Water Management in Greece Shortcomings and Opportunities

Prof. Dionysis Assimacopoulos
School of Chemical Engineering
National Technical University of Athens

The tangible problems

- Widening gap between water supply and demand at the local level
- Water quality deterioration
- Increasing vulnerability to extreme events (drought episodes and floods)

The underlying causes

- Limited funding
- Limited incentives and lack of enforced mandates
- Shortfalls in management & planning
- Lack of capacity of water users
  - Limited technology diffusion
  - Limited awareness on water saving

"Kathimerini ", 29 June 2008

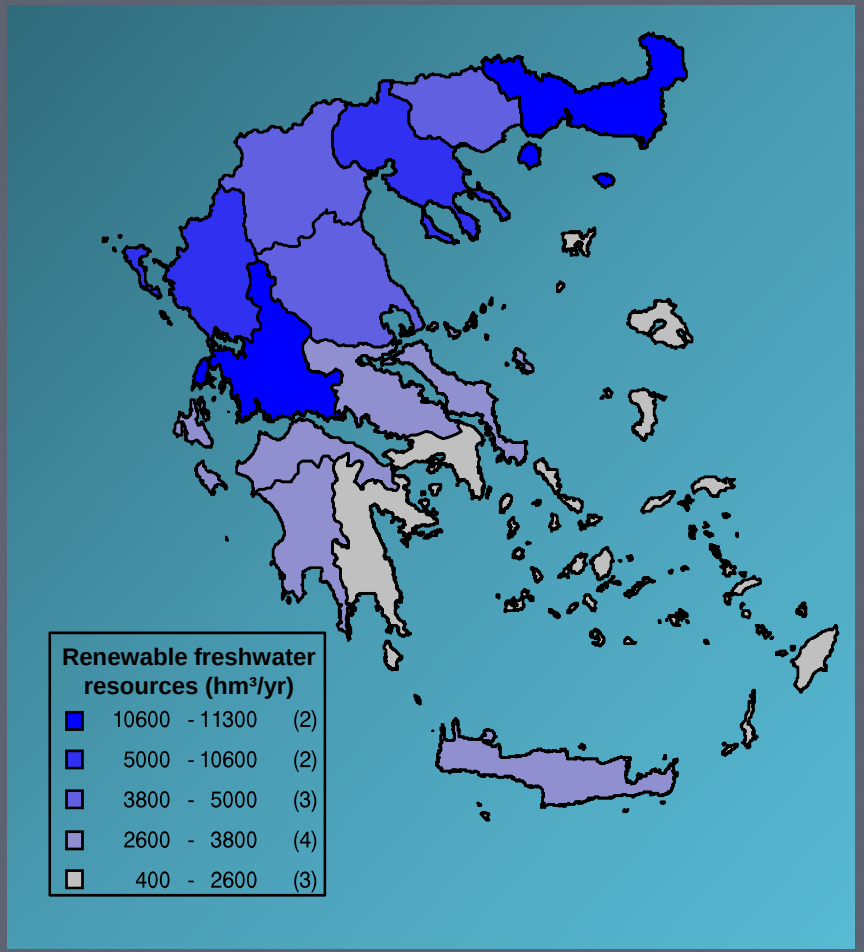
1. Lack of basic infrastructure projects in several areas
2. Lack of contingency plans for areas vulnerable to drought
3. Costly and difficult (in terms of obtaining approvals) for citizens to harvest rainwater (loss of traditional water saving options)
4. Lack of consistent irrigation water pricing mechanisms; irrigation water is often not metered, and its use tends to be wasteful
5. Drip irrigation has not been widely adopted; low efficiency due to inefficient irrigation scheduling
6. Deterioration of surface and groundwater due to agrochemicals and industrial pollution
7. Treated effluents are not used for irrigation or aquifer recharge
8. Significant conveyance and distribution losses
9. Uncontrollable groundwater extraction, mostly through illegal boreholes
10. High water consumption in insular and coastal areas due to tourist influx
11. Coastal aquifers subject to salinization due to overexploitation

Problems or Challenges ?

Water availability issues

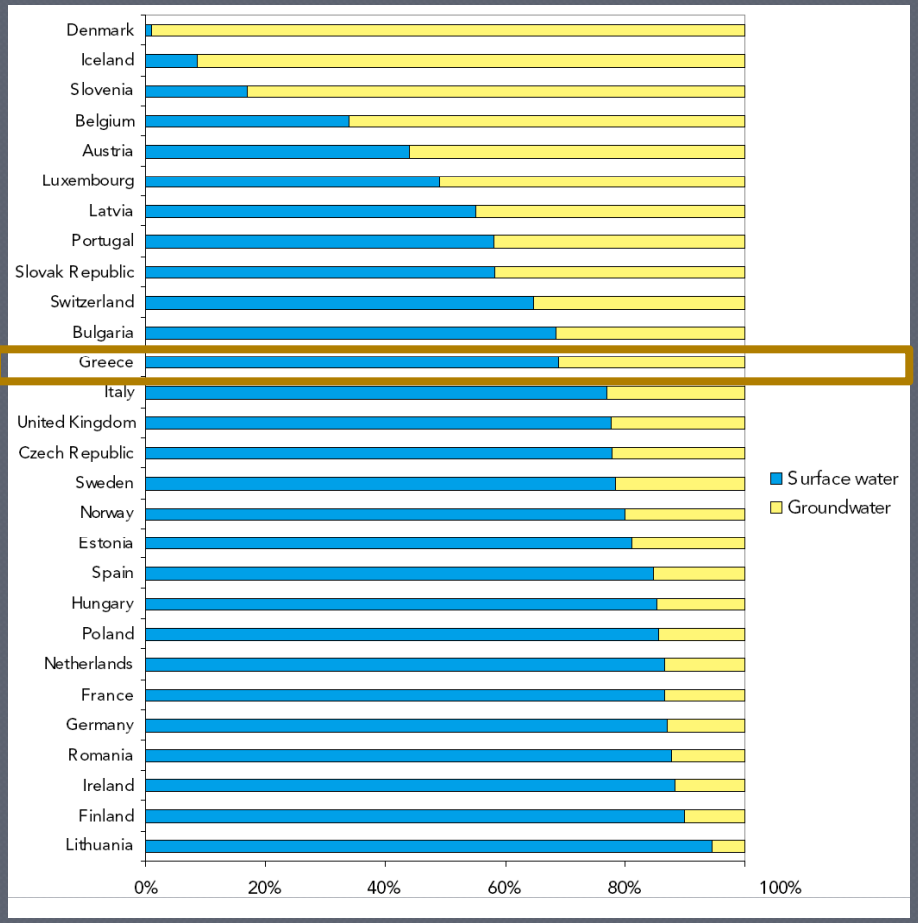
- Water availability
  - 6798 m³/cap/yr
- Water exploitation index
  - 1990: 10%
  - 2002: 12%

  Source: EEA, 2003
- High spatial and temporal variability
- Regional development patterns have often exceeded the carrying capacity of natural resources, water included
  - Examples: Athens, Thessaly, Aegean islands



Dependencies

- Dependence on river flows from neighbouring countries (1990-2005 average, Plan Bleu)
  - Internal resources: 58 km³/yr
  - External resources: 16.25 km³/yr (21.8%)
- Strong dependence on groundwater for domestic and irrigation supply



Source: EEA, 2000

The "Water Footprints"

- Greece
  - Water footprint: 2389 m^3/cap/yr
  - Domestic water resources
    - Domestic use: 0.83 billion m^3
    - Crop and livestock production (exports included): 18.15 billion m^3
    - Industry (exports included): 0.854 billion m^3
  - "Virtual water inflow"
    - Total: 10.19 billion m^3
- Denmark
  - Water footprint: 1440 m^3/cap/yr
  - Domestic water resources
    - Domestic use: 0.38 billion m^3
    - Crop and livestock production (exports included): 8.67 billion m^3
    - Industry (exports included): 0.324 billion m^3
  - "Virtual water inflow"
    - Total: 10.72 billion m^3

Agriculture (1/2)

- Traditional irrigation methods are still dominant
  - Public networks (managed by the local Offices of Land Improvement)
    - Surface water irrigation: 35-40%
    - Irrigation with sprinklers: 50-55%
    - Drip irrigation: 10%
  - Private networks (own boreholes)
    - Surface water irrigation: 7-10%
    - Irrigation with sprinklers: 49-51%
    - Drip irrigation: 40-44%

  Source: Ministry of Agriculture, 2002

- Additional losses in water networks
  - Open-air channels in public networks (1998): 35%
  - Open-air channels in private networks: 0.6%

- In public networks, farmers pay according to the irrigated area and not water consumption
  - No incentives for water conservation
  - Although there are meters, metering is rarely applied

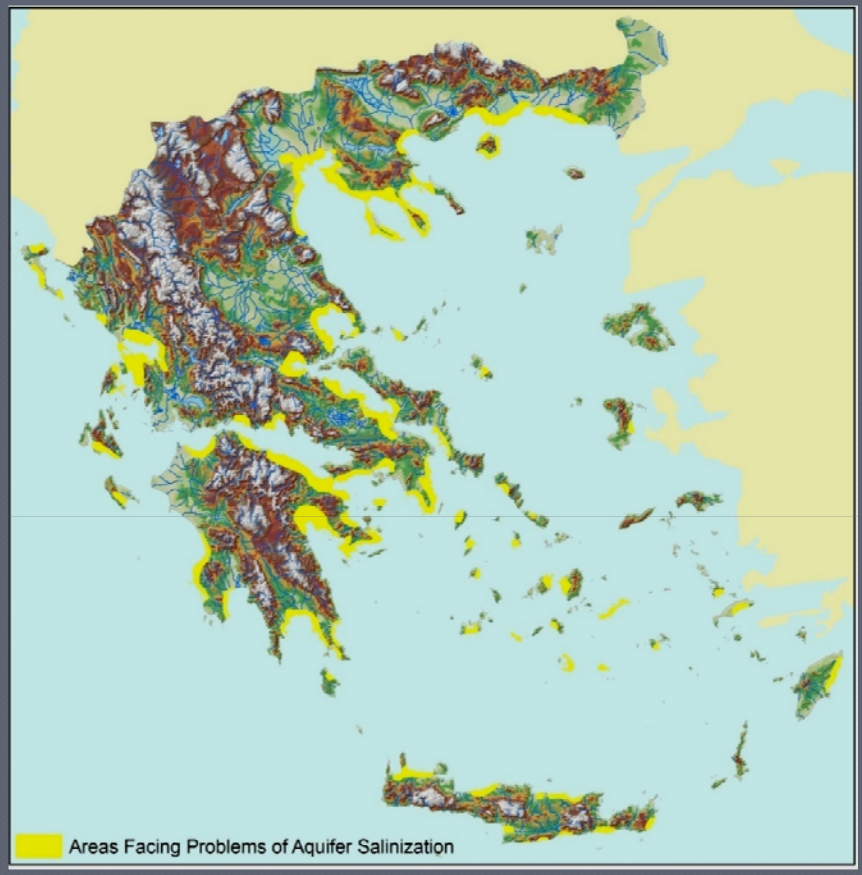
Agriculture (2/2)

- Water-intensive crops, such as cotton and maize, are main cultivations in arid areas, like Thessaly
  - A shift to vegetables and cereals would conserve almost the same quantity of water as the one that will be supplied from the diversion of Acheloos
- Little information has reached farmers on the reform of the Common Agricultural Policy
- Excessive use of agrochemicals
  - Pollution of surface and groundwater (Thessaly, Kopaida, Arta, Argolida …)

Nitrate vulnerable zones (EEA, 2003)

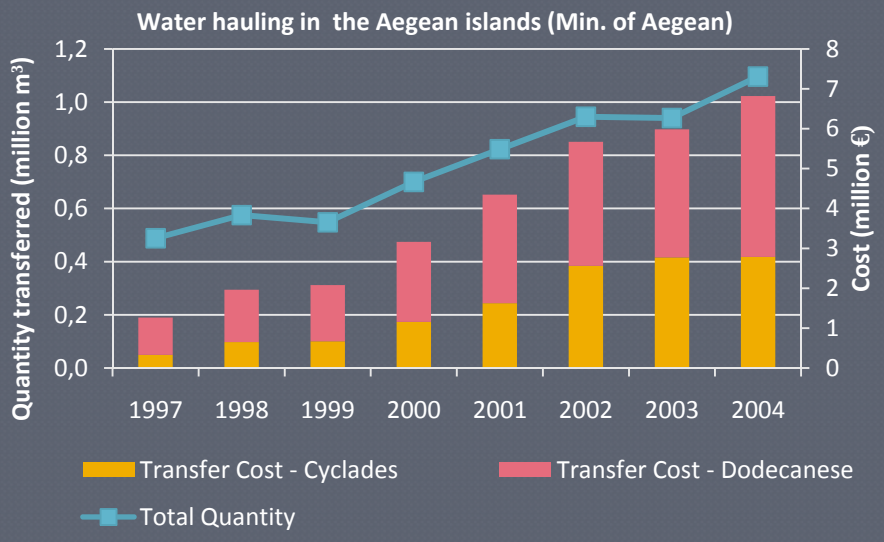
Groundwater

- Groundwater extraction remains uncontrollable
  - According to estimates, more than 200,000 boreholes operate throughout the country
- Overpumping to meet agricultural and/or tourism needs is frequent in the coastal and agricultural areas
- Widespread Illegal drilling



Tourism

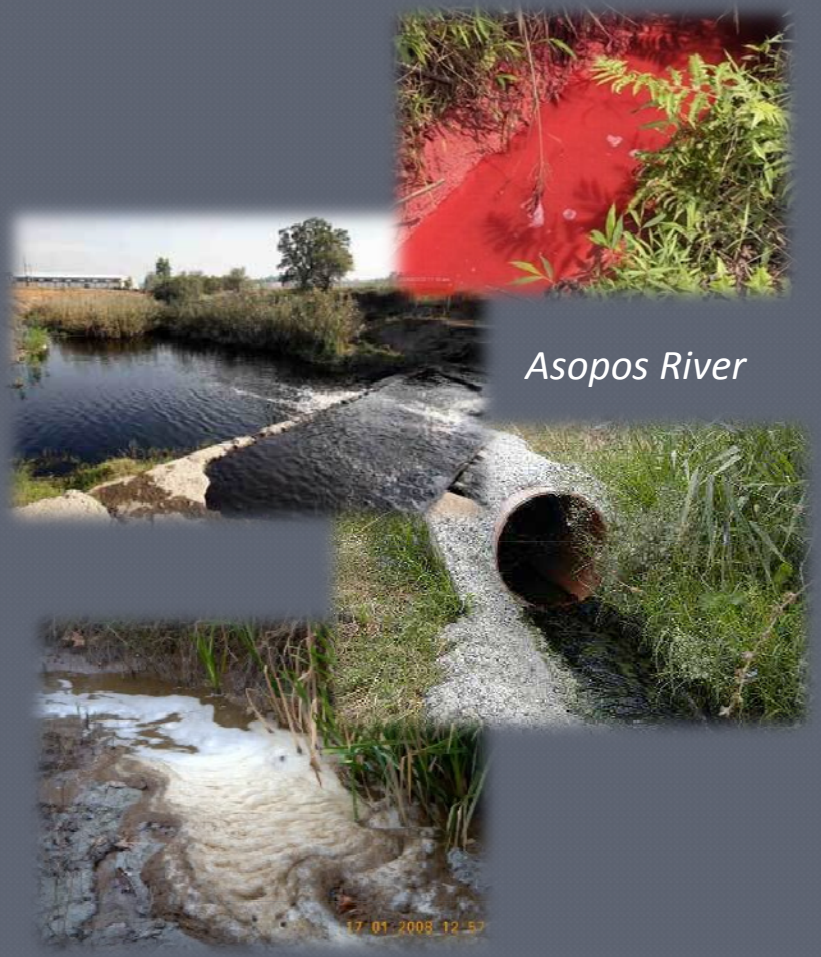
- Significant pressure in coastal areas
  - Induces peak demands, high pollution loads
  - Need for additional infrastructure
- Traditional practices
  - Water hauling
  - Groundwater overexploitation
- Supported solutions
  - Desalination for small islands and popular tourist destinations
  - Storage reservoirs where run-off is significant



- Total desalination capacity
  - Cyclades: 11,300 m³/d
  - Dodecanese: 700 m³/d
- Plans of installing additional units in the small islands of the Dodecanese

Industry

- Minor water user but major water polluter
- Pollution and environmental degradation episodes reveal:
  - Inability to monitor and enforce compliance to discharge and technology standards
  - Deficient collective wastewater treatment schemes in some officially designated industrial areas
  - Lack of incentives towards cleaner production practices (maximum recycling-minimum pollution)



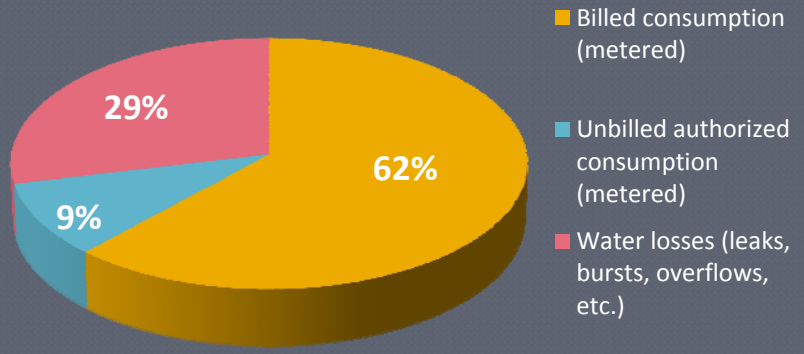
Asopos River

Source: Various Greek blogs

Urban supply & Use

- High losses in distribution networks
- Water prices low when compared to European standards
  - They seldom reflect real costs or scarcity values
- Traditional water saving methods, such as cisterns and rain tanks, have been long abandoned
  - High value of land and housing
  - No incentives, bureaucracy in the relevant permit issuing processes

Water losses in 2006 / *Municipal Enterprises for Water Supply and Sewerage*



Total system inputs (2006): 383 million m^3
Sample of 124 Enterprises, throughout Greece

- 40% in the Ionian islands
- 30% in Southern Aegean

Source: Safarikas N., 2008

Water supply infrastructure

- In many areas water infrastructure is still lacking or is developed “hastily” to solve pressing problems
- The new water management plans advocate the need for extensive inter-basin transfer schemes
  - Development patterns not addressed
  - Demand management alternatives, which would possibly defer the needs for extensive infrastructure, not adequately explored

Water recycling and reuse

- Efforts are pursued to foster water reuse in agriculture but penetration remains limited
  - Need for in-depth assessment and continuous monitoring → Lack of capacity
  - Lack of funds for dual distribution networks and storage facilities
  - Limited acceptance of farmers and consumers
  - Lack of trust regarding effluent water quality
- Water reuse is non-existent in urban water systems
  - Centralized infrastructure development (e.g. Athens Metropolitan Area and developing suburbs in Mesogeia)
  - Limited awareness of authorities on possibilities for alternative water supply

The Opportunities

The Institutional Reform

- Law 3199/2003 (WFD transposition)
- Development of a new water management framework
  - Building on existing administrative structures
  - Avoidance of overlaps in authority
    - Among Ministries
    - Among prefectural and regional directorates dealing with WM issues
- Integration of public consultation procedures
- Water policy frame
  - Integrative and inclusive planning
    - Integration of water-related issues in sectoral policies (agriculture, tourism and industry)
    - Coordinated development of sectors and water resources
  - Opportunities to:
    - Establish concrete environmental objectives for water bodies & relevant programmes of measures
    - Widely introduce economic instruments and incentives
    - Overcome data fragmentation, facilitate communication & empower communities

But …

- Significant delays …
  - The actual transposition (through the relevant Presidential Decree) was only achieved in 2007
  - Several Joint Ministerial Decisions still pending
  - Regional Water Directorates in some areas (e.g. Southern Aegean) still understaffed
- Delays in the actual WFD implementation process
- Data fragmentation & deficient information disclosure to the general public
- Economic principles & instruments only advocated in legislation

Can Challenges create Opportunities?

- Integration of supply-side and demand-side interventions
- Promotion of efficient water allocation & use
- Wider application of economic instruments and pricing - compulsory metering, esp. in agriculture
- Fostering the emergence of a water-saving culture
- Preparation for climate change & adaptive capacity building

Thank you for your attention