

# Outlines for Water Saving Practices in Kuwait

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# Introduction

- The increasing imbalance between water supply and demand has compelled the Arabian Gulf Countries to augment supplies.
  - Seawater and brackish water desalination.
  - Reuse of renovated waste water.
  - Groundwater recharge schemes.
  - Implementation of water conservation measures.
- The demand for water continues to increase rapidly in Kuwait with expanding population base and steep rise in per capita consumption as a result of
  - Rapid development
  - Improved standard of living

# Introduction Cont.

- Kuwait is trying to exploit its non-renewable groundwater resources in large quantities causing depletion of these resources.
- In this critical situation, approaches to water development must give way to integrated water resource management and on the conservation of both quantity and quality with emphasis on a partnership between
  - Decision Makers
  - Water Suppliers
  - Water Users.

# Objective

- To set up relevant guidelines for designing a water conservation program that can be convenient for implementation in Arabian Gulf countries in general and in Kuwait in particular.
- These guidelines cover many alternative methods of conserving water including:
  - Supply management methods.
  - Demand management methods.

# Supply Management Methods

1. Network leakage/loss control.
2. Use of especial plumbing equipment.
3. Behavioral practices at users' end that conserve water.
4. Use of renovated wastewater for irrigation and other non-potable purposes.
5. Water metering.

# 1. Network Leakage/Loss Control

- There are different types of leaks:
  - Service line leaks.
  - Valve leaks.
  - But in most cases, the largest portion of unaccounted-for water is lost through leaks in the mains.

# 1. Network Leakage/Loss Control

- The possible causes of leaks can be due to the
  - Material
  - Composition
  - Age
  - Joining methods of the distribution system components
  - Water conditions (temperature, aggressiveness, and pressure)
  - External conditions (stray electric current and stress from traffic vibrations around a pipe).

# 1. Network Leakage/Loss Control

- Potential benefits of leak detection and repair can be obtained by
  - Increasing the knowledge about the distribution system,
  - More efficient use of existing supplies,
  - Improving environmental quality;
  - Reducing property damage, legal liability, and insurance; and
  - Reducing risk of contamination.

# SUPPLY MANAGEMENT METHODS

## 2. Plumbing

- Significant water conservation by residential users can be achieved through the use of efficient indoor plumbing fixtures and equipment.
- Plumbing programs usually include the use of:
  - A. Low flush toilets.
  - B. Toilet displacement devices.
  - C. Low-flow showerheads.
  - D. Faucet aerators.
  - E. Pressure management.

# SUPPLY MANAGEMENT METHODS

## 2. Plumbing

### A. Low-Flush Toilets

- Indoor use accounts for roughly 60 percent of all residential use, and of this, toilets (at 12 liters per flush) use nearly 40 percent.
- Conventional toilets use 12 to 20 liters or more of water per flush, but low-flush toilets uses only 6 liters of water or less.
- In new construction there is a great potential to reduce water consumption by installing low-flush toilets.
- Even in existing residences, replacement of conventional toilets with low-flush toilets is a practical and economical alternative.

# SUPPLY MANAGEMENT METHODS

## 2. Plumbing

### **B. Toilet Displacement Devices**

- Plastic containers can be filled with water and placed in a toilet tank to reduce the amount of water used per flush.
- By placing such containers in the tank more than 4 liters of water can be saved per flush.
- A toilet dam, which holds back a reservoir of water when the toilet is flushed, toilet dams result in a savings of 1 to 2 gallons of water per flush (USEPA, 1991).

# SUPPLY MANAGEMENT METHODS

## 2. Plumbing

### C. Low-Flow Showerheads

- Showers account for about 20 percent of total indoor water use.
- By replacing standard 17 liters per minute showerheads with 10 liters per minute heads, a family of four can save approximately 75000 liters of water per year (Jensen, 1991).

# SUPPLY MANAGEMENT METHODS

## 2. Plumbing

### D. Faucet Aerators

- Faucet aerators, which break the flowing water into fine droplets and entrain air while maintaining wetting effectiveness, are inexpensive devices that can be installed in sinks to reduce water use.
- Aerators can be easily installed and can reduce the water use at a faucet by as much as 60 percent while still maintaining a strong flow.
- More efficient kitchen and bathroom faucets that use only 5 to 6 liters of water per minute unlike standard faucets, which use 12 to 20 liters per minute, are recommended.

# SUPPLY MANAGEMENT METHODS

## 2. Plumbing

### E. Pressure Reduction

- Reducing excessive pressures in the distribution system can save a significant quantity of water. Reducing water pressure can decrease
  - Leakage
  - Amount of flow
  - Stresses on pipes and joints which may result in leaks
  - Decrease system deterioration
  - Reducing the need for repairs
  - Extending the life of existing facilities.
- Pressure management and reduction strategies must be consistent with state and local regulations and standards, as well as take into account system conditions and needs. and should not compromise the integrity of the water system or service quality for

# SUPPLY MANAGEMENT METHODS

## 2. Plumbing

- The Ministry of Electricity and Water in Kuwait with the Kuwait Institute for Scientific Research
- Developed and adopted a plumbing code for the residential consumers,
- Going to retrofit 1,000,000 of faucets aerators of 6 L/min in the residential units on an experimental basis to study their effects on water consumption this coming summer.

# SUPPLY MANAGEMENT METHODS

## 3. Behavioral Practices

- Behavioral practices involve changing water use habits so that water is used more efficiently, thus reducing the overall water consumption in a home. and this behavioral practices for residential water users can be applied both
  - Indoors (the kitchen, bathroom, and laundry room)
  - Outdoors.

# SUPPLY MANAGEMENT METHODS

## 3. Behavioral Practices

### A. Kitchen

- In the kitchen, for example, 40 to 80 liters of water a day can be saved by running the dishwasher only when it is full.
- If dishes are washed by hand, water can be saved by filling the sink or a dishpan with water rather than running the water continuously.

### B. Bathrooms

- Turning off the faucet while brushing teeth or shaving
- Taking short showers
- Turning the water off while soaping
- Installing low-flow showerheads

# SUPPLY MANAGEMENT METHODS

## 3. Behavioral Practices

### C. Car Wash

- Additional savings of water can result from car washing, sweeping sidewalks and driveways instead of hosing them down.
- 600 liters of water can be saved when washing a car by turning the hose off between rinses.
- The car should be washed on the lawn if possible to reduce runoff and to reuse the wash water for lawn irrigation.
- If a home has an outdoor pool, water loss from evaporation can be prevented or reduced by covering the pool when it is not in use.

# SUPPLY MANAGEMENT METHODS

## 3. Behavioral Practices

### D. Landscape Irrigation

- One method of water conservation in landscaping uses plants that need little water.
- Scheduling lawn irrigation for specific early morning or evening hours can reduce water wasted due to evaporation during daylight hours.
- Use of cycle irrigation methods to improve penetration and reduce runoff. Implementation of efficient landscape irrigation engineering practices.

# SUPPLY MANAGEMENT METHODS

## 3. Behavioral Practices

### D. Landscape Irrigation

- Design of landscapes for low maintenance and low water requirements.
- Use of water-efficient irrigation equipment such as drip systems or deep root systems.
- Proper maintenance of irrigation equipment to ensure that it is working properly.
- Distribution of irrigation equipment to make sure that water is dispensed evenly
- Scheduling of irrigation to ensure maximum water use

# SUPPLY MANAGEMENT METHODS

## 3. Behavioral Practices

- In implementing the changes in behavioral practices of using water in Kuwait and other countries of the Arabian Gulf region, the special factor that should be taken into considerations is that in many residences here, water is mainly used by hired manpower that has generally lower education levels and little understanding of the value of this commodity.
- It should primarily be the responsibility of the home owners in these cases to make their employees aware of the need of the water conservation and instill in them the behavioral changes in water use, called for this purpose.

# SUPPLY MANAGEMENT METHODS

## 4. Use of Waste Water

- Greatest benefit of establishing water reuse programs is their contribution in delaying or eliminating the need to expand potable water supply and treatment facilities.
- The use of water for cooling in industrial applications represents one of the largest water uses in the world.
- Given the limited available water resources and the increasing demand, treated municipal wastewater can play a special role in maintaining and increasing the water resources of Kuwait.
- Treated wastewater effluents free from health hazards must be considered as valuable water resources for
  - A) Irrigation of certain crops, B) Greening enhancement, C) Landscaping and land reclamation, D) Car washing, E) Industrial

# SUPPLY MANAGEMENT METHODS

## 5. Water Metering

- Metering makes water users more aware of how much water they use and its cost.
- Metering is reported to reduce water usage by 20 to 40 percent (Rathnau, 1991).
- Recent surveys in connection with the estimation of network leakage have, however, revealed various problems:
  - Poor installation practice.
  - Effects of pumps on the supply pipe on meter readings.
  - Effects of normal wear on minimum recorded flows.
  - Damaged meters and improper choice of meters that are affecting the meter readings.

# SUPPLY MANAGEMENT METHODS

## 5. Water Metering

- A comprehensive review of metering policy is called for covering meters.
  - Selection and sizing.
  - Installation details.
  - Replacement programs
  - Allowable pump arrangements.
  - Multiple occupancy situations to resolve the issues related to metering and arriving at a reliable estimation of water utilization and network leakage.

# Demand Management Methods

- Demand management methods should include:
  1. Pricing.
  2. Information and education.
  3. Water use regulations.
  4. Water use audits.

# DEMAND MANAGEMENT METHODS

## 1. Pricing

- Costing and pricing are conservation strategies because they involve understanding the true value of water and conveying information about that value, through prices, to water customers. Systems should
  - Conduct a cost analysis to understand what types of usage drive system costs
  - Analyze patterns of usage by season and class of service
  - Consider whether their current rate structures promote water usage over conservation.
  - Non promotional rates should be implemented whenever possible in order to enhance the conservation signal of rates.
- Conservation-oriented pricing requires planners to make certain assumptions about the elasticity of water demand, or the responsiveness of water usage to a

# DEMAND MANAGEMENT METHODS

## 1. Pricing

- Studies showed that fresh water consumption in Kuwait is price elastic. Based on
  - Analysis of the historical data
  - Water consumption
  - Real gross national product, price index for water and population.
- Adoption of a suitable pricing structure for water should, therefore, result in reduction in water demand in Kuwait.

## 2. Information and Education

- Public information and education are important components of every water conservation plan.
- Consumers are often willing to participate in sound water management practices if provided with accurate information.
- Providing information and educating the public may be the key to getting public support for water conservation efforts.
- An information and education program should explain to water users all of the costs involved in supplying drinking water and demonstrate how water conservation practices will provide water users with long term savings.

## 2. Information and Education

### A. Informative Water Bill.

- Customers should be able to read and understand their water bills.
- An understandable water bill should identify volume of usage, tariff rates, total charges and other relevant information.

### B. Public education program

- Outreach methods speakers' operating booths at public events, printed and video materials, coordination with civic organizations.
- In case of Kuwait and other GCC countries, (diwanias) of citizens can be very suitable venues for spreading the message of water conservation.
- MEW in Kuwait has already initiated preliminary steps in public campaign for the conservation of electricity and water through newspaper, radio, TV, billboards and banners under

# DEMAND MANAGEMENT METHODS

## 2. Information and Education

### C. Workshops

- Workshops for plumbers, plumbing fixture suppliers, and builders or for landscape and irrigation service providers.

### D. School program

- Contacts through schools can help increase in awareness in young generations about the value of water and conservation techniques, as well as communication with parents.

### E. Advisory committee

- A water conservation advisory committee can involve the public in the conservation process; The committee can provide feedback to the decision makers concerning its conservation plan and develop new material and ideas about public information and support for conservation in the community. Potential committee members include
  - Elected officials, Local business people, Interested citizens,
  - Agency representatives, Representatives of concerned local groups.

# DEMAND MANAGEMENT METHODS

## 3. Water-Use Regulation

- Restrictions on water use should be justified by the system's circumstances and should not unduly compromise the customer's rights or quality of service. Water use regulations can be summarized in the following steps:
  - Promote the adoption of a water conserving ordinance which requires the installation of water-saving plumbing fixtures and fittings in all new buildings constructed or in existing homes where building permits are issued for kitchen or bathroom remodeling work.
  - Institute requirements for the installation of water-saving plumbing fixtures and fittings as a condition prior to hook-up for new customers.
  - Encourage the wise use and management of water during peak use summer periods by restricting lawn/garden watering to non-daylight hours.
  - Institute fines for the unauthorized use of water such as illegal hookups and hydrant discharges.
  - Promote land use regulations which protect critical groundwater

# DEMAND MANAGEMENT METHODS

## 4. Water-Use Audits

- An audit program can be selective in terms of targeting customer groups that have particular needs or for which water conservation could be particularly beneficial.
- Water audits should begin by identifying the categories of water use for the large-volume user, followed by identifying areas in which overall water use efficiency can be improved through alternative technologies or practices.
- In Kuwait it is a high priority to collect information on water use by different sectors of its society and economy to understand the water use pattern and to identify areas where conservation efforts should be implemented in earnest.

# Conclusion

1. Improvements in the standard of living and urban migration, coupled with the absence of conservation programs in the Arabian Gulf Countries in general and in Kuwait in particular, have resulted in excessive domestic water consumption.
2. Current programs in these countries are focusing mainly on the development of water resources rather than management, in order to meet rising water demand.
3. Water managers in this region might have opportunities to consider and implement measures that can accomplish integrated resource management, where water conservation is jointly accomplished with the conservation of other resources like electricity and fuel used to generate both electricity and desalinated water.
4. This should be accomplished by taking both supply and demand management measures for water and power so that the operation of the water and electrical production is optimized and the demand for both is controlled without compromising the living standards.

**Thank  
You**

