

# BEST PRACTICES SUMMARY

## EGYPT

### BACKGROUND

- Population:** 65.0 million
- Water Resources:**
  - Nile River provides 97 percent of the fresh water
  - Ground water provides the other 3.7 Billion cubic meters
- Water Usage:**
  - International Water Treaty with Sudan limits Egypt's use of the Nile to 55.5 billion m<sup>3</sup> year
  - per capita water usage: 981 m<sup>3</sup> per year
  - 1990: reused agricultural drainage water constituted 4.7 billion m<sup>3</sup>
  - 84% of water used for agricultural purposes, 5% for domestic use
  - annual water usage grows at an average of 2.3 percent
  - domestic water waste is 50% (35% through leaks, 15% within network)

### BEST PRACTICES

#### Technical

- National Community Water Conservation Program (NCWCP) introduced 16 water conserving retrofits
- improved meter installation and leak reduction investments by some municipal water systems

#### Educational/Awareness

- NCWCP implemented mass media efforts with TV, radio and print outlets, supplemented by some targeted mailing, resulting in a 2.5 % reduction in water demand other NCWCP efforts:
  - religious leaders include water conservation messages in Friday prayers
  - mobilization of youth groups through group meetings at youth institutions
  - local festivals, exhibits, and workshops such as the annual Nile celebration
- Ministry of Public Works and Water Resources has begun a multi-media water conservation campaign directed toward farmers to cut agricultural use of water

#### Policy

- NCWCP has been the major domestic water conservation effort, initiated in 1994
- to test potential policies three governorates measured cost recovery times for maintenance and operational expenses with results ranging from 3.4 to 4.4 years
  - private sector cost recovery experiments of water-saving retrofits yielded results as short as three months

# BEST PRACTICES SUMMARY

## ISRAEL

### BACKGROUND

- Population:** 5.8 million
- Water Resources:**
  - 35% Lake Kinneret Watershed/Yarmouk River
  - 50% Major Aquifers
  - 15% Minor Aquifers, treated wastewater, floodwater
- Water Usage:**
  - current water use: 500 MCMY
    - 63% agriculture
    - 30% domestic
    - 7% industry

### BEST PRACTICES

#### Technical

- dual volume flushing cistern device (low flush toilets)
- flow controlled shower heads and taps
- electronic operated automatic taps
- apartment pressure regulators
- compact wastewater treatment units
- garden planning
- part-circle sprinklers
- remote leakage detection instruments
- drip irrigation systems

#### Educational/Awareness

- massive publicity campaigns for water conservation using all kinds of media
- public information campaigns promoting understanding of water conservation topics
- Sakhnin Center Model: education programs in classrooms and specific programs (tours)
  - instruct children and teachers in water conservation subjects
  - disseminate topics to community (tours, lectures, cultural activities)
  - station for experiments for students to perform research projects
  - meeting place for professionals and public from various nations and sectors within Israeli population

#### Policy

- law forbidding tap flushing of toilets
- law demanding installation of dual volume flushing cistern in all new buildings
- water tariff policy encouraging conservation (ex: reclaimed water is cheaper than potable)

# BEST PRACTICES SUMMARY

## JORDAN

### BACKGROUND

- Population:** 4.1 million
- Water Resources:**
  - Jordan-Yarmouk River
- Water Usage:**
  - 1995: 240mcm (185 liters per capita per day (l/c/d))
  - unaccounted for water is 55% of total (30% leakage, 25% errors/illegal connections)
  - water shortage - 38 l/c/d

### BEST PRACTICES

#### Technical

- harvesting water from roofs
- wastewater reuse (70% used for irrigation)
- collection of water in cisterns
- installation of water saving devices in showers and faucets in hotels

#### Educational/Awareness

- awareness cards left in hotel rooms
- celebration of special nat'l and int'l events (ex: Int'l Water Day, Arab Environment Day)
- on one Friday every mosque in Jordan gave a lecture at prayer time about water conservation
- fact sheets, pamphlets, posters, stickers
- water walks (competition for youth)
- community programs (seminars, activities, events)
- Water Conservation Education Project
  - implemented water conservation curriculum in school environmental youth clubs

#### Policy

- Social and Economic Development Plan (1993-1997)
  - improve efficiency of water carrying systems
  - raise efficiency and water saving practices at user level
- Water Rationing Practices by Water Authority of Jordan
  - summertime rationing in all municipalities
  - raise water tariff on high consuming groups
- Awareness Project in Water
  - establish information, education and communication capability in Ministry of Water and Irrigation (MWI) and Jordan Environment Society (JES)
  - implement information, education and communication campaigns and activities

# BEST PRACTICES SUMMARY

## MOROCCO

### BACKGROUND

- Population:** 27 million
- Water Resources:**
  - surface water, ground water
  - wells, springs
  - treated wastewater
  - desalinated water
- Water Usage:**
  - 92% of water used for agricultural purposes (surface water)
  - water withdrawal per inhabitant: 440 m<sup>3</sup> per year (37% of current total renewable water resources)
  - 8% of rural population receives water from water distribution network

### BEST PRACTICES

#### Technical

- studying eutrophication of water in dams
- artificial recharge of aquifers (ex: from Charf Al Akab near Tangier)
- treatment of wastewater (ex: plant in Benslimane )
- construction of small debris dams
- heightening of Lalla Takerkoust Large Dam on N'Fis River
- desalination of seawater through reverse osmosis (ex: Boujdour and Laayoune)

#### Educational/Awareness

- drinking water conservation campaign launched (in 1990) by Potable Water Authority (ONEP)
- Water Conservation Advocacy Program for Young People (students under 18) organized by the Ministry of Education in 1997
- Ministry of Education's Efforts
  - publications
  - courses
  - dissemination of various government documents, letters, and topic papers

#### Policy

- conservation and protection of Public Hydraulic Property, Section 3 of Act 10 (1995)
- Royal Decree Dahir from 1918
- Water Pollution Control Measures Act 10 (1995) Articles 51, 52, 53, 54 and 56

# BEST PRACTICES SUMMARY

## OMAN

### BACKGROUND

- Population:** 2.0 million
- Water Resources:**
  - alluvium in Northern Oman
  - tertiary limestones in the South
  - 55% of total produced water is met through desalination process
  - system of wells mining groundwater
  - irrigation systems such as the falaj
- Water Usage:**
  - agriculture is the principal consumer of water (90% of total water use)
  - domestic consumption: 200 l/c/d (liters per capita per day)
  - 35.7% of dwellings are connected to public water supply, the rest are supplied by: tanker vehicles (20.1%), private well (20.4%), public well (17%), and falaj (3.3%)

### BEST PRACTICES

#### Technical

- improved water meters (on wells, municipal water supplies)
- drip irrigation agriculture
- reducing pressure at discharge points
- computerized irrigation cycles
- mist collection experiments
- use of brackish water, treated wastewater/grey water
- plugging leaks

#### Educational/Awareness

- participatory efforts with residents prior to installing new systems
- programs with households (women) to change behavior
- national community water conservation program
- NGO and Government educational efforts in schools

#### Policy

- Agriculture: focus on controlling water applications, crop choice and relocation of agriculture to sites where water resources are underutilized
- National Desalination Program
- Municipality of Muscat re-uses grey water for urban beautification
- Ministry of Electricity and Water sells water at subsidized rates, and operates a national hotline to reduce water wastage from breaks in system
- Ministry of Water Resources augmentation policies: urban wastewater reuse, runoff harvesting, monsoon precipitation harvesting

# BEST PRACTICES SUMMARY

## PALESTINIAN AREAS

### BACKGROUND

- Population:** 2.5 million
- Water Resources:**
  - Jordan-Yarmouk River System
  - Per capita fresh water availability: 100 m<sup>3</sup>
- Water Usage:**
  - 62% of water is used for agricultural purposes, 38% for industrial and domestic
  - 50% of water in municipal distribution networks is lost through leakages, illegal connections and inaccurate or lack of metering
  - domestic water consumption: 50 l/c/d (liters per capita per day)

### BEST PRACTICES

#### Technical

- rainwater harvesting in the West Bank
- development of springs in the West Bank
  - reach the source and increase the yields of the springs
- rehabilitation of water distribution networks in the West Bank
- Water and Sanitation Services Project in Gaza/Strip
  - well inventory and quota revision
  - network for treated wastewater for irrigation
  - drilling new wells/rehabilitation of existing municipal wells
  - development of appropriate water and sewage tariffs
  - storm water collection
  - construction of new treatment plant
- Municipal Infrastructure Development Project for the West Bank and Gaza Strip
- service improvement for water and wastewater in 16 Municipalities of the Gaza Strip

#### Educational/Awareness

- public awareness campaign for water/wastewater in the West Bank and Gaza Strip
  - achieve public participation in the development and implementation of national policies for water conservation
  - educate, train, and prepare materials, using different kinds of media
  - change behavior and attitudes regarding water use and abuse, and promote common responsibility

#### Policy

- water tariff study in the Palestinian Territories
- action plan for Water Master Planning Support of the Palestinian Water Authority