

WATER IN THE KINGDOM OF SAUDI ARABIA: SUSTAINABLE MANAGEMENT OPTIONS

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ABSTRACT

Water is one of the most precious and valuable resources affecting the Saudi development plans. The acute shortage of fresh water resources poses a major challenge in Saudi Arabia. Demand for fresh water is on the rise as sufficient water is no longer available to meet daily needs. Some 95% of water comes from aquifers. Desalination plants and waste water reclamation projects provide about 4% and 1% water respectively. About 30% of the water for household consumption comes from desalinating plants. The users of desalinated water of the Kingdom represent about 26% of world total. In the light of the present scenario of declining water resources and increasing demand, the Kingdom must consider the most viable option i.e. Water Demand Management (WDM). However, other necessary water conservation measures should not be overlooked. The article also suggests that in order to use water resources efficiently, factors such as economics, social aspects and environmental conditions must receive due consideration.

Keywords: Precious and Scarce; Water Demand Management; Conservation Measures; Water Price; Extension Education

INTRODUCTION

Situated in the tropical and sub-tropical desert region with arid climate, the Kingdom of Saudi Arabia (KSA) is exposed to dry winds and limited water resources (FAO, 2009). The relatively cloudless skies and extreme temperatures are important features that make water the most valuable component of the ecosystem. Scarcity of fresh water resources presents the major challenges to the existence of biotic life in the Kingdom. The Kingdom not only suffers from absolute water scarcity but also witnesses an ever decreasing per capita water availability. This decline is the outcome of continuous increase in water consumption due to population growth, household consumption patterns and an increase in production sectors. These factors have, in turn, led to an increase in fresh water demands for different purposes (Al-Zahrani, 2009a). Presently, the Kingdom meets its major water needs through the massive desalination of seawater. The cost of desalinating water is as high as \$2 per cubic meter in Saudi Arabia. Above all, the costs of developing new sources or expanding the existing sources are increasing in the Kingdom (MWE, 2009). Water resources are limited and water wastage and losses are quite high. Therefore, there is an imperative need to minimize the water losses by detecting leaks and making repairs to improve distribution system. In the scenario, saving water rather than the development of new sources seems to be the best possible option. The world is currently shifting its emphasis from water production or supply, to maintain a

balance between supply and demand through considering the water demand management (WDM). The new emphasis has the potential to ensure the application of necessary and efficient measures to achieve fair and effective use of water. The main objective of water demand management is to realize more efficient and equitable provisions of water and ensure better sanitation services. This article is an attempt to examine the possibility of applying water demand management (WDM) principles as the preferred alternative to meet the increasing water needs of the nation. The article also suggests measures such as by launching awareness creation campaign through extension education and outreach programs to address the water shortage issue. At the moment, consumers enjoy subsidies on the domestic use of water, therefore, enforcing pricing policies and laws that govern the use of water for households could offer a great help in economizing water. The article also examines the possibility of introducing water meters to measure monthly consumption. It is anticipated that pricing and monitoring systems on the use of water would lead to its conservation at the household level.

An overview of water resources in KSA: Saudi Arabia is a desert like country with no permanent river or lake and very little rain fall (FAO, 2009). Water is scarce and extremely valuable. With the country's rapid growth, the demand for water is increasing. Aquifers are the major source of water in Saudi Arabia. They are vast underground reservoirs of water. Another major source of water is desalination of sea water. The Saline Water

Conversion Corporation (SWCC) operates 36 desalination stations that produce more than 1000 million cubic meters a day of potable water (SWCC, 2008). The users of desalinated water of the Kingdom, represent about 26% of world total. In addition, some 260 dams capture rain water; collecting an estimated 16 billion cubic feet of water.

Water use: Total municipal water use in Saudi Arabia is about 9% and has been estimated at 2.1 billion cubic meters per year in 2004. Agriculture accounts for 88% and industry consumes only 3% of the available water (Al-Zahrani, and Elhag 2003). Demand for water has been growing at the rate of 4.3% per annum during (1999-2004). Household water consumption reaches around 260 liters per capita per day. In Riyadh average domestic water use in 2004 was 320 liters/capita/day (Ministry of Economy and Planning, 2005-2008; World Bank, 2010).

Water demand management (wdm) as a strategy to improve the situation: Water Demand Management (WDM) is an effective strategy to increase available water supply that involves water conservation and increased water use efficiency (AML, 2010). The main objective of water demand management is to ensure equitable provision of water and sanitation sources and make them more efficient. The sketch of the proposed strategy for managing household water is presented in Fig. 1. In order to be more efficient and effective, IRC, (2010) stresses that while serving the domestic consumers, the water demand management measures can be divided into the following:

1. **Water conservation measures:** Leakage detection; Reduction of illegal connections; In-house retrofitting; Out-of-house water saving measures;
2. **Water pricing measures:** Water metering; Tariff structure
3. **Information and educational measures:** Awareness raising; Public involvement, In-school education;
4. **Legal measures:** Rules and regulations forming the basis of WDM policy; Regulations on resale of water.

Water demand management is an integrated concept that also includes a number of water sub-sectors to ensure that social, economic, environmental and technical dimensions are taken into account (World Bank, 2010). The concepts of the integrated water resources management (IWRM) comprise of the activities of planning, developing, distribution and optimum use of water resources under defined water policies and regulations which have been agreed in the "Dublin

Principles" (Wikipedia, 2010). According to the Dublin Principles:

1. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
2. Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels.
3. Women play a central part in the provisions, management and safeguarding water.
4. Water has an economic value in all its uses and should be recognized as an economic good, taking into account of affordability and equity criteria.

Price of water: The price of water is increasing throughout the world. Over the past five years, municipal water rates have increased by an average of 27% in the US, 32% in UK, 45% in Australia, 50% in South Africa and 80% in Canada (Clark, 2007). The price of household water in New York is about \$ 0.75per cubic meter while in London the price of one cubic meter of water is around \$ 1.50. The price of water in Manila, Accra and Columbia are \$ 3, 3.5 and 4.5 per cubic meter, respectively (Global Issues Organization – GIO, 2010). The price of household water in Saudi Arabia is almost free as apparent from Table-1.

Table -1: Price of water (KSA)

Segment	M ³ /month	Price (SR)
1	1-50	0.10
2	51-100	0.15
3	101-200	2.00
4	201-300	4.00
5	301+	6.00

Table -2: Proposed new price of water (KSA)

Segment	M ³ /month	Price (SR)
1	1-50	5
2	51-100	7
3	101-200	9
4	201-300	12
5	301+	15

Source: Ministry of Economic and Planning Report, 2009

Water Conservation Measures: Up to 30% of fresh water supplies are lost due to leakage in the developing countries. In some major cities, losses can run as high as 40% to 70%, in KSA leakage losses are about 35% (GDRC, 2010). That establishes the need for taking measures to address and check the conveyance losses and conserve the available water resources.

Strategy for household water demand management in Saudi Arabia: Squeezing fresh water resources pose one

of the major challenges faced by the world generally and the Kingdom of Saudi Arabia (KSA) precisely (Al-Zahrani and Siddig, 2007). Due to the deminishing water resources and limited supplies, the world is currently shifting its interest from emphasis on water supply to maintain a reasonable balance between supply and demand through considering the water demand management principles.

Water demand management is a managerial approach which aims at meeting the demand of water through the application of necessary and efficient measures and incentives to achieve fair and effective utilization of water. The water requirements in Saudi Arabia are growing rapidly due to an ever increasing population together with improved living standards. The existing and anticipated future water requirements will exceed than the available resources. Total household water consumption increased at an average annual growth rate of 4% rising from 1,750 million cubic meters in 2004. Water consumption per capita is relatively very high in the city of Riyadh. There it exceeds 300 liters per capita per day. Unfortunately the Kingdom experiences network losses as high as 30 percent.

Abusing of water facilities by some residents is not uncommon in the Kingdom; washing their cars or the houses, wastage of the precious resource can be seen in the form of running water through the streets. A survey conducted by (Al-Zahrani, 2009b) showed that low prices

of the water and lack of efficient monitoring measures against those abusing the facility were the main reasons for the misuse of water.

An arid and desert climate prevails in Kingdom of Saudi Arabia (KSA) and is ranked one of the driest countries in the world. Based on the data and information presented in this paper, there is a need to manage water resources demand by changing the pattern of water consumption for household consumers by adopting the following measures:

- While putting new prices for water, factors like environmental conditions of Saudi Arabia, the real cost of the production of each cubic meter of water by the government, the high living standards of people, the price of other commodities and the price of water of some major cities of world should be considered for making comparisons.
- The new proposed prices will help reducing water loss rate from the network.
- Introduce effective and efficient national water campaigns to rationalize water use by consumers, based on the outcome of the previous campaigns, and the responses of the women, children and house mates.
- Introduce educational curriculum to create awareness among the students of the schools.
- Apply effective policies, monitoring measures, and enforce penalties to control the misuse of water.

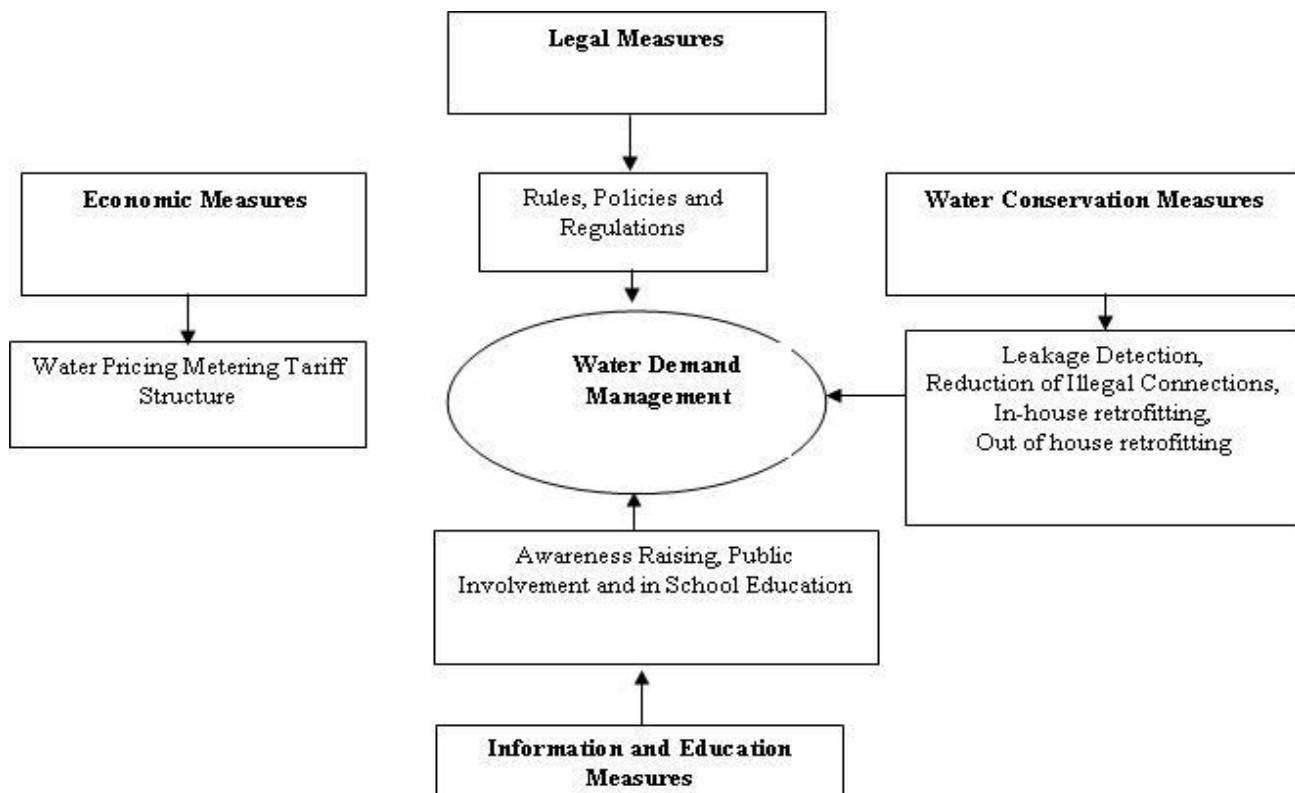


Fig.1: Sketch of the Proposed Strategy for Managing Household Water

Conclusions and Recommendations: An arid environment and limited natural water resources are the prominent features of Kingdom's landscape. The bulk of water (about 30%) available for household consumption comes from the desalinating plants and the process of desalination produces water that is quite expensive. It has been estimated that all the available water sources collectively are unable to meet the requirements of ever-increasing population of the Kingdom. In addition, an appreciable amount of water is being lost due to un-wise consumption and irrational use by the general public. The users take water as a free enterprise because the kingdom provides generous subsidies to its consumers. It is suggested that all the stakeholders including the policy makers, planners and the consumers need to re-think the importance of this precious resource, its judicious use and wise consumption. Among the available options, the concepts of Water Demand Management (WDM) hold significant potential. WDM must be viewed as a managerial approach aimed at meeting the demand of water through the application of necessary and efficient measures and incentives to achieve fair and effective utilization of water. Among the other suggested measures, the role of extension education is of prime importance. Without creating an awareness among the users and educating the general public on the importance of this precious resource, all conservation measures adopted would be limited. Once they are convinced for its wise use and become water conscious consumers, they will happily put all the suggested water conservation measures into their practice and implement the plans and policies with letters and spirits, offered by the Kingdom.

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