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More politics than water: Water rights in Jordan

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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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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 sustainably 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 0-20m³ block, with a minimum of 5m³ 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 (JEWPP) – 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 Jordan's leading biodiversity protection organization, and it is responsible 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

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Jordan

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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 Efficiency and Public Information for Action (WEPIA)

Mission and objectives:

A multistakeholder programme for awareness and demonstrating 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 EU-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 Euro-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 Sukneeh:

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 Sukneeh 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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WHO/UNICEF (2001): *Access to improved drinking water resources in Jordan*”, WHO/UNICEF Joint Monitoring Programme for water supply and sanitation.

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Al-Jayyousi, O. (1998): "Transboundary water resources in the ESCWA region: utilization, management and cooperation" in: "ESCWA: A conceptual Framework for the Management of Shared water resources in the ESCWA region, Publication E/ESCWA/ENR/1997/7

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>

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<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>

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<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](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

[http://www.mwi.gov.jo/Investment%20plan/A.Investment%20projects/A.2%20%20Private%20Sector's%20Projects/4-Disi%20Amman%20Water%20Conveyor%20\(BOT\).htm](http://www.mwi.gov.jo/Investment%20plan/A.Investment%20projects/A.2%20%20Private%20Sector's%20Projects/4-Disi%20Amman%20Water%20Conveyor%20(BOT).htm)

Water Authority in Jordan

<http://www.mwi.gov.jo/More%20about%20mwi/waj.htm>

Jordan Valley Authority

<http://www.mwi.gov.jo/More%20about%20mwi/jva.htm>

Northern Governorate Water Authority

<http://www.ngwa.gov.jo/>

Multilateral Working Group on Water resources in Middle East

<http://exact-me.org/institutions.htm>

Centre for the Study of the Built Environment (CSBE)

www.csbe.org

Greywater reuse Project

<http://www.csbe.org/graywater/contents.htm>

Greywater reuse report

<http://www.csbe.org/graywater/report2/contents.htm>

Water Conservation Landscape Project

http://www.csbe.org/water_conserving_landscapes/index.html

Global and regional knowledge resources

GIWA-Global International Water Assessment-Jordan River

<http://www.giwa.net/areas/area51.phtml>

Green Cross International:

Farenilli, X. "Freshwater conflicts in the Jordan River Basin", in International Freshwater Conflict: Issues and Prevention Strategies

<http://www.gci.ch/GreenCrossPrograms/waterres/gcwater/study.html>

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<http://www.greencrossinternational.net/GreenCrossPrograms/waterres/middleeast/amman/ammansummary.html>

Water for peace in the Jordan River Basin

http://www.greencrossinternational.net/GreenCrossPrograms/waterres/wwf_03/gci_jordan1.pdf

Sustainable solutions to water conflict in Jordan Valley

<http://www.greencrossinternational.net/GreenCrossPrograms/waterres/sovereignty/sustain.doc>

Aquastat water country profile-Jordan

<http://www.fao.org/ag/agl/aglw/aquastat/countries/jordan/index.stm>

World Resource Institute- Freshwater country profile-Jordan

http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_400.pdf

Directory of Wetlands in Jordan

<http://www.wetlands.org/inventory&/MiddleEastDir/JORDAN.htm>

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Azraq Oasis Management Guidelines

http://www.ramsar.org/about_mgp_azraq.htm

Advisory Mission to Jordan

http://www.ramsar.org/ram_rpt_17e.htm

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EMWIS Jordan

<http://www.emwis.org/country/jordan.htm>

IDRC WDMF

Jordan-Case study in wastewater reuse

<http://www.idrc.ca/waterdemand/docs/english/jordan.doc>

Jordan Agricultural Water Valuation case study

http://www.idrc.ca/waterdemand/docs/english/WtrValF/Jordan_Agriculture.doc

Jordan domestic water valuation

http://www.idrc.ca/waterdemand/docs/english/WtrValF/Jordan_Domestic.doc

IDRC Reports: Divining Jordan's desert waters”

http://network.idrc.ca/ev.php?URL_ID=5494&URL_DO=DO_TOPIC&reload=1060032904