. The capital Beirut is

estimated to require 250 MCM/Year of water, but its fresh and wastewater infrastructure is inadequate, though it is better than other regions. This results in an irregular supply of fresh water, especially during the summer.

Additionally and during the years of conflict, more than 45,000 artesian wells were dug throughout the Lebanese territory for domestic use and were an additional cause of a sinking water table and the intrusion of seawater. The consumption of water from these sources is not accounted for and hence, the domestic water consumption figures might need some revision.

The domestic water network has suffered greatly during the war due to the lack of maintenance and the illegal tapping. The deterioration of the pipes, the increased leakages and the irresponsibility of many users through removing the flow regulators from or even installing pumps directly at the supply led to a distortion in the distribution of potable water.

During the post war period, rehabilitation efforts focused on the primary and secondary supply lines leaving the tertiary ones nearly untouched. This in turn is alone a potential threat to the water safety irrespective of the quality and quantity reaching the primary or secondary supply lines.

In addition, the faulty planning of the sewage network and its vicinity to the potable water network caused in many cases a contamination of potable water. This led in certain areas to outbreaks of waterborne illnesses when sewage water infringes into potable water network lines. A serious problem exists in new residential areas that were established during the war and in the absence of governmental service provision. These areas lying in the vicinity of the major cities have no domestic water or sewage networks.

During the construction, artesian wells were dug to provide households with potable water and at a close distance deeper wells or primitive septic tanks were made to receive the sewage. The areas are time bombs threatening the groundwater aquifers and exist mainly in the Aramoun-Bshamoun area south of Beirut and the areas east of Tripoli.

The latest general survey related to the domestic water supply dates back to 1996 (published in 1998) as part of the mapping of living conditions in Lebanon conducted by the UNDP and the Ministry of Social Affairs.

According to this study, 79% of the total households have access to water through the public network with significant disparities among regions ranging from 68% in the north to 88% in Beirut. Despite a significant improvement in supply as of 1991, especially in rural areas, still many villages in remote areas do not have home access to potable water and have to rely on buying water from underground sources.

The same report indicates that about 16% of the dwellings have access to a public and private network in addition to an artesian well, while about 5% have no access to any source of water and these usually purchase water from private suppliers. The access to the public network does by no means indicate that water is abundantly available. The same report indicates that about 10% of the dwellings have a very low degree of satisfaction of their basic water needs, while the needs of 74% are moderately satisfied.

A report by METAP (2000) indicates that Lebanon still does not have a water quality database, and quotes UNICEF that 60-70% of the Lebanese water resources are polluted.

Till date the number of sewage treatment facilities in Lebanon does not exceed more than 2 regional ones that provide primary treatment for less than 10% of the population. Village-level of secondary sewage treatment facilities were established with the help of the USAID. Still the problem is far from being solved and cases of contamination of potable water sources by sewage water are reported occasionally with no improvement in sight, as still about 35 MCM of industrial effluents are discharged in the Bekaa and the Mediterranean.

As for the access to potable water, the figures show a bigger problem as the data show that 60% of the households get non-sterilized water through the public network, while 13% receive sterilized water as compared to 10% using spring water and 5% consuming bottled or mineral water. Looking at the degree of satisfaction in terms of potable water supply, about 21% and 61%of the households in Lebanon are classified as very low and intermediate, respectively.

Currently, with respect to potable and domestic water, all the water authorities operate chlorination units. However, due to the absence of accredited and credible laboratories and the lack of knowledge regarding the degree of deterioration of the tertiary network, there is a tendency to over-chlorinate the water to insure that they get rid of microbial contaminants. This leads to unpleasant chlorine taste in the water and to increased corrosion of the already mostly corroded galvanised pipes of the tertiary supply lines.

As a result of all the above-mentioned problems, the country has witnessed a boom in suppliers of “drinking water”. A study published by the Ministry of Health in 2002 indicated that more than 4000 such operational companies are not licensed and registered, while only seven are legally registered. Of the seven, two have shown varying degrees of contamination in their water. This report has created much controversy, however little action was taken to confront this problem.

The concern regarding the quality of potable water is growing among citizens, non-governmental and civil society organizations that operate in the country, as is the concern regarding the quality of near-shore seawater. One of the critical areas is the industrial zone in the Litani watershed near the town of Zahle. The majority of plants located in the Litani watershed (except for cattle and poultry farms) are grouped in seven clusters, most in the vicinity of Zahle, an area, according to a 1996 survey of industries (N’khaal et al. 1998), that contains a total of 36 factories, including 15 plants for processing food and beverages and 6 plants for manufacturing non-metallic products (glass, ceramics, etc.). The Lebanese Ministry of the Environment is monitoring the industrial waste of about 100 factories, with the choice of factories based on the size and type of activity and operation they are engaged in. Of these, only four are located in the Litani River watershed.

1.3.4 Water pricing

The water pricing system in Lebanon is based on a yearly subscription for the flow in the supply line and not on the consumption. A line capable of supplying one cubic metre of water per day is subscribed currently ranging between 130-150 USD per

year. This is controlled via a gauge at the household supply lines. Normally, people tend to remove or change the setting of the gauge personally or through bribing the control officers.

There are no reports on the impact of the pricing system for the accessibility to water. The prevailing conditions in Lebanon do not allow deprived households water if they do not cover their subscription. Although in many cases people are fined, there is no real enforcement as this might lead to tensions between the authorities.

Recently, the city of Saida introduced a new tariff system based on consumption. This model shall be copied into other areas.

As for the cistern supply of domestic water, the prices range from 4 to 10 USD per 4000 litres depending on the area and season. This is not affordable to all households and many people tend to carry water from public sources using gallon containers.

Regarding bottled water, the price ranges from 0.67 USD to 4 USD per 20 litres. Surely, smaller containers are more expensive at retail shops.

Irrespective of the quality of supplied water, the price of water does not allow for adequate accessibility to water for all income groups. Normally, this would lead to a problem at the social level, however, the dependency of many households on more than one source of income and the fact that many people access water illegally from the network reduce the problem and its consequences.

Strength and weakness

National water management is in a poor state. Agriculture is by far the largest consumer of water in Lebanon accounting for more than two-thirds of the total water demand. Household water consumption accounts for an average amount in comparison with other developing countries. Reliable data for industrial water consumption are not available. Water quality is very poor due to resource overuse in the coastal areas causing salination of wells and poor supply network conditions. Water prices are in general affordable, but need to be improved due to the fact the tariff system doesn’t differentiate between users and uses.

1.4 Legal and regulatory framework

The legal framework in Lebanon is generally outdated. Nearly all laws and regulations for water quality and water resources protection date back to the time of French colonialism in 1925. A few complementary application decrees have been issued. In addition to those are also a few laws covering wastewater disposal, solid waste discharge, industrial wastewater discharge, and other water pollutants. The main legal texts covering water are:

- Order No. 144, 1925: Protection of Surface Water and Groundwater Resources
- Order No. 320, 1926: Protection of Catchment Areas
- Decree No. 639, 1942: Protection of Nabaa Al Assal Spring, Faraya
- Decree No. 10276, 1962: Protection Zones for Water Sources and Recharge Areas
- Decree No. 14438, 1970: Restrictions on the Depth of Unlicensed Boreholes

- Decree No 14522, 1970: allocation of water resources for areas south of Beirut River to the southern Border
- Decree No. 8735, 1974: Pollution from Solid and Liquid Waste
- Law No. 64, 1988: Pollution from Hazardous Waste
- Decision No. 2528/C, 1996: Protection of Groundwater at El Kneisse Mountain
- Decree No. 680, 1998: The Preservation and Protection of Boreholes

One of the troublesome and urgent hydrological issues in Lebanon pertains to groundwater management. Order in Council 144 (10 June 1925) states that public property is any that may, by its very nature, be used by many people or for the benefit of the general public. Regardless of how much time may have passed in ownership or use of a certain land resource, such properties may not be sold or profited from, and they include surface and groundwater, lakes, rivers, and lake and riverbanks. However, in the late 1960s, the legislation was amended to exclude wells drilled on private lands with an output of less than 100 m3/sec. Such wells must not pump water that possibly belongs to someone else or feeds into a river. Innumerable wells are found throughout Lebanon, especially in the Litani watershed, and for various reasons enforcement of existing laws is very lax to nonexistent.

Some wells were dug during the civil war to meet the water needs of nearby rural communities. Until the government water infrastructure is rebuilt, it would be difficult to imagine the state enforcing the law on such wells. In addition, the average age of the poorly paid staff at the Ministry of Electrical and Water Resources is 55, and this figure is increasing yearly because of the current employment freeze. The Ministry also suffers from a shortage of technical and managerial skills.

As for the standards, the Ministerial Decision No. 1/52, July1996, issued standards for water quality and wastewater discharge. The implementation of the standards proved difficult; hence, they were revised and amended under decision No. 8/1, January 2001.

Despite the texts dealing with surface and ground waters, catchments and declaring them as common goods (144/1925 and 320/26), still there is no mention of the accessibility and the right to water within the Lebanese legislation. The absence of such texts renders activities in this context more difficult and complicated.

Strength and weakness

The legal water framework in Lebanon is generally outdated and needs to be adjusted.

1.5 Institutional setting

The Ministry of Energy and Water (MEW) is the major authority dealing with water. It is responsible for water management and developed a 2000-2009 water strategy in coordination with the other bodies. The strategy addresses: dams and aquifer recharge; potable water projects; irrigation projects; wastewater treatment plant construction; and prevention of river flooding and inundation. The *MEW* supervises four autonomous water authorities that were established by law No. 221 of May 2000 namely: Greater Beirut and Mount Lebanon, Northern Lebanon, Southern Lebanon, the Bekaa. These authorities were formed as a result of merging the nineteen water authorities into the above-mentioned four.

The Ministry of Environment is responsible for the protection of the environment in general, through providing studies on wastewater treatment, environmental impact assessment and natural resources management and conservation. This Ministry is also responsible for proposing legislation that ensures the implementation of relevant measures.

The Ministry of Public Health established a Department of Sanitary Engineering to monitor water quality. The ministry also sets standards for drinking water; proposes specifications for wastewater and drinking water networks; recommends action for pollution prevention; and operates water quality equipment such as chlorinators.

The Ministry of Municipalities and Rural Affairs is responsible for monitoring municipal works including sewage and drainage infrastructure.

The Council for Development and Reconstruction, which has the role of a Ministry of Planning, is responsible for the implementation of the major infrastructure projects in the country, including irrigation, water networks, wastewater and solid waste facilities.

The National Council and Scientific Research conducts and coordinates scientific research and contains an environmental division responsible for pollution, marine biology, waste, wildlife, and nature reserves.

Personal communications with experts working in the water and infrastructure sectors indicate that the four water authorities are still relatively inactive with respect to their mandates and responsibilities towards the regional suppliers and the Ministry of Energy and water. Despite the legal and theoretical distribution between the different authorities, this does not seem to be applied on the ground and there is no central source of information where documentation about the domestic and potable water distribution network is collected. After 1991, the parties involved in the rehabilitation of the network were the CDR, *MEW*, the water authorities, some municipalities and the central fund for the displaced. It is not confirmed whether there was proper coordination among those parties to avoid duplication of work that was reported on a few occasions.

Strength and weakness

Water authorities are defined, but without clear definition of their roles, competences, mandate, and responsibilities towards the regional suppliers and national ministries.

1.6 Political and administrative aspects

Though Lebanon is in a favourable position with respect to water availability, still the national demands are not yet met. The civil war and the following severe economic crisis have left their marks on many sectors including water. The water resources are only partially developed with attempts from the various institutions to improve them. Widespread public and political concerns about water reflects the country's insecurity about perceived and real threats to its sovereignty over water resources, and affects the quality of water data collected, analysed, and published.

In light of the growing regional discussions about the distribution of water resources and the need to have an "equitable" sharing of water, there was a tendency within the Lebanese administration to strictly control any issues related to the water sector. The major concerns are related to the claims of Israel in Lebanese waters that are based on

the misconception that Lebanon has excessive water resources exceeding its future demands. As a result, discussions on issues related to the water resources, especially those of the southern part of Lebanon, are strictly monitored by the Ministry of Energy and Water. This makes it difficult to manage water resources adequately in the present and to make meaningful projections into the future about potential use and availability of water.

Both the political and institutional aspects of the water sector do not support an enabling environment for achieving the right to water and assuring it. On the other hand, the regional political context regarding water makes the national handling of the water problem more difficult. As mentioned, the government considers public discussions on water as negative to its image and to a certain extent a taboo subject. The impact of this attitude affects mainly the free accessibility to information and data.

Strength and weakness

Public awareness of water issues is concerned about the country's insecurity about perceived and real threats to its sovereignty over water resources. National water policy, law and institutional setting does not contribute to change that perception. Water data quality is often poor and data itself are not easy to get with negative impetus on data collection, analysis, and publishing.

2 Meeting the UN concept: The Lebanese understanding of water

2.1 The national water policy versus the human right to water

Politically, the government of Lebanon has historically been committed to the principle of the "Right to Water" that is one of the commitments of the Convent on Economic, Social and Cultural rights that Lebanon accessed in 1976. In practice, till 1975, a big part of Lebanon had no direct access to domestic and potable water at the household level. During the war between 1975-1991, the existing infrastructure was torn apart either accidentally or on purpose by the different parties.

After the war, the reconstruction of the network with all its components started without a clear plan, taking into consideration the different political interests.

It is worth noting here, that the extremely complex social matrix creates, to a certain extent, a different view of human rights. Many politicians see the rights as only those of the people from their own confession or their voters. In a review about "the transformation and implementation in the water sector in Lebanon, the role of politics", Kunigk (1999) indicates that the religious groups are reflected within the water sector through the distribution of leadership within the water authorities among persons representing the different confessions.

In 1999, the Ministry of Energy and Water completed its 10-year strategy mentioned above that was adopted by the council of ministers in 2000. In a presentation during a UNDP workshop held in Beirut 2001, the director general of water and energy points out "the increasing need of the citizen to water" as one of the driving forces behind the adoption of this plan. Additionally, the plan guidelines indicate "alleviating the thirst of the Lebanese and their suffering could not be achieved except through a policy of water harvesting through lakes, dams and groundwater replenishment".

The director general indicates further that the balanced policy targets six main components, namely:

- securing additional water resources through the establishment of 30 dams and lakes and the ground water replenishment,
- potable water supply projects through the establishment of water treatment and pumping stations,
- irrigation schemes through designing and installing irrigation networks,
- wastewater projects, including the networks and collection facilities,
- alignment and maintenance of rivers through Inundation and flooding, and
- electrical facilities projects that include the establishment of electricity networks in deprived areas and initiating hydro-electrical, solar and wind energy projects.

The implementation of the water policy is hindered mainly by political and financial difficulties that will be discussed later. The problems, which are similar to other sectors, did not trigger a public discussion about the privatisation possibilities for the sector, though there are rumours that there are already potential buyers for the water sector and the negotiations are taking place behind the scenes.

2.2 Community approach to water

Despite the positive changes in the communities' approach to environmental issues, there is still a gap in the approach to water access from a human right concept. Very few national non-governmental or community-based organisations dealt with the water issues from an integrated human-rights-based perspective. Discussions dealing with the quality of potable and irrigation water are occasional and usually lack sustainability, momentum and commitment.

One such activity was done by the young volunteers with the *Social Movement* who did a survey about water accessibility and needs in one of the suburbs. The study, though published, is indicated at as lacking professionalism in terms of data collection.

On the other hand, Environmental NGOs focused more on other priorities such as solid and sewage waste management, privatisation and public access.

As for privatisation, public discussion on the issue has not reached the water sector and it is still focused on other sectors, namely the electricity and telecommunications

The projects executed by US-based NGOs have a political dimension serving mostly an agenda of the agency and for a specific period. Despite still being a priority for the people, the water management projects, domestic and sewage, funded by the USAID have been downgraded and the NGOs that were executing these projects removed them from their priority setting. For example, the same NGOs were advised to downsize their projects within their clusters and move towards the liberated zone right upon the end of occupation.

National NGOs working on water issues mostly tend to be service providers ensuring water supply to deprived areas or households.

Universities and research centres are until now focusing on the needs for irrigation when dealing with water demand management. This is demonstrated in terms of workshops and a couple of projects dealing with water harvesting and sound irrigation practices.

2.3 Constraints facing the water sector

The water sector is facing several constraints and problems, which need to be addressed through an integrated approach that combines practical technology with political and social support to avoid water shortages in the future (figure 4). The major challenges include:

- increasing water scarcity,
- continuing water quality deterioration,
- inter-sectoral water allocation conflicts,
- unsystematic and disordered cost recovery and wasteful operational performance,
- inadequate government involvement and bureaucratic restraint, and
- the inefficient institutional arrangements.

The constraints facing the water sector in Lebanon affect the quantity and quality of supplied water. These constraints can be divided into 5 categories namely: political, technical, financial, legal and institutional, and natural.

2.3.1 Political constraints

The master plan was approved in 2000, still however a broad assessment of the achievements to date reveal that very little has been done towards reaching its aims. Of course, the mentioning in the master plan of the need of people to water rather than being a legitimate right, clarifies the approach of the authorities and hence, could explain the low-level commitment among the decision makers and their handling of the issue.

The major obstacle facing the realization of the plan is the lack of political will and the presence of political interest behind every step that is being discussed. An example of this is the discussion that delayed the launch of the establishment of a dam in the Kesrouan area north of Beirut for more than a year. Other projects are still pending for similar reasons.

2.3.2 Technical constraints

Technical aspects include the staff capacity, distribution network design and status including the purification equipment and techniques, physical assaults against the network, contamination of water sources and the outdated water management and saving techniques.

2.3.3 Financial constraints

The poor management and embezzlement has affected the water sector just as any other sector. In many cases, the infrastructure rehabilitation works were not completed or not compliant with the standards.

On the other hand, the pricing system needs revision to promote water saving, while many people tend to refrain from payment, linking the issue to inadequate supply.

On the institutional and administrative level, the distribution of authorities between the *MEW*, CDR, and the water authorities with the relevant restrictions and bureaucratic barriers significantly affects the planning and implementation of plans. The lack of cooperation and coordination between the various water authorities poses an additional limitation on the improvement of the services.

The nature conditions in Lebanon reduce the possibilities for an efficient utilization of water resources. The topography (fissured carstic rock and steep slopes) and the concentration of precipitation in less than 100 days, increases the difficulty of water harvesting. This is augmented by the hot dry summer, which causes high levels of evapotranspiration.

2.3.4 Water supply

The current water supply in terms of network coverage and accessibility to water is by far better than 1975 with respect to most rural areas. This has been achieved during the post 1991 period. However, with the bulk of the population living in the urban areas, minimal achievements have been noted regarding securing additional water

resources to enhance supply. For example, after more than 7 relatively dry years, the year 2003 was an exceptional year in terms of precipitation, which reached in some areas double the 50-years average. The enormous amounts of water resulted in many problems that unveiled the poor infrastructure quality. The fact the works have started on only one dam of the 30 mentioned in plan, and that after intensive political discussions, is one indicator of the problem. Data from the Litani water authority indicated that 10 million cubic metres were released daily from the full Qaraoun Lake over a period of two months, more than two times the capacity of that lake. Estimates of the quantity lost from springs after the Qaraoun Dam, reveal that a similar quantity of water was lost. Still, during the summer of 2003, water shortages and rationing were noted in many areas of the country though at a lower extent than in previous years. The lake, which was completely full at the same time last year, is still not even half full in the same month of 2004, where rainfall has exceeded the average. Similar rationing was observed in other areas of the country.

Another challenge is the integrity of the supply system, which is still disturbed by heavy rains, and supplies in too many areas are disrupted due to the intrusion of runoff water into the water pumping and purification stations.

2.3.5 Water quality

Water quality is as important as its quantity since quality affects usage and vice-versa. In Lebanon, the discharge of raw sewage into surface and ground waters, especially in the mountainous rural areas where this water is later used for irrigation or as a potable source of water, presents serious health problems as evidenced by microbial contamination of rivers, springs and ground water.

As mentioned earlier, water used for irrigation purposes accounts for more than two-thirds of the water demand in Lebanon. Seasonal disparities between the winter precipitation period and the maximum irrigation water demand period (dry summer) has consistently led to excessive and uncontrolled groundwater withdrawal to meet these demands. Such patterns of water withdrawal have led to severe lowering of the water table and caused saltwater intrusion along the coast. This intrusion poses a serious threat to the quality of fresh water in coastal areas, particularly in some locations where seawater has actually intruded several kilometres inland and contaminated coastal aquifers. Other agricultural practices have also contributed to a diminishing water quality. Excessive fertilizer utilization and unregulated application of pesticides in some areas has led to contamination of surface and subterranean waters by these substances or their by-products, particularly in shallow aquifers.

The lack of sewage treatment facilities and the presence of septic tanks or wells present an enormous threat to water quality and especially the underground aquifers. There seems to be a political ignorance regarding the gravity of this and other problems. The uncontrolled disposal of solid waste in watersheds has also led to the contamination of river basins by the leachates. The leachates might also infiltrate through fissured bedrock and pollute the groundwater downstream from a dumpsite, and thus widen the contaminated region. With respect to industrial pollution two main categories can be identified; the surface and subsurface disposal of liquid effluents laden with organic chemicals and heavy metals, which find their way through the highly pervious and fractured bedrock into the groundwater. The second and more widespread source of industrial pollution is from leaky underground gasoline storage

tanks and the uncontrolled surface dumping of waste oils and petroleum by-products and residues.

2.4 Future needs

In general, there is a consensus within the reports that at the current rate of water consumption, Lebanon will be facing a serious shortage beyond the year 2010 (Figure 4). However, the traditional and future water demands vary widely because of different assumptions used in the estimation process, particularly in relation to available land for agriculture, average consumption per hectare, annual population growth, average per capita consumption, and future industrialization potential. While the numbers vary, the consensus is that there will be a deficit in the quantities of water required within the next ten to fifteen years as depicted in Figure 4. Using the water balance presented in Table 1, it is clear that the total quantity of fresh water available for exploitation will result in a water shortage in the near future; hence the need to address the issue of water management through proper policy setting (El-Fadel, 2001).

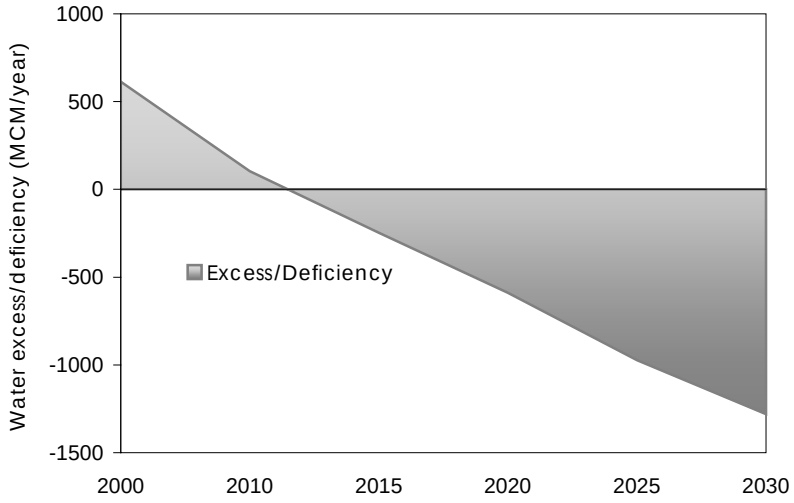

Figure 4: Lebanon's future water demand and deficit (El-Fadel, 2001)

The web of social and political conditions and the water realities presented above require a comprehensive framework that can address these constraints and provide for more efficient allocation of water resources. In this context, management, institutional and policy options, as well as the feasibility of developing non-conventional water resources must be examined.

2.5 Management, institutional and policy options

Efficient water resources management is crucial when addressing the water imbalance in Lebanon. New management and planning policies are necessary to overcome the problems and constraints outlined above. The importance of proper water management has already been recognized in other countries that have initiated specific policies, legislation and steps to mitigate water-related problems. Fundamental issues emerging from cross-country studies relating to water management indicate that measures to enhance proper resource allocation and water quality are complementing and sometimes replacing actions targeting additional resource development and

increasing water quantity. In addition, centralized decision-making, administrative regulation and bureaucratic characteristics are fading and paving the way towards decentralization, stakeholder participation and economic mechanisms.

As such, the current institutional reorganization drive in the country should be exploited as a platform to launch fundamental change in water laws, policies and administration in line with international trends.

Currently, these approaches are still lacking and in Lebanon and there is a high importance for targeting them. Despite some decentralization trials, the systems seem to be stationery blocked by the socio-political structure and the lameness of the public sector and public servants, including the water authorities.

2.6 Current activities in water resources management

Considering the projected water shortages that Lebanon will face within the next couple of decades, the Ministry of Energy and Water launched steps aimed at setting the general policy for the management of Lebanon's water resources through the formulation of the 10-year plan for water and wastewater management, to be completed by 2011. This is the first step towards proper, sustainable, and comprehensive water management.

Despite the various studies, projects and assessments of the infrastructure and needs, very little has been achieved towards the implementation of the master plan for water resource management and protection. The fact that prioritisation of activities is based on political and not on national interests, and the economic crisis, has been the major reason behind this inactivity and the stall.

On the other hand, infrastructure projects have been initiated through the assistance of loans and grants from major organizations and governments such as the World Bank, European Investment Bank, European Union, United States Agency for International Development (USAID), Saudi Fund for Development, Kuwait Fund for Arab Economic Development, Arab Fund for Economic and Social Development, French and Italian cooperation agencies, and the German and Japanese Governments through their specialized agencies. These projects include rehabilitation and maintenance works on water treatment plants, sewage treatment, pumping stations, groundwater wells and surface reservoirs, extension of existing and newly constructed potable water supply and distribution networks and technical support on sound irrigation practices. Institutional and administrative development of the water sector is also a focal area for a multi-million Euro project funded by the European Union MEDA programme.

The USAID is currently implementing a water policy programme within the MEW that focuses on three policy and implementation areas, namely private sector participation, water services pricing and local level participation. The objectives will be accomplished through training groups of the different water and wastewater authorities, local authorities and the MEW to build the strategies using a collaborative and participatory process.

On the other hand, the proposed EU project focuses on Institutional Programming and Planning within the Ministry of Energy and Water as well as the Water authorities. The programme that was signed recently focuses on three major aspects:

- The main rules of operation and the cooperation mechanisms between the water authorities
- The network losses, their detection methods and the policy for loss reduction, and
- Development of models for optimum use of water resources

This programme includes under the priority areas the stakeholder consultation and trainings that would contribute to its success. Details related to this project are not available yet as the finalization of the contracts is ongoing.

3 Conclusions and recommendations

The information in this document confirms what has been stated by many reports and studies regarding the water supply and accessibility. Surely, the mismanagement of resources leads to this conclusion. The efforts that were made towards alleviating the war damage did not completely succeed due to the faulty planning, corruption and lack of expertise. An additional challenge was the lack of accurate data. The figures used currently are mostly estimates that are based on pre-war data. The fact that the existing system is not capable of satisfying the needs of the population in terms of irrigation and domestic water leads to the following recommendations of utmost priority:

- The rehabilitation of the water network and the broadening of its geographical coverage,
- Implement with available resources, without resorting to international debt, the Ten-year action plan in order to increase available water resources
- Capacity development of public sector personnel on management related issues
- Focus on managerial aspects to reduce/eliminate the water rationing such as stricter control on the networks and their losses,
- Make use of available water resources, especially the trans-boundary ones within the limitations of international law
- Conduct community training and awareness campaigns related to the right to water, accessibility and affordability, in addition to good practices in water management and saving practices
- Work on updating existing legislation or develop new legal texts that support a sound water management policy, and ensure the enforcement of these texts.

4 List of NGOs

As mentioned earlier, very few national NGOs handle the water issue from a human right perspective, rather it was always considered as a basic need and the water was provided as a service. On the other hand, a few US based NGOs were involved in installing primary and secondary domestic water networks and irrigation canals in some remote areas.

Caritas Lebanon

P.O.Box 16-5274

Youssef Hajjar Street, Sin El-Fil, Kalaa, Beirut

Tel.+961 1 499767/8/9, 483305

Fax.: +961 1 494713

Email: executive@caritas.org.lb

Recently moved into service provision regarding irrigation water management

Jihad Al Binaa Association

P.O.Box 24-153

Rotex Building

Haret Hreik Main Street, Beirut

Tel.: +961 1 557151/2

Fax: +961 1 557603

Email: binaa@cyberia.net.lb

The association was mostly involved during the war in providing potable water to houses through cisterns and other basic services such as garbage collection. Later it became involved in agricultural and rural development including irrigation.

Social Movement

148 Alam street, Forest Building

Badaro Street, Beirut

Tel.: +961 1 381 279/381879/383718

Fax.: +961 1 387736

Email: mouvementsocial@mouvementsocial.org

The movement is involved in various social activities including preliminary water study in one of the suburbs of Beirut. The activity was part of a youth mobilization campaign that needs to be continued.

The below mentioned NGOs are US based that received funding from USAID to implement a project in domestic and irrigation water supply and sewage treatment. The project cycle was between three and five years. The project was closed or is currently being closed.

Cooperative Housing Foundation

Bir Hassan, Adnan Al Hakim St.,

Mobarak Bldg., 3rd Floor, Beirut

Tel.: +961 1 853263/780

Fax.: +961 1 853262

Email: cdi@cyberia.net.lb

Mercy Corps International

5590 Beirut- Lebanon

Bostani Bldg, 3rd Floor

35 El-Fors St. , Beyond Olivetti

Justice Palace Area.

Tel.: +961 1 611586/7 Mobile: +961 3 701543

Fax.: +961 1 611585

Email: mc@lb.mercycorps.org

YMCA Lebanon

P.O.Box 11-5520 Beirut

Centre Delta, 3rd floor

Horsh Tabet - Sin El Fil, Beirut

Tel.: +961 1 490640/685, 491740

Fax.: +961 1 (01) 491740, 490640

Email: ymca@ymca_leb.org.lb

Pontifical Mission

P.O.Box 70790 Antelias

Jal El Dib - Mar Abda Bldg.

Tel.: +961 4 714901-4

Fax.: +961 4 714905

Email: pontim@inco.com.lb

In addition to the above-mentioned NGOs, the following universities and research institution are involved in water management issues, with a special focus on irrigation and quality.

American University of Beirut

http://www.aub.edu.lb

Faculty of Agricultural and Food Sciences

Faculty of Health Sciences

Faculty of Engineering and Architecture

This university operates interfaculty programmes that handle environment and water related issues

Notre Dame University

http://www.ndu.edu.lb

Water, Energy and Environment Research Centre deals mainly with water demand management at the agricultural level

National Council for Scientific Research

http://www.cnrs.edu.lb

The largest governmental research body supports the researcher in various fields including water quality of rivers, ground water assessment and irrigation management

Lebanese Agricultural Research Institute

http://www.larileb.com

Once a major actor in water management and irrigation research, the institute currently works on irrigation water management in the northern Bekaa region, maintains a laboratory that conducts routine water analysis for the public and conducts pesticide and fertilizer residue analysis for ground water

5 List of donor activities of governmental and non-governmental organizations

United States Agency for International Development

Supported grants worth about 53 million USD for US based NGOs to work in the Field of water supply, sewage treatment and solid waste management. The agency is currently supporting the Water Policy Programme at the MEW with a budget of about 1.3 million USD.

European Commission

Currently finalising the agreements with the MEW with a budget of about €15 million.

Italian Ministry of Foreign affairs/Trust funds

The project of about €2 million supports water demand management activites within a rural development context in the northern Bekaa in cooperation with LARI, CARITAS and the Italian Institute of University Cooperation

The World Bank

The bank gave loans of about $120 (supposedly 'million', please verify figure!) to rehabilitate the irrigation and domestic water sectors.

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Palestine

Water as a human right:
The understanding of water in Palestine

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Summary

Throughout the Middle East, there is a gap between water supply and water demand. In Palestine, this gap is growing with time because water supply is artificially constrained. This gap is having severe adverse effects on both current and future Palestinian socio-economic development.

Water is essential to human life — for basic health and survival, as well as food production and economic activities. Yet Palestine is presently facing a national emergency in that there is a lack of access to a basic supply of clean water and access to adequate sanitation, the primary cause of diseases linked to water – as well as a potential source of contamination to the water resources themselves.

This study presents the current situation in the water sector in Palestine, along with the water sector policy and strategy, and existing legislation. The criteria for the Human Right to Water are then considered. It is concluded that closing the water gap in Palestine will be totally dependent on the development option and on that action plan that is best able to be implemented in the current political and economic situation.

1 The national water sector

Records show that pre-1948 Jewish and Palestinian communities in the region were consuming similar quantities of water for both domestic and agricultural purposes. Since the establishment of the Armistice Line in 1949, Israel commenced restrictions on the development of wells in the area under Jordanian administration, specifically in the West Bank area, which impacted on the shared North Eastern and Western aquifers. In parallel with these restrictive actions, Israeli exploitation of water resources accelerated and the water consumption gap between the Israelis and the Palestinians started to widen. In 1964, Israel took advantage of its control over much of the headwater area without recognition of other riparian users' needs or rights in the Jordan River Basin when it implemented the first "out of basin" transfer (National Water Carrier System) of the Jordan River waters to the Negev and southern coastal areas of Israel.

After 1967, with the annexation of the Golan Heights and the occupation of the West Bank, Israel increased its control over both the headwaters and the lower Jordan River. This control was further extended with the invasion of Southern Lebanon in 1978 and the establishment of the "security zone" – which was returned to Lebanon in May 2000.

Further exploitation of the resources of both the upper and lower reaches of the Jordan River continued over this period with total disregard for other riparians until the Peace Treaty with Jordan in 1994.

Meanwhile, colonisation of the West Bank and Gaza was carried out by the construction of settlements. These settlements, in addition to utilizing a disproportionate part of the available aquifer, discharged untreated domestic, agricultural and industrial waste into nearby valleys, resulting in significant harm to the environment.

Post-1967 actions were also effected to close some Palestinian wells and to place restrictions on pumping accompanied by restrictive controls by means of licensing, application of fixed operating quotas and refusal of permission to deepen wells.

Progressive desertification has also taken place in the West Bank and Gaza due to the reduction of available grazing area by 50% mainly as a result of the acquisition of land for settlements, military camps and "nature reserves". Forestation programs in the West Bank and Gaza that existed during the British Mandate and Jordanian Administration were stopped under the Israeli occupation and a 25% effective deforestation has taken place over 30 years, mainly due to the establishment of the Israeli military camps and settlements.

The entire period from 1967 to the present day was accompanied by the degradation of existing infrastructure and limited development of new infrastructure for water supply, sewerage and solid waste. This resulted in insufficient supply and unreliable service together with poor quality and with large losses in the systems. The Israeli "operator" also cut off supplies periodically, thereby discriminating unfairly between Palestinians and Israeli settlers when shortages or problems occurred (especially during periods of drought).

Consequently, the gap in water consumption between Israel and Palestine has widened from a similar utilization in pre-1948 to the more than three times differential that exists today. The differential in water use between Israeli settlements and Palestinians is even more marked, being in the order of five to six times. Not until the Declaration of Principles in 1993, ratified by the Oslo II Accord in 1995, did the principles of equitable utilisation and the shared management of regional resources between Israel and Palestine get official mention and hopefully these principles will again become part of the negotiating agenda in the future. Effectively, Oslo II – as in the Interim Agreement – only permitted a relatively small increase in the utilisation of water resources by Palestinians and otherwise agreed (referred to) to a status quo on other abstractions.

However, it must be stated that the situation has worsened since the current Intifada. Quantities of supply are still deficient (controlled) and in many localities it is necessary to purchase water for domestic use from water tankers at high prices, 5-6 times that of piped water from public utilities (Shalabi 2003). The bottom line is that sufficient and reliable water services in the West Bank and Gaza Strip are affected negatively by the continuing water shortage.

1.1 National macro-economic setting and development objectives of Palestine

Historical/geographical Palestine is located on the eastern edge of the Mediterranean Sea, with the countries of Lebanon and Syria in the north, and Jordan to the east. It had a total land area of 26,323 square kilometres. The West Bank of Palestine (the inland region) is 5,655 square kilometres and is 130 kilometres long and ranges from 40-65 kilometres in width. The Green Line border between Israel and the West Bank is 307 kilometres long, and the eastern border with Jordan is 97 kilometres in length.

The Gaza Strip of Palestine (the coastal region) is 365 square kilometres and is 45 kilometres in length, and from 5-12 kilometres in width. The Gaza Strip has a 62 kilometres coastline, and a 51 kilometres border with Israel, and 11 kilometres with Egypt. (ESCWA/FAO 1985, UNEP 2003)

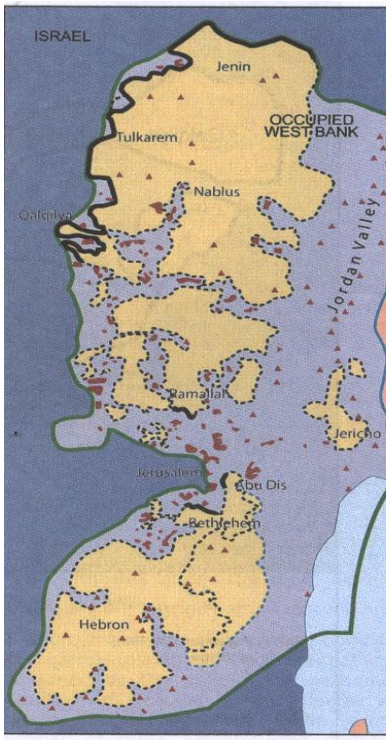
A picture is worth a thousand words. Below, Map 1 depicts historical or geographical Palestine, with a line illustrating the "Armistice Line" in 1948, and the spots indicating the areas that are supposedly under Palestinian control – based on the Sharm el-Sheikh Memorandum as of March 2000 – i.e., 21.7% of the "Armistice Area" and 5% of historical/geographical Palestine.

Map 2 shows the status of the West Bank portion of Palestine in November 2003. All of the West Bank is essentially Israeli controlled – with the yellow coloured areas having different degrees of Israeli presence. Map 3 shows a picture of the Wall (Separation fence) that is being constructed by Israel and which has again altered the geographical face of Palestine – and at the same time has significantly affected the availability and accessibility to water resources. To-date, this Wall has put another 15% of the West Bank land on the "Israeli" side – home to 274,000 Palestinians, with at least another 326,000 who will be affected by being separated from their lands or schools or health care services – not to mention family and friends.(Jarrar et al. 2003)

With regard to water resources, the Wall is blatantly meant to insure Israel's complete control over Palestinian water resources. The positioning of the Wall has now put Israel in complete control of the Western Aquifer Basin and has eliminated any

opportunities for Palestinians in the future to develop or extract any water through drilling wells in productive areas, as defined by geological structures. The Wall even now physically controls about 40 existing Palestinian wells (over 5 MCM/year) that were located in agricultural lands in the Western Aquifer Basin alone. This is nearly one fourth of the entire current Palestinian usage of the Western Aquifer Basin (WAB) (22 MCM/year). In comparison, Israeli abstractions from the WAB increased up to 544.8 MCM in 1998-99 (decreasing somewhat in 2000 and 2001) (SUSMAQ 2003). It is noteworthy that the sustainable yield of the Western Aquifer Basin has always been quoted as being 400 MCM/year.

Map 1: Palestinian controlled Areas – March 2000



Map 2: The West Bank November 2003

Map 3: The Gaza Strip

The Wall in Abu Dis
January 2004

The Wall near Qalqilia
January 2004

Currently, in 2004, the two remaining pieces of historical /geographical Palestine have a projected population of 3.6 million, with 2.3 million in the West Bank and 1.3 million in the Gaza Strip. These populations are based on a 1997 census that was taken by the Palestinian Central Bureau of Statistics. The overall natural increase or population growth in Palestine is 3.5%, based on 3.2% in the West Bank and 4.0% in the Gaza Strip. The Gaza Strip may be the most densely populated region in the world with over 3,600 persons per square kilometres in 2003. The West Bank has 407 persons per square kilometres.

Population increase is the fundamental parameter affecting future water needs. This determines not only municipal demand, but also agricultural demand (to feed the population) and industrial demand (to provide an economy to support the economic development of the population).

In Palestine as a whole, more than 50% of the population lives in an urban environment, 28.5% in rural areas, and 15% in camps. In addition to the 3.6 million Palestinians 'in' Palestine, there are over 4.5 million Palestinians living outside, mostly in other Arab countries. There are also another 1.5 million Palestinians living inside Israel, as Israeli citizens. (Shalabi 2003, UNEP 2003).

The climate in Palestine is classified as Mediterranean with hot, dry summers and short, wet, and cool winters. The temperature and rainfall vary with altitude within the five distinct climatic areas – the coastal region of Gaza, the semi-coastal fertile plains

of the West Bank, the hilly chain or central highlands, the Eastern slopes, and the Jordan Valley.

Strength and weakness

The remaining (and growing) population of Palestine essentially has little control and obvious restricted access to its national water resources. Palestinian water rights have not been defined.

1.2 Palestinian water policy and strategy

The elements of a Palestinian Water Policy were stated in a document issued by the Palestinian Water Authority in January 1996. The Palestinian water policy, as set out in the following principles, was to be the basis for decisions on the structure and tasks of water sector institutions and the water sector legislation. (Palestinian Water Authority 2003a, PECDAR 2001, SUSMAQ 2003)

All sources of water should be the property of the state.

Rationale: In a situation of acute shortage of available water resources, a just, equitable and sustainable allocation among all legitimate users may be best ensured by the state. To this end, all well drilling, water production and supply should be allowed only by permit or a license. It should be noted that unlicensed drilling still occurs, predominantly in Gaza and the northern West Bank.

Water has a unique value for human survival and health, and all citizens have a right to water of good quality for personal consumption at costs they can afford.

Rationale: The right to water for survival is seen as a universal human right. However, individual water rights do not necessarily imply free access to water supply or disposal services. Standards for assuring a safe quality of drinking water, and for water supply must comply with resource assessment based on scientific methods. The words "and of sufficient quantity" should be added to this statement.

Domestic, industrial and agricultural development and investments must be compatible with the water resource quantity available.

Rationale: An important means to meet this goal is consistency between national economic planning and the national water policy. Economic development should not imply, even inadvertently, unsustainable water use or irreversible environmental damage. The regard for resources and environment should lay the bases for the economic solutions. The role of agriculture is particularly important in the economy of the Palestinian territory, and the major share of water resources are being used for agricultural purposes. Water consumption in the agricultural sector will have to adjust on a cost-efficiency basis, with due consideration to issues such as issue such as choice of cultivars, use of marginal-quality water, and improved irrigation technology. Domestic uses occupy the first priority in the allocation of potable water resources.

Water indeed is an economic commodity, therefore the damage resulting from the destruction of its usefulness (pollution) should be paid by the party causing the damage (polluter).

Rationale: Sustainable management of water as a scarce resource is only possible when its full cost is acknowledged during the planning and development of water

projects. Pricing policy may, however, have to be made so as to provide drinking water to poor parts of the population at an affordable price.

Water supply must be based on a sustainable development of all available water resources.

Rationale: In this context, available resources include sharing of regional water resources, recycling, reuse, rainwater (and storm water runoff) harvesting, use of marginal-quality water, and unconventional sources such as desalination. Sustainability in the context of Palestinian water resources means, in particular, long-term maintenance of groundwater levels, water pollution prevention, more efficient use of marginal waters, and rainwater (storm water runoff) harvesting.

The development of the water resources of the Palestinian territory must be coordinated on the national level and carried out on the appropriate local level.

Rationale: The scarce and limited resources of catchments and aquifers must be managed in their entirety, preventing upstream overuse to the detriment of downstream users. This is best achieved through overall coordinated actions, complemented by local implementation, together with proper measurements, monitoring and recording of all water production and use.

The national water sector management should be carried out by one responsible body with the separation of institutional responsibility for policy and regulatory functions from the service delivery functions.

Rationale: The water resources of Palestine are of such overriding importance for human welfare and the national economy that water matters should be dealt with at the highest level within the government for effective coordination of sectorized interests. The Palestinian Water Authority should carry out its activities in close collaboration with relevant sectorial authorities.

Public participation in water sector management should be ensured.

Rationale: Local participation in planning, operation and management is one key to ensuring proper management of water demand. Public awareness of the role of water in both the public and private domain and its social, environmental and economic value is important for informed decision-making.

Water management at all levels should integrate water quality and quantity.

Rationale: Usable water is always a function of both quality and quantity and the two are strongly interconnected. Disregard of this fact is disastrous, and has, for example, led to saltwater infiltration from the Mediterranean into Gaza. Integrated water management should include monitoring and other data collection.

Water supply and wastewater management should be integrated at all administrative levels.

Rationale: Water consumption will inevitably lead to spill or sewage. The economy and technology for managing both water supply and sewage can be optimised by an integrated approach. Moreover, in some circumstances, wastewater as well as storm-water drainage is a potential resource for raw water supply.

The optimal development of water supply must be complemented by consistent water demand management.

Rationale: Use of appropriate technology should be encouraged in water-saving practices, both in households, industry, and above all in agriculture. Pricing policies are important tools for managing water demand and must be a part of the overall water policy. In this context, it is also essential to modernize surface and groundwater monitoring systems.

Protection and pollution control of water resources should be ensured.

Rationale: In this context, all preventive measures against pollution should be ensured and legal actions against offenders should be taken. For example, industrial waste should be treated on-site and then discharged to the wastewater network. Areas of good water quality should be protected and safeguarded against pollution and major development projects.

Conservation and optimum utilization of water resources should be promoted and enhanced.

Rationale: Water resources should be developed and managed to optimise the efficiency of their utilization, recognizing their scarcity, the need for their conservation and the importance of pricing to promote economic efficiency.

The Palestinians will pursue their interests in connection with obtaining the right of water resources shared by other countries.

Meaning: The Palestinians were committed to implement Article 40 as agreed upon with the Israelis in Oslo II (an Interim Agreement). This also stresses the fact that the Palestinians will negotiate with the Israelis in the final stage to reach a final agreement. Accordingly, the Palestinians will seek other agreements with other countries.

The government will cooperate with regional and extra-regional parties to promote the optimum utilization of water resources, to identify and develop new and additional supplies, and to collect and share relevant information and data

Meaning: Regional co-operation should include sharing of information and data on water resources and promotion of regional seminars, meetings and publications. The Palestinian government will cooperate on regional initiatives to identify likely sources of new and additional water supplies and agree on the development of such resources. (It should be noted that the "sharing of information" stage still has not been reached – neither bi-laterally nor even between institutions in Palestine.)

Based on the above Elements of a Water Policy, the National Water Policy for Palestine has been formulated by the Palestinian National Authority to address the increasing scarcity of water resources in Palestine and the political complexity in relation to this valuable resource. This policy contains the above outlined points and principles for governing policy and planning for the water sector in Palestine. When drafting the Palestinian water strategy, the above points were summarized and re-prioritised to capture the most important issues and strategic interventions to be considered when developing water resources for supply purposes, e.g.:

- Pursue Palestinian Water Rights.
- Strengthen National Policies and Regulations.
- Build Institutional Capacity and Develop Human Resources.
- Improve Information Services and Assessment of Water Resources.
- Govern Water and Wastewater Investments and Operations
- Enforce Pollution Control and Protection of Water Resources.
- Promote Public Awareness and Participation.
- Regional and International cooperation.

Overall objective:

Equitable and Sustainable Management and Development of Palestine's Water Resources

Ultimate goal:

To find the optimal way to manage, protect and conserve the limited water resources.

Mission:

To maximise benefit from resources by raising water consumption to levels that provide for safe health and economic prosperity.

Strength and weakness

Thus, the basis for a Palestinian water policy and strategy have been drafted and studied – and different scenarios have been formulated. The institutional and regulatory framework for water resources management in Palestine has been set up. However, there is a never-ending need to cope with growing demand, deteriorating quality and conflict between user categories – while always having to deal with the issues of water rights, between neighbouring countries. The needed approach to completion and implementation of the Palestinian Water Management Strategy is the one that will build the capacity of local utilities and promote ownership, commitment and awareness not only in local institutions – public, private, non-governmental- but also more directly to the general civil society.

1.3 Water resource assessment: Base and potential - The water resource gap

Throughout the Middle East, there is a gap between water supply and water demand. In the Palestinian Territories, this gap is growing with time because water supply is artificially constrained by the stagnation of the peace process. This gap is having severe adverse effects on both current and future Palestinian socio-economic development.

There is a great deal of uncertainty regarding the quantity of cheap, locally accessible water that will be available for future Palestinian use. For example, the utilization of 'national' groundwater resources and the riparian share in the Jordan River system is much cheaper than seawater desalination or water import. This obviously means that ground water and surface water sources from the Jordan River will be exploited first.

More costly water sources, which are often more distant, or otherwise more difficult to obtain, will only be developed at a later date, after cheaper sources have been fully utilized. In the Palestinian case, this issue is related, of course, to how much water will be available to the Palestinians from these resources based on Permanent Status Negotiations with Israel (PECDAR 2003).

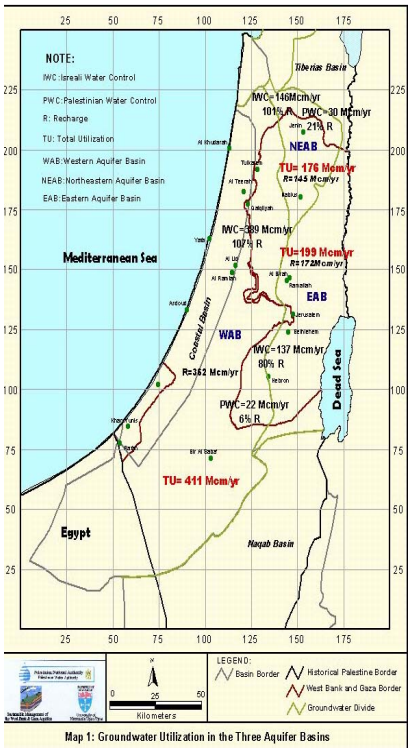
It must also be noted that the groundwater quality of the aquifer in the Gaza Strip has been substantially impacted by vast over extraction in excess of the sustainable yield of the aquifer, by raw wastewater discharges, agricultural water return flow, and salt water intrusion due to the mining of the coastal aquifer.

The fresh water gap in Palestine has to take into account the different water qualities because at times water from a certain resource cannot be used for a certain demand sector. For example, water from treated wastewater or harvesting of storm water cannot be used for domestic purposes.

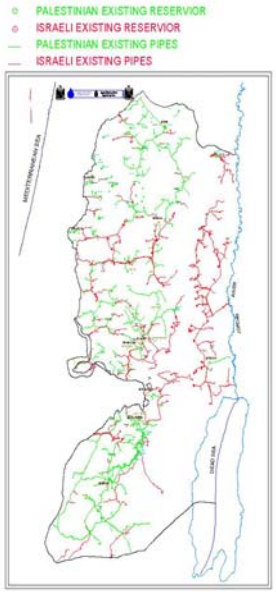
Strength and weakness

Obviously, closing the water gap will be totally dependent on the development option and the action plan best able to be implemented due to the current political and economic situation. There is restricted access to national water resources. The following diagram and maps show clearly the control of water resources of the West Bank – as well as the Gaza Strip:

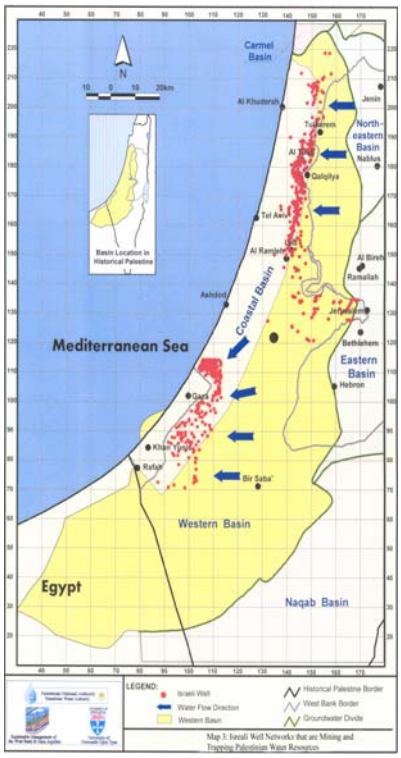
Figure 1: All basins' water



Map 4: Groundwater utilization in the 3 aquifer basins in the West Bank:



Map 5: Existing infrastructure in the West Bank – pipelines and reservoirs, Israel – red lines, Palestine – green lines



Map 6: Israeli wells that are mining the water resources from the West Bank – and before the water resources reach the Gaza Strip

Israel (MCM)	**Palestine (MCM)**
Western	Western
389	22
North-eastern	North-eastern
146	30
Eastern	Eastern
137	22

1.4 Analysis of demand and supply of water

1.4.1 Municipal water demand

Actual municipal water demand

The total water use by the domestic and municipal sectors in the West Bank and Gaza Strip during 1999 is estimated to be 101.3 MCM/Year. An amount of approximately 52.3 MCM/year was used in the West Bank, whereas a total of approximately 49 MCM was used in Gaza Strip. The overall supply rate (including losses) for urban domestic purposes in the West Bank is estimated to vary between 53 litre/capita/d in Tubas and 134 litre/capita/d in Jericho. The overall loss or unaccounted-for-water (UFW) rate is estimated to vary between 25% (in Ramallah) and 65% (in Jericho), with an average of 44% of the total supply. The loss rate in un-piped areas was assumed to be 25%. All localities in the Gaza Strip are considered connected to a water distribution system. The total average use is estimated to be 134 litre/capita/d. The per-capita domestic consumption rate is estimated to be approximately 80 litre/capita/d. However, in the Gaza Strip, the groundwater is of poor quality with only a small percent considered potable. In the Gaza Strip, the overall loss rate is estimated to be about 45%, of which 40% is estimated to constitute physical losses from the system and 5% unregistered connections and meter losses.

The municipal future water demands comprise the domestic, public, livestock, commercial and tourist water needs. The demand projections are estimated based on the WHO standards of 100 litre/capita/d and 150 litre/capita/d as minimum and average domestic water consumption. Other consumption rates (including commercial, industrial and livestock consumption rates) are projected as a percentage of the municipal water demand. Assuming an estimated physical loss rate ranging from 12% to 8% by the year 2010 (PECDAR 2001), the total demand of 302 MCM/year projected for the year 2010 gives a total municipal annual per capita water demand of 69 CM/Year. (The current total annual municipal per capita demand in Israel is around 105 CM/year.) (Assaf and Aliewi 2003, SUSMAQ 2001)

Table 1: Projected municipal water demand in MCM/year

Year	**2000**	**2005**	**2010**
West Bank	127	159	187
Gaza Strip	77	96	115
Total Palestine	204	255	302

1.4.2 Industrial water demand

Due to the constraints imposed on this economic sector in Palestine during the last 34 years of occupation, the industrial sector made only a limited contribution to the overall economic development. Consequently, the existing situation of the industrial sector in Palestine (which consists mainly of light and small industries) does not represent the actual stable industry that could be achieved in Palestine. This implies that the current industrial water demand cannot be utilized for the projection of the future water demands. Types of existing Palestinian industries range between quarries,

food processing and others. It is stated that the present industrial water demand in Palestine represents about 8% of the total municipal water demand. The present industrial water consumption is included in the total current domestic consumption, and it is very difficult to estimate, while the actual industrial water demand is about 16%.

The national vision regarding the industrial sector is the establishment of 9-13 Palestinian industrial estates eight of which are to be distributed among the different Governorates of the West Bank, and four in the Gaza Strip. (Assaf and Aliewi 2003, SUSMAQ 2001)

Table 2: Future industrial water demand

Year	**Industrial demand (MCM/year)**
2000	8.3
2005	41
2010	48

1.4.3 Irrigation water demand

As expected, the major share of water in Palestine is being used in agriculture. The role of agriculture is particularly important in the economy of Palestine due to its high contribution to GDP and its role in employing Palestinian workers. Irrigated agriculture contributes more than 37% of total agricultural production compared to only 24% from rained agriculture (the remaining being field and orchard crops). Agriculture has a major role in national trade, as agricultural products constitute 23% of the national commodities export. Irrigation water in the West Bank comes from groundwater in the form of wells and springs, but only from wells in the Gaza strip.

Note: Wastewater reuse can only be incorporated into the agricultural sector after the time lag needed for infrastructure development, i.e., construction of wastewater treatment plants.

The current irrigation water supply is about 172 MCM/year, about 89 MCM of which are utilised in the West Bank coming from springs and wells. It is important to note that water supplies for irrigation are either shallow, small, old wells or natural springs. Natural springs face the severe problem of discharge variability, and thus these spring sources are not reliable water sources. Although the average discharge of the springs used in agriculture is about 49 MCM/year in the West Bank, this spring discharge is low in dry years and high in wet years. Due to lack of storage structures, large volumes are lost in wet years

In the years 2005 and 2010, annual agricultural water demand has been estimated at 326 and 373 MCM/year respectively, which is roughly double the current irrigation supply. (Assaf and Aliewi 2003, SUSMAQ 2001)

Strength and weakness

The National Water Policy for Palestine has clear statements within which water demand will be developed, but these statements still need to be brought into being. The key statements in this regard are:

- Water has a unique value for human survival and health, and all citizens have a right to water of good quality for personal consumption at costs they can afford – and of sufficient quantity;
- Water is an economic commodity.
- Water supply must be based on a sustainable development of all available water resources.
- Industrial and agricultural development and investment must be compatible with the water resource quantity available, which leads to the following points:
- Domestic/ Industrial water demand must be prioritised with regard to quantity and quality, with the highest priority assigned to domestic uses
- No increase of freshwater supply to the agricultural sector will be considered beyond the current levels; any increase in the agricultural demand for water will be satisfied by reclaimed waste water and maximization of the use of storm water run-off. Any water saving due to upgrading the agricultural water supply system, to modification of agricultural practices, techniques, or cropping patterns, will ultimately be reallocated to the Domestic / Industrial sector.
- Industrial development requiring good quality water supplies will need to be situated near accessible and secure (24 hours/day) supplies.

1.5 Regulatory framework of water law

Listed below is the Palestinian legislation that has been passed in the water sector since the establishment of the Palestinian National Authority: (Assaf 2000, Jarrar etal 2003, Palestinian Water Authority 2003a, PECDAR 2001)

- Decision No.(5) – a Presidential decree - of the Palestinian Authority which was issued on April 26, 1995 to establish a Palestinian Water Authority.
- Bylaw No.(2) Regarding the Establishment of the Palestinian Water Authority, Issued in Gaza City on January 18, 1996 which included the basic functions and authority of the new water authority, and also designated a National Water Council whose responsibility it is to prepare a national water policy, and to make strategic decisions.
- Presidential Decree No.66 in 1997: The Decree established the internal regulations of the Palestinian Water Authority and the rules of procedures.
- Palestine Water Law No.3 passed and on July 17, 2002 by the President: This law includes the institutional framework of each level in the water sector. The overriding theme in formulating the Water Law was that water resources should be developed and managed efficiently in order to meet present and future needs in an environmentally sustainable way.

International and/or Bilateral Agreements:

The Declaration of Principles signed on September 13, 1993 (Oslo I) was the first bilateral agreement between the Palestinians and the Israelis. According to this agreement, water resources issues were to be discussed by the permanent Palestinian-

Israeli Committee for Economic Co-operation. The parties agreed to prepare plans for water rights and equitable use of water resources. However, the agreement did not identify or establish any explicit water rights for the parties, meaning that this agreement did not address Palestinian water rights in explicit terms.

Then came Oslo II (Interim Agreement on the West Bank and Gaza Strip) and the appended Article 40, which had to do with water and sewage. This was called the Interim Agreement and it was signed on September 28, 1995. It was Oslo II / Article 40 that established the framework for co-operation in the field of water and sewage between Palestine and Israel – with embedded conflicting meanings of sustainable yield and current use, not scientifically based.

Under the umbrella of the Multilaterals in the Middle East Peace Process, a Declaration on Principles for Co-operation Among the Core Parties on Water-Related Matters and New and Additional Water Resources was also "initialled" in 1995. This Declaration pointed out the importance of:

- Developing regionally compatible legal, economic, and institutional frameworks, and
- The ability of the participating parties to co-operate based on identified common denominators among their respective water management systems.

There was an attempt at negotiations for an agreement on water resources in Camp David in July 2000. These negotiation rounds ended negatively. During discussions, Israel offered the Palestinians additional "allocations" and Palestinian water rights were not discussed at all**.**

It should be noted that in the West Bank especially, the water sector is still controlled by the military orders of the 'civil' administration that have been in effect since 1967, and these military orders are still largely valid in Area C in the West Bank – which is the largest designated Area (when compared to A and B).

Strength and weakness

A regulatory framework is developed, but still clear water rights need to be defined and applied according to international water law. According to Oslo II, Article 40, there exists 70-80 MCM/year as an additional supply for Palestinians (within the Interim Period), with 28.6 MCM for immediate needs. Only around 15 MCM has been developed to the point of actual supply through Palestinian implemented projects.

1.6 Institutional settings and process: The institutional framework in the water sector

Over the 30 years of occupation in Palestine, the water sector was kept fragmented and the scattered responsibilities within the water sector were really a case of survival of the fittest. Whatever donor finances were available went to those who knew how to apply for funding. The occupation authorities did not work with the benefit of the Palestinian public in mind.

With the formation of the Palestinian National Authority, the institutional reforms within the water sector centred on the following three issues:

- The water sector should be regulated by one responsible body, with the separation of the institutional responsibility for policy and regulatory functions from those of service delivery;
- Regional utilities were to be set up, three in the West Bank and one in the Gaza Strip
- Involvement of the private sector would eventually be encouraged in the funding and implementation of projects.

Thus, the overall institutional framework of the water sector in Palestine is shown below. As of 2004, the Regulatory Level (the Palestinian Water Authority) has been developed institutionally, and the Central (Ramallah) and Southern (Bethlehem/Hebron) water utilities are being strengthened in the West Bank, along with the Gaza Strip utility. The Northern utility in the West Bank has not, as yet, been set up. The Bulk Water Utility will be institutionalised, stemming from what was called in the past the West Bank Water Department. A few community-based water-user associations have been established. The National Water Council is set-up legally, and members have been designated, but there has been no formal meeting to-date.

Table 3: Institutional Framework in the Water Sector

Policy and Decision Making Level	Cabinet of Ministries National Water Council	
Regulatory Level	Palestinian Water Authority	
Service Delivery Level	Bulk Water Utility	
	Regional Water Utilities	Water User Associations

1.6.1 Supporting and advisory level

Universities provide support to the water sector research activities and training experience to the Palestinians working in the water sector. NGOs/GOs (both Palestinian and international) provide financial and technical support to the water sector projects. Water User's Associations (such as the Jenin village) provide direct feedback to the regulator regarding their requirements and concerns**.**

Strength and weakness

Institutional development and capacity building in the water/wastewater sector is being emphasized, but the ability to act is restricted by actual political situation determined by Israeli occupation.

1.7 Principal stakeholders, their roles, interests and conflicts

The partners and interested parties (i.e., stakeholders) include the Palestinian National Authority ministries and authorities, regional and local water departments and utilities, municipalities, village councils, NGOs, international organisations, industries, farmers, as well as individuals involved in analysing and evaluating water and environmental problems.

The Palestinian water sector consists of the following strategic stakeholders:

- Palestinian Water Authority (PWA): regulator of the water sector.
- Ministry of Agriculture: is responsible for guiding and overseeing the agricultural sub-sector, which represents a major Palestinian water user.
- Ministry of Planning: is the key policy formulator for future Palestinian development in all sectors.
- Ministry of Health (MoH): is the regulator of the health sub-sector. In this role, the MoH is responsible for establishing and regulating health standards and guidelines in Palestine, including drinking water standards.
- Ministry of Local Government: is the key link between the national government and municipalities and local councils. In the water sector, this ministry is involved in the co-ordination of local water sector operations and processing license applications.
- Ministry of National Economy: serves as the planning agency for industrial sub-sector. Planning efforts for industrial development will impact water demand in Palestine.
- Environment Quality Authority: is the regulator of the Palestinian environmental sub-sector. They do not have direct authority over water resources planning and management; however, environmental regulation in the form of policy, standards or law places limits, constraints and requirements on water resources management actions. They influence the water sector with concerns about both water quality and water quantity.
- West Bank Water Department: is responsible for developing and maintaining bulk water supply in West Bank with many of the wells still being controlled by the Israeli water company Mekorot. The future plan is to transform this agency into a bulk water utility providing wholesale water to the regional utilities.
- Regional Water Utilities: the Palestinian water sector has strategically committed to the development of three regional utilities in West Bank and one in Gaza Strip, for the management of water and wastewater services, operations and
- maintenance of water infrastructure and fee collection.

Other significant stakeholders are:

- Ministry of Justice, which impacts final approval of water regulations
- Ministry of Finance, which will provide final approval of water tariff schemes and will aid in identifying financing sources and methods of cost recovery
- Municipalities and Village Councils, which provide and require support and guidance to the design and implementation of water-related activities
- Also Water Users Associations, Universities and NGOs

Strength and weakness

Although the responsibilities of newly formed governmental institutions have been defined while other are still in various stages of development, there is an urgent need for political stability in order to coordinate initiatives towards socio-economic development which is severely hindered in all its aspects by the current situation in Palestine.

2 Meeting the UN concept: The national understanding of water

2.1 The national water policy and the Human Right concept of water

Water has become one of the most critical natural resources in the world, and Palestine is in one of the regions in the world facing serious water shortages. There are great disparities in water availability and use within the region because the resources are so unevenly (or inequitably) distributed. It is these disparities that constitute growing concerns about future access to water for Palestinians, particularly since the situation is that Palestine shares water resources with two or more countries.

Water is needed in all aspects of life - for human consumption, agriculture (livestock and irrigation), and industrial activities. Also, availability of safe water is inversely related to some health problems (dysentery, diarrhoea, etc). This centrality to the very existence of man and his supporting economy means that even though it is a renewable resource, there is a need to utilise water in a sustainable manner to ensure the continuance of the resource. This is the only way any country will be able to survive.

"No water, no future"

Dutch Prince of Orange, Willem Alexander, Kyoto, Japan, March 2003

In November 2002, the United Nations Committee on Economic, Social and Cultural Rights affirmed that access to adequate amounts of clean water for personal and domestic uses is a fundamental human right of all people. In its General Comment No. 15 on the implementation of Articles 11 and 12 of the 1966 International Covenant on Economic, Social and Cultural Rights, the Committee noted that; “the human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights.” While the General Comment is not legally binding on the 146 States that have ratified the International Covenant, it aims to assist and promote the implementation of the Covenant and does carry the weight and influence of “soft law”.

The decision elaborates that the sufficiency of water should not be interpreted narrowly, by mere reference to the volume of water or to technologies. Water should be treated as a social and cultural good, and not primarily as an economic commodity. Without equitable access to a minimum requirement of clean water, other established rights, such as the right to a standard of living adequate for health and well being, as well as civil and political rights, are not attainable. The legal obligation ensuing from such an acknowledgement of a right to water should motivate governments of both developing and donor countries to make effective changes in domestic and aid policies and resource “allocation”.

Water is essential to human life — for basic health and survival, as well as food production and economic activities. Yet Palestine is presently facing a national emergency in that there is a lack of access to a basic supply of clean water and access to adequate sanitation: the primary cause of diseases linked to water, as well as a potential source of contamination to the water resources themselves.

Strength and weakness

The concept of the Human Right to water is well understood in Palestine. Even though water is mentioned as 'an economic good' in the Palestinian Elements of a Water Policy – it is described as such only with the intent that any "damage" to water should be compensated by the "polluter". This statement is, thus, supporting the basic premise that water is a social and cultural good - because water is "the property of the state" – which is stated as the first element of water policy.

Other elements of the Palestinian Water Policy that fit directly into the essence and spirit of the Human Right to water are:

- Water has a unique value for human survival and health, and all citizens have a right to water of good quality for personal consumption at costs they can afford.
- Water supply must be based on a sustainable development of all available water resources.
- The development of the water resources of the Palestinian territory must be co-ordinated on the national level and carried out on the appropriate local level.
- Public participation in water sector management should be ensured.

Water supply to Palestinians is artificially constrained by the ongoing occupation, the extreme measures of the Israelis, and the stagnation and inherent deficiencies of the Peace Process. The political situation is an overwhelming burden on any hope of improvement in socio-economic development.

2.2 Areas of concern and opportunities

Water sector problems in Palestine require a multidisciplinary approach. Several major elements can be identified that characterise the nature and scope of the water issue in Palestine: (Assaf 2000, ESCWA/FAO 1985, Jarrar et al 2003, UNEP 2003)

- Chronic Water Scarcity: There is an ever-widening gap between the demand for quality water and the existing supply.
- Interdependence on Water Resources: Water is a shared resource. This creates interdependencies that require co-operation between the parties if optimum use is to be achieved.
- Social, Economic, and Political Differences: The countries in the region around Palestine have distinct social, political, and economic systems and water regimes. Differences between the basic outlook and agendas of these countries must be acknowledged and overcome if water problems are to be confronted and resolved at a regional level.
- Political Volatility: The pattern of relations between Israel and Palestine can be described as variable, ranging from open hostilities to full-fledged negotiations.
- Undefined borders: Despite some progress during the past phases of the peace process, most of the borders of the State of Palestine (and in the inverse, also Israel) are not recognized internationally. As a consequence, the

rights to access water resources within those borders are undefined and can be a contributing factor in bilateral and regional tensions.

Although the first three of these elements characterise circumstances in Palestine and the Middle East in general, they are common, in some degree, to other regions of the world. The scarcity of quality water, whether resulting from limited availability or from uninformed management, rarely respects political boundaries. Water resources are often shared between different political entities, and riparian claims can impair otherwise normal peaceful relations between states. Disparity between socio-economic and political systems also is common between neighbouring states, and all regional water systems are affected somewhat by politics.

The development of Palestinian water resources has as its aim - in common with Palestinian development generally - the enhancement of the conditions of human life and must be recognised as an integral part of its social and economic programs. It must always be remembered that the development goals chosen by "the Palestinian governing authority" for their people are not realisable in the absence of water adequate in quantity and quality.

To date, supply-oriented and resource-oriented water management dominated the scene in Palestine with emphasis on structural measures to cope with supply of water and water-related services. Now the time has come to implement the Palestinian policy for water resources development, planning and supervision that includes non-structural measures such as data collection and analyses (based on a sound "structured" monitoring system), legislation and regulation, economic incentives and penalties, as well as public participation. Since the establishment of the Palestinian Water Authority in 1996, intensive and broad institutional development programs have been initiated, aimed at developing the management tools necessary for a sound and sustainable integrated water management policy.

Lastly, future water resource planning in Palestine should include adequate links and co-ordination with other Palestinian national master plans - such as agriculture in general, forestry, economic and industrial expansion and urban planning. This type of inter-disciplinary approach should aim at a more efficient operation of the existing water schemes as well as providing the infrastructure for new systems. This will be done in Palestine through the National Water Council as set-up in the Water Law and can be done even better once Palestinian water rights are defined.

3 List of Palestinian NGOs

The NGOs in Palestine engaged in activities in the water sector are listed below. These institutions are involved in research as well as infrastructure development, lobbying and awareness building.

Applied Research Institute--Jerusalem (ARIJ)

P.O.BOX 860
Caritas Street, Bethlehem, Palestine
Tel: +972-2-2741889
Fax: +972-2-2776966
E-mail: jad@arij.org
Website: http://www.arij.org

Founded in 1990, the Applied Research Institute of Jerusalem (ARIJ) is a non-profit organisation dedicated to promoting sustainable development in the occupied Palestinian territories and the self-reliance of the Palestinian people through greater control over their natural resources.

Arab Scientific Institute for Research and Transfer of Technology (ASIR)

P.O. Box 3681, Above Central Marketplace
El-Bireh, Palestine
Tel/FAX: +972-2-295-5380
Mobile: +972-59-836-430
Email: kassaf@planet.edu, kkassaf@yahoo.com

ASIR was founded in 1981, and has been involved in water research from the beginning by studying the wells in the Jordan Valley for Birzeit University Research and Documentation Centre. ASIR continues to study water resources and management in the region, water security, food security, desalinisation (especially membranes), and water re-use and cropping patterns, and interpretation of chemical analysis data of water. Emphasis is on transfer of know-how and technology in the water and environmental fields.

Land Research Centre (LRC)

4 Abu Obeida St.
P.O. BOX 20479
Jerusalem, Palestine
Tel (temporary): +972-2-2217239
Mobile: +972-50-507931
E-mail: lrc@palnet.com

On February 6, 2002 the LRC was forcefully shut down and data and equipment were confiscated by the Israeli security services. Although this institution worked primarily on land issues, their input into environmental network was significant, for example, their study entitled "Inventory of the Soil resources of the West Bank and the Gaza Strip.

MA'AN Development Center

P.O. Box 51352
Ramallah, Palestine
Telefax: +970 2 2954451/
+972 2 2986796/2986698 Gaza Branch Office
P.O.Box 5165
Gaza, Gaza Strip
Telefax: +970 7 2823712
E-Mail: maanc@palnet.com
Internet Site: http://www.maan-ctr.org/

Ma'an has concentrated on self-sufficient development activities since it was founded in 1989, but has broadened its mandate to encompass initiatives to strengthen Palestinian institutions that develop the rural and agricultural sectors – especially agricultural water resources.

Palestinian Agricultural Relief Committees - PARC

Jerusalem Office

P.O.Box 25128
Shu'fat, Jerusalem, Palestine
Tel: +972-2-5833818
Fax: +972-2-5831898
E-mail: pr@pal-arc.org
Website: http://www.pal-arc.org/

Founded in 1983, PARC's aims include achieving comprehensive environmental development, developing and optimizing the utilization of available water resources.

Palestinian Hydrology Group (PHG)

Ramallah (Main Office)
Al-Ma'ahed St., Near Casablanca Hotel
PARC Building
P.O. Box 565
E-mail: phg@palnet.com
Website: http://www.phg.org/
Tel: +972-2-2966315/8
Fax: +972-2966319
Offices in Jerusalem, Hebron, Nablus, and Gaza.

Established in 1988 dedicated to developing and protecting water and environmental resources, and to insure more public accessibility to adequate water supply sources and sanitation – especially in rural areas. Primary activities include: Conventional Water Resources Rehabilitation and Development, covering rainwater harvesting and rural and small community sanitation and water development. It promotes awareness and conservation, including lectures, workshops, campaigns and exhibits, and lobbying and advocacy

The Society for Environmental Protection

Jenin, Palestine
Tel: +970-9-2385894

Established in 1996 with the main goal of protecting the Palestinian environment and minimizing existing environmental problems through activating society's role and expanding public awareness. Main activities will be in the future (due to the current situation) including environmental summer camps, and awareness programs, using posters, leaflets and training programs.

Union of Palestinian Medical Relief Committees (UPMRC)

P.O. Box 51483 Jerusalem, Palestine
Tel: +972-2-5833510/2697/8/4021
Fax: +972-2-5830679
Email: mrs@baraka.org
Website: http://www.upmrc.org/
Offices in Ramallah, Gaza, Hebron, Nablus, and Tulkarem.

Founded in 1979 as a medical / health services association, this institution does have a separate department dealing with the environment and health. Like its other departments, the environment and health units provide health education and medical care.

Palestinian Universities:

Institute of Water Studies, Birzeit University

P.O. Box 14
Birzeit, Palestine
Telefax: +970-2-2982120
E-mail: mbarakat@birzeit.edu

The Institute of Water Studies at Birzeit University was established in 2001 to contribute to the building of the Palestinian water sector by providing knowledge, advisory services, graduate education (MSc level), research and continuous education through short-term training in water and related issues. In addition, the Institute of Water Studies participates in solving crucial water problems within Palestine and the neighbouring countries through research projects, consulting activities and joint regional activities. Together with the International Institute for Infrastructural, Hydraulic and Environmental Engineering in The Netherlands, (IHE-Delft), BZU will establish a sustainable training and knowledge centre at the University for professionals of the water sector in Palestine.

Water and Soil Environmental Research Unit (WSERU), Bethlehem University

P. O. Box 9
Bethlehem – Palestine
Tel: + 970-2-2741242
Fax: + 970-2-2744440
Email: abedrabo@bethlehem.edu

Established in 1988, this unit of Bethlehem University responds effectively to requests from a large number of municipal authorities for help and information on water quality issues, and provides data and makes recommendations to appropriate agencies.

Water and Environmental Studies Centre (WESC),

Al Najah University
P.O. Box 7
Nablus, Palestine
Tel: +972-9-2383124
Fax: +972-9-2387982
E-mail: anan@najah.edu

Established in 1984 to meet the needs of the Palestinian community in the areas of water and environmental control, maintenance and education. This centre is involved in analysing and evaluating water and environmental problems. This centre has been involved in many regional studies.

Water and Environmental Development Organisation (WEDO)

Palestine Street
P.O. Box 844
Bethlehem, Palestine
Tel: 970-2-274-7948
FAX: 970-274-5968
E-mail: wedo@p-ol.com

4 List of donor activities

In order to provide a sound basis for planning and a program for short to medium term investment projects, all within the framework of a water sector investment program and the Palestinian economic development objectives, the governmental institutions use a Strategic Plan that draws together various local and sub-sectorial plans and, where appropriate, can identify multi-objective and regional solutions.

Within the non-governmental organizations, water projects are also coordinated with the regulatory arm (PWA) in the water sector. The data below are official figures as published by the Palestinian Water Authority. No figures were available for projects in the non-governmental organizations.

The Palestinian Water Authority issues periodic reports including detailed information about water project status and donor contribution in water sector in Palestine. As of 2003, the following statistics are available for the West Bank and Gaza Strip: (Palestinian Water Authority 2003a, 2003b, 2003c)

- In the Northern Governorates (West Bank), the total investment cost of water projects (completed, ongoing, committed) since the establishment of Palestinian Water Authority in 1996 through 2002 is about 500 million U.S. dollars. This figure includes all governorates and all water sectors, in which the total implemented cost is 150 million US dollars,
- On-going project costs are 300 million US dollars,
- 50 million US$ have been committed to future projects by donors. Around 90% of these investments were grants, and 10% soft loans, which come from the European Investment Bank (EIB) (30 million US$), and the World Bank (21 million US$).

The investment in the West Bank Northern Governorates were distributed according to the following water categories:

- water supply 200 million US$,
- water conservation 80 million US$,
- wastewater 130 million US$,
- institutional and capacity building 30 million US$,
- while the remaining water categories (storm water, water resources, irrigation systems) were around 60 Mio. US dollars.

In the Southern Governorates (the Gaza Strip), the total investment cost of water projects (completed, ongoing, committed) since the establishment of Palestinian Water Authority in 1996 through 2002 is about 230 million US$ (only through the PWA). This figure includes all governorates and all water sectors, in which

- the total implemented cost is 60 million US$,
- ongoing projects cost is 170 million US$.

Around 90 percent of these investments were grants, and 10 percent soft loans, which came from the European Investment Bank (EIB) (23 million US$), and the World Bank (30 million US$).

The investment in the Gaza Strip Southern Governorates were distributed according to the following water categories:

- water supply 100 million US$,
- water conservation 40 million US$,
- wastewater 40 million US$,
- institutional and capacity building 30 million US$,
- while the remaining water categories (storm water, water resources, irrigation systems) were around 50 Mio. US dollars.

The highest development was in the Hebron and Bethlehem governorates of the West Bank, around 200 million US$ - Ramallah 50 million US$, while in the north in the Nablus governorate around 130 million US$. The remaining governorates share was limited because the geographic distribution of these investments was constrained by the Israeli obstacles through preventing JWC (the Joint Water Committee) approval to many projects.

The major donors who contributed to the water and sanitation sector are; USA, Germany, Norway, France, Netherlands, Japan, Sweden, Denmark, Italy, Saudi Arabia, Greece, and Austria. In addition, important contribution came through international organizations like the World Bank, UNDP, and OPEC.

The importance of these projects can be summarized as:

- Emergence of PWA as a sustainable organization.
- Increasing water supply of 30 %.
- Reduction of leakage by 5-20%
- Increase access to new served areas

In spite of the generous contribution of donors in improving the water sector in Palestine, there is still a need for future investment, since the estimated total capital investment for the proposed future investment plan for the West Bank Northern Governorates is approximately $1.1 billion ($0.5 billion for capital investments, $0.6 billion for operation and maintenance) over the planning period (2003 to 2025), while for the Gaza Strip Southern Governorates the proposed investment is around $0.8 billion over the same period ($0.3 capital investments, $0.5 operations and maintenance).

5 References and further information

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6 Pictographic impressions

Boys getting a drink of water from a puddle in Gaza

Small girl collecting drinking water

Jerusalem showing water baths and water carrying structures

Heinrich Böll Foundation

The Heinrich Böll Foundation, affiliated with the Green Party and headquartered in the Hackesche Höfe in the heart of Berlin, is a legally independent political foundation working in the spirit of intellectual openness.

The Foundation's primary objective is to support political education both within Germany and abroad, thus promoting democratic involvement, socio-political activism, and cross-cultural understanding.

The Foundation also provides support for art and culture, science and research, and developmental cooperation. Its activities are guided by the fundamental political values of ecology, democracy, solidarity, and non-violence.

By way of its international collaboration with a large number of project partners – currently numbering about 200 projects in 60 countries – the Foundation aims to strengthen ecological and civil activism on a global level, to intensify the exchange of ideas and experiences, and to keep our sensibilities alert for change. The Heinrich Böll Foundation’s collaboration on sociopolitical education programs with its project partners abroad is on a long-term basis. Additional important instruments of international cooperation include visitor programs, which enhance the exchange of experiences and of political networking, as well as basic and advanced training programs for committed activists.

The Heinrich Böll Foundation has about 170 full-time employees as well as approximately 300 supporting members who provide both financial and non-material assistance.

Ralf Fücks, Barbara Unmüssig comprise the current Executive Board.

Two additional bodies of the Foundation's educational work are: the “Green Academy” and the “Feminist Institute”.

The Foundation currently maintains foreign and project offices in the USA and the Arab Middle East, in Bosnia-Herzegovina, Brazil, Cambodia, the Czech Republic, El Salvador, Israel, Kenya, Pakistan, Russia, South Africa, Thailand, Turkey, and an EU office in Brussels.

The Arab Middle East office of hbf opened in 1998; it is situated in Ramallah, Palestine. Its responsibilities encompass projects and programmes in Palestine, Egypt, Jordan, Lebanon, and Syria as well as in other Arab countries. Main areas of activity are democratisation, media, gender, culture, and youth-related issues. Due to the particular structures of societal and political power in most Arab countries, activities also focus on promoting NGOs and initiatives whose work fosters democratisation of thought and action. Another area of special interest is regional and international exchange, particularly with the EU and Germany.