WATER DEMAND MANAGEMENT - SECURITY FOR THE MENA REGION

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ABSTRACT:

Traditional water resources management based on supply driven approaches is no longer acceptable. To secure the sustainability of water resources, it is necessary to look for a new paradigm for water management. This is especially true in the Middle East and North Africa Region (MENA), where many countries are facing severe shortages in fresh water resources. The new paradigm calls for an integrated water resources management in which the water demand management (WDM) forms a basic component.

This paper introduces WDM as an integral part of comprehensive water resources planning, and highlights the historical development of the WDM concept. The paper also reviews water resources availability in the MENA region and the extent to which WDM tools are actually applied in some MENA countries.

It was concluded that in spite of recent increasing interests and efforts by researchers and policy-makers to integrate WDM in national water policies, WDM options are not yet implemented in the region. The obstacles facing the integration of WDM into water policies are highlighted and suggestions to overcome them are recommended.

1. Introduction

The provision of adequate water supply and sanitation to the rapidly growing population is increasingly becoming a challenge facing many countries worldwide. In the twentieth century, the population of the world increased from 1,600 million people at the beginning of the century to over 6,000 million people in the year 2000. During the same period, irrigated land increased in area from 50 million hectares to over 267 million hectares *(Gleick, 2000).*

The last decades of the twentieth century were characterized by an accelerated growth in water demand, which is rising today at a rate never experienced in any previous time of history. Human use of water has increased more than 35-fold over the past three centuries and four folds since 1940 (Easter and Hearne, 1995).

Expanding urban areas and the growing demand for water by both industrial and agricultural sectors form enormous pressure on water resources. To meet the rising demand on water, the traditional approach was based – up until recently-on expanding the supply of water from existing water resources and on the development of new water resources. As a result, the most accessible water resources have already been tapped.

Today, many developed and developing countries face growing problems of unbalanced water demand versus water supply, and suffer from degradation of water quality. One of the most extreme examples of water shortage is in the MENA region, where the annual water share per person is less than in any other region worldwide. While water demand continues to increase in MENA, the limited amount of fresh water resources poses a serious constraint on food security. Because of this imbalance, a search for a new water management paradigm is currently taking place. The new paradigm focuses on the other side of the water management process, namely, the demand side. This new approach attempts to integrate the demand management process into the water resources policies.

The aim of this paper is to introduce the WDM concept, to review the water resources management status in the MENA region and the current role of WDM in the water resources planning and strategies of some MENA countries. The paper also investigates the role that can be played by WDM as a tool for integrated water resources management to alleviate the pressure imposed on the water resources of the region, in order to achieve food security through the sustainable use of limited water resources. Some key references are listed in the end of this paper of further reading.

2. What is Water Demand Management?

The traditional view of water use considers water as a "requirement" which must be met through the process of developing additional water resources, i.e. water supply management.

The new approach - water demand management - seeks to find an acceptable equilibrium between limited water resources and competing, usually increasing, demands for water using policy and technical means.

The terminology for demand is confusing (Brooks, 1999**),** and there is still not one common understanding of WDM. According to a paper by Brian Grover (7:2002), several definitions have been offered previously for <u>water demand management:</u>

- any socially beneficial action that reduces or reschedules average or peak water withdrawals or consumption from either surface or groundwater, consistent with the protection or enhancement of water quality.

- a practical strategy that improves the equitable, efficient and sustainable use of water.
- the development and implementation of strategies aimed at influencing demand, so as to achieve efficient and sustainable use of a scarce resource.

Perhaps the simplest definition of water demand management is that provided by the International Development Research Centre (IDRC):

- to get the most from the water we have.

In some occasions, WDM is referred to needs, wants, or desires to describe demand. However, demand can be defined simply as a desire to obtain a certain good or service induced by the need. Economists considered that this need or want should be supported by purchasing power to create an effective demand. Thus, demand refers to the willingness and ability of consumers to pay for a good or service. In the field of water, the demand is mainly induced by the fact that water is necessary for life continuity, and there is no life in its absence. As a result, water cannot be subjected to pure economic definitions. However, there is always a minimum quantity of water needed (demanded) by each consumption sector to secure the sustainability. For example, the amount of water required to satisfy thirst is only few litres. At the same time, the amount needed to grow enough food is many times of that for thirst quenching. Water demand usually is affected by certain factors, such as socio-economic characteristics, water resource reliability to meet the needed amount with required quality at all times, and the consumers' opinion on the policies followed in managing the water resources. *(Abu Qdais, 2003).*

WDM is concerned with the efficient use of water, and can be defined as the adaptation and implementation of a strategy by water utilities to influence water demand and usage by making better use of the existing supplies rather than developing new ones in order to achieve the following objectives *(Rother, 2000):*

- economic efficiency
- social development and social equity
- environmental protection
- sustainability of water supply and services
- political acceptability

Therefore, WDM is a policy for the water sector that stresses making better use of existing supplies, rather than developing new ones *(Winpenny, 1997),* which implies a switch in emphasis from supply management (that attempts to meet rising demands by abstracting more water from a depleted resource base) to demand management (that attempts to reduce consumption by increasing efficiencies) and developing alternatives over time. Most of WDM strategies applied around the world today can be classified into four categories *(Abu Qdais, 2003*):

- economical
- institutional/administrative
- technical
- educational /behavioural

Table 1 lists WDM tools that can be adopted under each of the above categories:

Table (1) Categories and tools of water demand management

Economical	**Institutional / Regulatory**	**Technical**	**Educational/ Behavioural**
- well designed water tariff system - financial incentives for water conservation - enforcing polluter pays principle - Water allocation through market	- legislation and regulations to conserve water - building and plumbing codes - capacity building of the water institutions - monitoring and controlling of land use - decentralization and local-level management	- Applying metering to measure consumption - Leak detection - Pressure monitoring and control in the networks - Using water saving devices - Using computer techniques to monitor and distribute water	- Seminars and workshops - Media campaigns - School curriculums - Competitions and festivals

Usually, most countries introduce water demand strategies only after the imbalance between supply and demand occurs. Demand management measures, however, should be applied as preventive measures to avoid reaching water crisis conditions, as well as to maintain sustainability.

3. History of the Water Demand Management

To eliminate or minimize the adverse impacts of floods and unpredictable rainfall, mankind has attempted several methods to capture, store, and drain water. With the development of irrigated agriculture, there was a need to convey water through irrigation channels. This has made it possible to grow crops in areas characterized by low rainfall. The development of new cities and industries also required more water supplies. The progress achieved in the field of hydraulics, hydrology and civil engineering sciences made it possible to meet the increased demand on water. This has been achieved mainly by constructing massive engineering projects such as dams, huge water transmission projects, and large irrigation systems. During the second half of the last century, enormous expansion of the water resources infrastructure had been taken place worldwide, including the MENA region, driven mainly by three main factors *(Gleick, 2000):*

- population growth
- changing standards of living
- expansion of irrigated agriculture

Water resources planning, until recently and especially during the last century was mainly dealt with the projection of future population, water demand, and agricultural and economic productivity. The output of these projections was an increasing trend of all the projected variables, which implied increase in water requirements to be met by the development of more water supplies**.** Thus, the water-planning paradigm until the last two decades of the twentieth century was mainly characterized by focusing on the supply management (i.e. supply-side approach that meets the increased demand, by constructing more physical structures, such as dams, new water aqueducts and more pipelines*(Gleick, 2000).*

The supply-side option had its own advantages, by supplying more food for the increasing population, and generating clean energy through hydropower projects, and improving the sanitation conditions as well as creating employment in many countries worldwide *(Gleick, 2000).* However, this progress was not achieved for free. The construction of new projects required huge capital investments and have caused increased degradation of ecological systems. With time, new water resources have become less accessible and available, and developing new sources has become more expensive. In addition, due to frequent cycles of economic recession, many governments worldwide started to squeeze their budgets. This was also accompanied by increases in the level of public environmental awareness, which started taking place since the 1970s. These developments have put enormous pressure on the water planners and policy-makers to change their traditional water management thinking.

Currently, many countries and international donors and aid organizations have started rearranging their water policies to achieve the sustainability of the water resources. These efforts gained momentum after the Dublin 1992 International Conference on Water and the Environment, in which the principles of water resources sustainability were first articulated by more than 100 countries. These principles are to manage water**:**

- holistically, as a finite and vulnerable resource.
- at the lowest appropriate level using a demand-based participatory approach.
- by involving women, who often play a pivotal role as water providers and users and as protectors of the environment.
- as an economic good.

The "Dublin Principles" were subsequently endorsed by major international conferences including the 1992 United Nations Conference on Environment and Development (Rio), the 1994 Ministerial Conference on "Drinking Water and Environmental Sanitation: Implementing Agenda 21", and the 1994 VIII World Congress on Water Resources of the International Water Resources Association (Cairo).

The recommendations of the above conferences emphasized the urgent need to move beyond the traditional management practices of water resources, which are typically wasteful, inefficient, and fragmented to a new paradigm. WDM forms a basic pivot of this paradigm, which integrates quality and quantity concerns, links management of land and water, recognizes freshwater, coastal and marine environments as parts of a comprehensive management system, encourages the public private partnership, incorporates institutional incentives that promote efficient and improved sector performance, and focuses on services that users want and are willing to pay for.

At the present time, calls for integrating WDM strategies into water resources planning come from countries, the international community, and the non-governmental organizations (NGOs) alike.

4. Elements of Water Demand Management Strategy

Water experts agree that an integrated water demand management plan should incorporate a combination of policy tools that include command and control regulations, economic incentives for conservation, implementation of water saving technologies, and public participation. This section of the paper summarizes various possible components for a WDM strategy.

Water demand management can be achieved by:

- stressing equitable access to water, reflected in a strategy that is specifically designed to improve service delivery to the poor;
- treating water as both an economic as well as a social good, and managing and pricing it accordingly;
- balancing the management of losses and consumption with the development or expansion of supplies; and
- managing a change in organizational culture from being technology focused and supply driven, to one which puts people first and is demand responsive.

According to Grover (8:2003), important WDM tools can include:

- *Quotas: setting a maximum amount of water that can be used for a certain purpose.*
- *Licenses: for withdrawals or discharges and subject to control for a limited period of time.*
- *Tradable water rights: the creation of a water market where stakeholders can buy and sell water rights within a well defined legal framework*
- *User charges: pricing of water services related to the type of service and the type of water use. Besides the cost recovery element, these charges may include demand management charges or subsidies to stimulate certain behaviour.*
- *Subsidies, grants, soft loans, product charges, tax differentiation, tax allowances, and other economic incentives to stimulate the allocation of water to certain preferred water users, or to make undesirable behaviour less attractive.*

- *Penalties: a system of financial and legal enforcement incentives (fines and premiums) that provide other instruments with "teeth"*

The simplest and most convenient water demand reduction practices is water meters used as regulatory instruments, also known as " command control " policies. These regulations are put forth by governing agencies with the intent to force water users to decrease consumption under threat of fine or penalty, should they be found using water for a purpose deemed inappropriate. In water short areas, regulations for water the grass or washing the car are usually enforced. Within the agricultural sector, droughts lead to mandatory rationing of irrigation water, forcing farmers to stress crops due to a reduction in irrigation water quantity. In the industrial sector, regulations set standards for the quality of water that is discharged into the environment as well as set minimum amounts of water that must be recycled or reused. As with any laws, adequate legislation and proper implementation and enforcement are necessary in order for these policies to be effective. Regulatory polices will fail if legislation is inadequate, or if inspection and enforcement staff is insufficient or unqualified, or if social, political or financial pressures impede implementation and enforcement.

Other WDM tools and strategies include economic instruments as policy tools to create incentives for water conservation among consumers. The simplest economic incentive to conserve water is to raise water tariffs to reflect long range marginal cost. Most users do not pay the full opportunity cost of water, or even the recovery cost such as the cost of mining, transmission, treatment and delivery. Water pollution exceeds the optimal level because polluters do not internalize pollution costs. Water subsidies in municipal, agricultural and industrial sectors distort price signals to consumers, and lead to wasteful and environmentally damaging use. The application of increasing block rate tariffs is one of the efficient tools that affect water demand.

The effectiveness of price increases to provide economic incentives to conserve water is determined by the price elasticity of demand. Elasticity simply describes the percent change in water demand relative to change in price. Within the municipal sector, elasticity varies depending upon whether the water is used indoors or out, and whether the use occurs in summer or winter. Outdoor uses in summer is relatively highly elastic, since most water used for watering lawns, filling swimming pools and washing cars are considered non-essential activities. On the other hand, indoor use is more difficult to reduce, since most water used indoors are for activities such as drinking, cooking, and bathing. Such uses are not likely to change regardless of the price *(Abu Qdais and Alnassay, 2001).*

Other market instruments offer flexibility to water allocation and ensure that it is put to the most economically beneficial use. Water markets that allow transfer of water between sectors is the most effective reform available for water distribution, but also requires far-reaching reform to water distribution laws.

Technological innovation is another area that can contribute to water conservation. Several municipal water conservation programs have incorporated new technology through programs that replace conventional household water fixtures with more efficient ones, and through special landscaping programs, which encourage using plants species that require little or no supplemental irrigation. Switching subsidies from water pricing to installation of more efficient water fixtures and irrigation systems may offer an effective solution to increasing the use of available water conservation technology.

Adopting computer techniques in water resource management is another efficient demand management tool. Computer techniques such as Geographical Information System (GIS) and Decision Support Systems (DSS) are tools that can aid in this regard. Unfortunately, there is a severe shortage of adequately trained professionals who can apply these techniques to water management in the MENA region.

Finally, a key instrument of WDM is awareness raising and public education at both consumers and school levels. The success of all other WDM tools relies mostly on users' cooperation. Thus, public education is an important complement to other WDM tools. Media campaigns and awareness seminars can contribute to conveying the water conservation message, provided that such programs are directed to the right audience. This will make consumers aware of existing water-use restrictions, encourage water-use behavior changes, explain why an increase in price is necessary, and disseminate information about available technologies to increase water use efficiency. Inclusion of user interests in decision making and promotion of water conservation goals are necessary components to implementation of other water conservation policy tools. Indeed, according to Brooks (xii: 2002):

If efforts to improve the quantity or quality of water are to be successful, not only must they be technically sound and economically feasible, they must also deal directly with poverty alleviation, local empowerment and ecological protection.

It is worth keeping in mind that any policy options considered for managing water demand must conform to local water-use conditions. Such considerations include questions of traditional water use, existing water allocation methods, local climatic conditions, societal value of water (cultural mores) and physical infrastructure. Furthermore it should be emphasized that there is no given WDM strategy that is universally applicable. This means that local factors such as culture, socio-economic conditions and climate should be heavily relied on when recommending WDM measures.

According to the Water Supply Collaborative Council (1997), WDM, if fully pursued and implemented can lead to:

- reduction in water demand by 30%-50% with no deterioration in life-style.
- significant reduction in capital requirements for expansion of supply.
- reduction in wastewater production, and therefore the requirements for new wastewater treatment systems.
- financially stable water systems.
- enhancement and adoption of new technologies that usually have short payback periods.

5. Overview of Water Resources Availability in The MENA Region

MENA is one of the driest regions in the world. It is characterized predominantly by scarce water resources. The scarcity in some countries of the region reaches crisis levels and poses heavy constraints on economical development. It also leads to political instability in the region. For the 5% of the total world population living in the region, less than 1% of the world's renewable freshwater is available for their use (World Bank, 1996).
Figure 1 shows the annual per capita share of water resources in MENA in 1995 as compared to other regions of the world. It can be seen that the average annual per capita share from water resources in MENA is about 1250 m^3/person/year, which is about one third of the water availability in Asia, and 16% of Africa's.
Figure 2 shows the annual per capita share from water resources in several countries of the region. The data clearly shows that many countries in MENA fall below the water poverty line, defined by experts as 1000 m^3/person/year *(Gleick, 1993; Falkenmark and Widstrand, 1992)*. By the year 2025, more MENA countries will fall below the water poverty line, while the annual amount of water available per person is expected to reach 667 m^3.

The water shortage in MENA may be attributed mainly to the following:

1. Geographical location of the region in arid and semi arid area, where the annual average rainfall in 8 countries of the region is less than 100 mm, while it is above 300 mm in only 4 countries *(FAO, 1997)*.

2. The high population growth rate in the region, averaging 2.8% which is one of the highest rates in the world *(Faruqui, et al 2000)*.

3. The current management of water resources relies heavily on the supply side. In addition to the heavy reliance on water supply management, the actual use of water by different sectors is inefficient. About 87% of all

fresh water in the region is used mainly in agriculture, while the remaining 13% goes to industrial and domestic uses *(World Bank, 1996)*. About half of the water supplied to municipal uses is considered unaccounted for water. This is due to the large leakages from old water networks, inaccurate metering and illegal connections. Furthermore, the price of the water in many countries is not covering the full cost of supply. In Jordan, for example, the average charged prices for drinking water covers only 40% of the total cost, while it is 23% in Algeria and only 13% Saudi Arabia *(Abu Qdais and Al Nassay, 2001*). In order to close the gap between supply and demand, groundwater aquifers have been heavily abstracted in many countries of the region. For example, in Jordan the current abstraction reaches twice the safe yield of the aquifers, while Yemen withdraws 30% more from aquifers than the recharge capacity, and in the Gaza Strip, withdrawal reaches more than the double annual rainwater recharge *(World Bank, 1996)*. The intensive abstraction of the groundwater has led to lowering the water table and to the degradation of ground water quality due mainly to saline water intrusion. In addition, surface water resources of the region are exposed to several sources of pollution, as a result of improper management of the municipal and industrial wastewater, thus limiting the possibility of their utilization for water supply with a reasonable cost.

Generally, water resources in MENA are characterized by the following:

- Water is scarce and expensive to exploit.
- Municipal and industrial water requirements are increasing sharply, as the population growth rate is one of the highest in the world.
- The technical basis for regional cooperation is not yet established.
- The institutions managing the resources are highly centralized and designed to work almost entirely on the supply side *(Brooks, 1999)*.

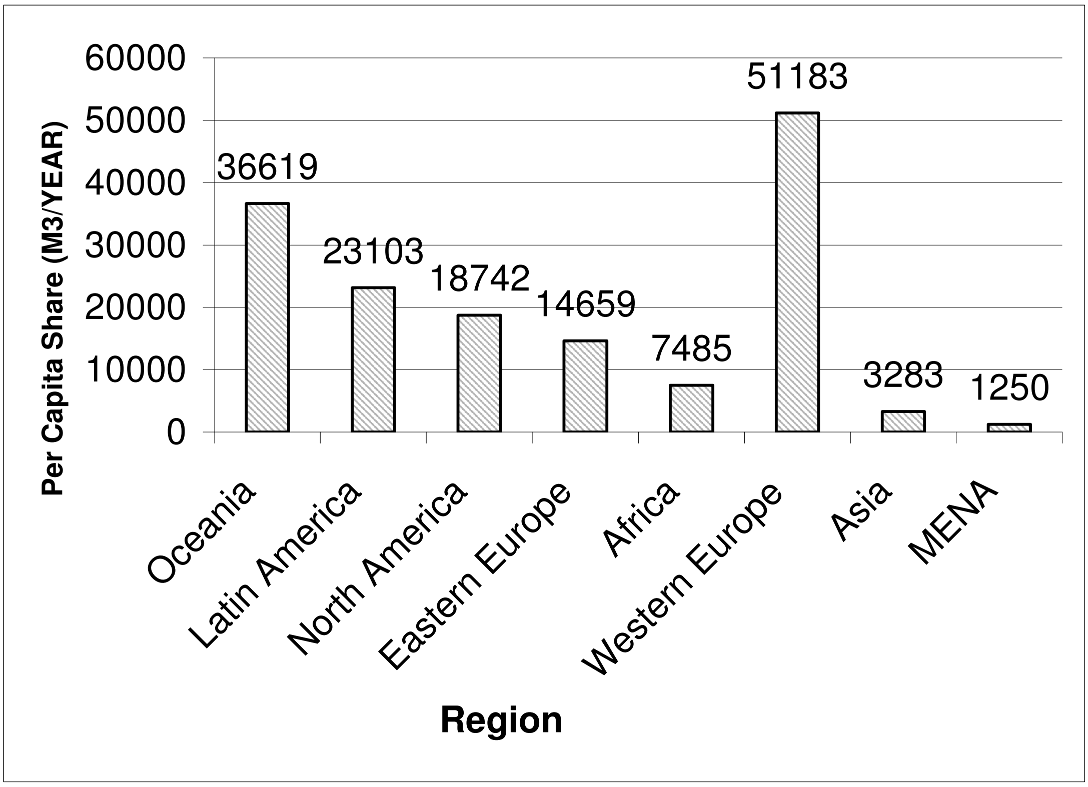

Figure (1) Annual water availability per person in MENA region as compared to other regions of the world

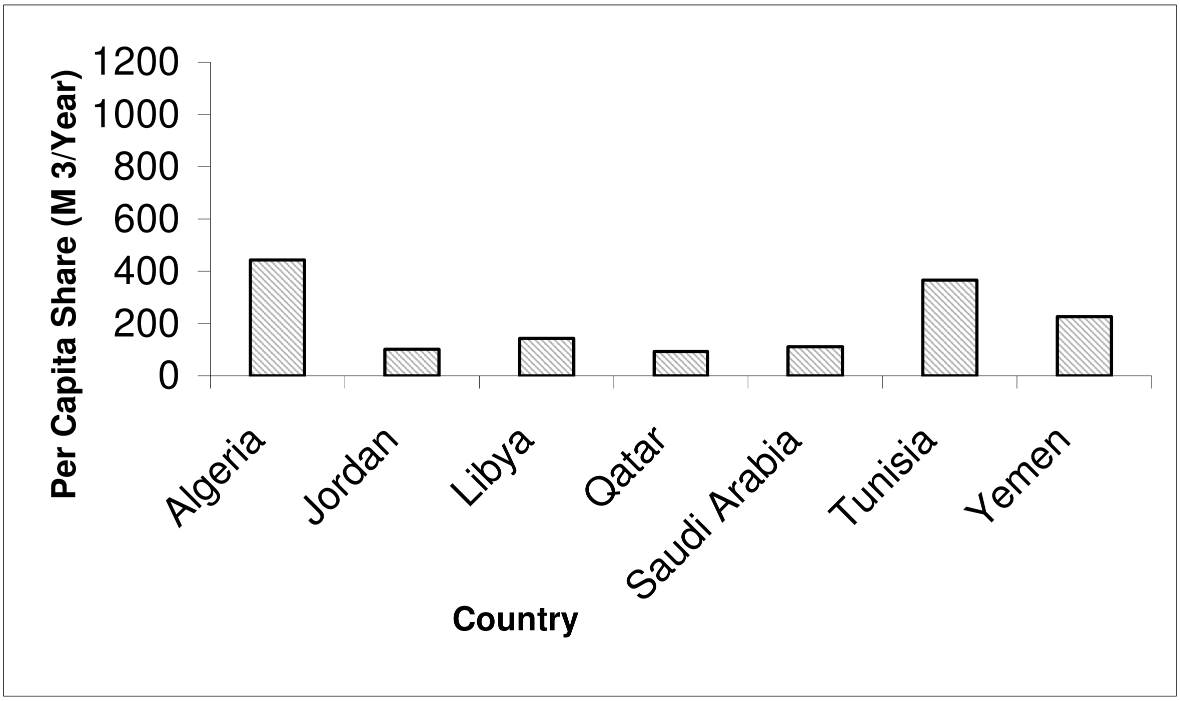

Figure (2) Water availability per person in water poor countries of the MENA as compared to the water poverty line of 1000 m^3/person/year

6. Potential of WDM options in MENA

Before investigating the potential of WDM in the region, it is useful to examine briefly the extent to which such WDM strategies are currently applied in MENA. First, it is important to note that WDM is still at its infancy, and only in the very recent past has demand management been considered as an essential and important tool of water management in MENA region *(Brooks, 1999)*. However, a quick overview does show that there are changes occurring in the way of water resources management in the region *(WDMF Documents, 2002*). Change, however, is slow and different countries in the region have begun applying certain measures of WDM in different ways and to differing extents.

For example, there is an increase in the use of non-conventional sources of water, such as treated wastewater in agriculture**.** In Jordan, treated wastewater is generated at nineteen existing wastewater treatment plants, and is considered an important water resources component. About 72 MCM per year (in 2000) of treated wastewater are effectively discharged into the watercourses or used for irrigation, 76% is generated from the biggest waste stabilization pond (Al-Samra treatment plant), serving a population of 2 million (approximately 70% the total served population) in 2000. By the year 2020, when the population is projected to be about 9.9 million, about 240 MCM per year of wastewater is expected to be generated *(Batayneh et al,* 2002).

In Morocco, about 546 million m^3 of wastewater is generated annually, yet only 70 million m^3 is reused in irrigating approximately 7000 hectares *(Jemali and Kefati 2002)*. Tunisia has a projected volume of 215 million m^3 by the year 2006, with the utilization potential of this water about 20,000 hectares (this constitutes 5% of the areas that can be irrigated, *Al Tairi et al., 2002).*

In Saudi Arabia, the reclaimed wastewater in 1990 was about 110 million m^3 and by 1995 it was expected to reach 290 million m^3 accounting for only 1-2% of the total water consumed by the whole country at that time *(Mohorjy and Grigg, 1995).* In Egypt, the annual quantity of treated wastewater reaches about 200 million m^3 and it is possible to increase this quantity in the future to 2 billion m^3/year. *(Abu Zaid and Radi, 1992).*

The interest in grey water reuse is gaining more attention in the region. In Cyprus, the government authorities support homeowners to install a separate drainage system to collect grey water to be reused for irrigating gardens. In Palestine and Jordan, several pilot projects to investigate the feasibility of grey water reuse are under implementation.

In the capital city of Riyadh, Saudi Arabia, a study on the water distribution system revealed that the system rehabilitation reduced water losses by 70%. *(Khadam et al, 1991).* The rehabilitation of the water distribution system in Amman, Jordan will cost about 220 million US $, and will lead to an annual saving of 130 million m^3 that is currently lost through leakage, compared to the price of 600 million US$ to deliver 100 million m^3 from a nonrenewable aquifer water (Aldeesi) to Amman. Changing the irrigation system in the Jordan Valley from surface irrigation to drip irrigation has increased the irrigation efficiency from 38% to 56%.

Several countries are applying the increasing block tariff system in pricing water. Table 2 shows the system applied in Jordan. In spite of the application of this system, the revenue from water is covering only 40% of the water supply cost while the remaining 60% is subsidized by the government (Taha and Batayneh, 2002**).**

Private-Public Partnerships (PPP) in WDM is really at its first stages of development in MENA. For an overview of PPP and PPP partnerships in the region, see Brian Grover's background report listed in the reference (2002).

Many public awareness and educational programs are being implemented in many countries of the region. The objective of such programs is to raise awareness levels among water consumers to conserve water. Some of these programs have had little impact because they have been poorly designed and failed to convey messages to their target groups. Most awareness campaigns are crises driven, often conducted on a seasonal basis. Public campaigns often lack the necessary expertise in the field of public relations and social marketing that is necessary for successful impact.

One of the pioneer programs in the region is the Water Efficiency and Public Information for Action (WEPIA), which is implemented in Jordan by the Ministry of Water and Irrigation in collaboration with the Academy of Education in Washington and supported by the USAID. A major achievement of this project is the creation of Water Demand Management Unit within the organizational structure of the Ministry of Water and Irrigation. It is hoped that this department will promote and enhance the integration of water demand management mechanisms into the water management planning of the country. Another major step of the project is the introduction of WDM ideas into the school curriculum to promote the WDM concept among school children.

The full range of WDM measures need to be adopted at a greater rate to match the urgent situation facing the region. There is also a need to manage water resources in a more integrated and holistic fashion.

Table (2) Water Tariff System in Jordan

Block (m^3)	Meter Charge (JD)	Total bill value of water (JD)	Total bill value of wastewater (JD)
Amman Water & Wastewater Tariff Residential (Bill Calculation)			
0 - 20	0.300	2.000	0.600
21 - 40	0.300	0.14(q)-0.8	0.04 (q) - 0.2
41 -130	0.300	$0.006556(q^2)$-0.12224(q)	$0.002889(q^2)$-0.07556(q)
131 - more	0.300	0.85(q)	0.35(q)
Other Governorates & Jordan Valley Tariff Residential (Bill Calculation)			
0 - 20	0.300	1.300	0.600
21 - 40	0.300	0.075(q)-0.2	0.035(q) - 0.1
41 - 185	0.300	$0.004517(q^2)$-0.10568(q)	$0.001828(q^2)$ - 0.038103(q)
> 185	0.300	0.85(q)	0.35(q)
Commercial Rates			
6 – more	0.300	1 (q)	0.5(q)
Water for Agricultural Use			
Treated Wastewater			10 fils / m^3
Freshwater:			
0 - 2500			08 fils / m^3
2500 - 3500			15 fils / m^3
3500 - 4500			20 fils / m^3
> 4500			35 fils / m^3

q = Quantity, 1 JD = 1,000 Fils = US$ 1.412

Source: Taha and Batayneh (2002)

7. Obstacles to WDM implementation in the MENA

To guarantee proper integration of WDM strategies and measures into the water resources management of MENA, several obstacles and constraints need to be overcome. The following are the major ones:

- Perceptions by all stakeholders that water resources are sufficient.
- Lack of needed knowledge and appropriate technology for WDM.
- Economic and institutional structures still encourage inefficient use of water.
- Prevalence of old thinking among water planners and decision makers.
- Free water culture (perception within various communities of the region that the government must provide abundant water cheaply or for free).
- Great social importance attached to agriculture and food production, regardless of economical viability.

8. Water Demand Management Forum

The International Development Research Center (IDRC) has supported a number of research projects related to WDM. More recently, the focus of IDRC work in this area has been to promote WDM higher onto the agendas of decision-makers in MENA, by advocating that WDM practices achieve significant impacts in terms of water and financial savings, with fewer social and environmental impacts, compared to supply management options. (see http://www.idrc.ca/waterdemand).

Forums are organized with regional decision makers. The aim of this Forum is to encourage debate around issues related to WDM in general and more specifically related to four areas:

- wastewater reuse
- water valuation
- Public-Private Partnerships
- decentralization at the local level

This work has gained good momentum and has been supported by a large number of donors, decision makers and other development practitioners who are contributing to the information exchange and awareness generated to adopt different WDM measures.

Until now, the Forum has held four regional conferences on each of the above issues. It is hoped that the output of these conferences will contribute to furthering WDM ideas in the region.

9. Conclusions and Recommendations

Integrated water demand management presents an alternative to infrastructure solutions for meeting additional water supply needs. The importance of such an approach gains special importance in regions of scarce water such as the MENA region. Although most of the MENA region countries suffer from water scarcity, few water demand measures have been applied in MENA to date, and efforts vary quite substantially among countries in the region.

Water demand management holds tremendous potential to help the region to bridge the increasing gap between water demand and supply. Policy instruments for reducing water demand include command and control initiatives, technological innovation and economic instruments. All of these instruments should be at the core of water policy strategies in all countries of the MENA region.

Currently, water in MENA is under-valued. This has led to inefficient use, as there is little incentives to save water. Since 87% of all the water is used by agriculture, improving the efficiency of irrigation systems must be a priority concern for the region.

Governments subsidize water in most countries of the region. This leads to inefficient allocation of water resources among consumption sectors. Redesigning the water tariff systems is therefore necessary to achieve the efficiency. Domestic water pricing systems should reflect equity goals, by including the use of low price for water to meet basic human needs, and a full cost for water use in excess of basic (lifeline) levels. Adopting water metering and reducing the amount of the unaccounted for water through leak detection, repair programs and illegal connections elimination will help in increasing the water use efficiency in the region.

There is also an inadequate legal basis to promote WDM in the MENA region. Thus, there is an urgent need to improve and enforce legislation to achieve the objectives of integrated water resources management to protect the quality of water resources through the enforcement of polluters-pays principle.

When implementing water demand management programs, public education and awareness is key to addressing the concerns of water users and wining support for the new policies. Most of the public awareness programs in the region are seasonal. It is recommended to make use of the experience gained elsewhere to improve impact.

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