EMWIS Promotion Seminar

Overview of National Report to Plan Bleu

on

¨Monitoring progress and promotion of water demand management policies in Cyprus¨

BY

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SCOPE OF THE REPORT

- The water situation in Cyprus, its current evolution and the likely consequences
- Necessity and expected benefits of water demand management
- Essential indicators and objectives for the design of the "efficiency plans" announced at the Johannesburg Summit and the « water » section of national sustainable development strategies
- Contribution to the Mediterranean reflection on the problem and to regional sharing of experiences about WDM

BACKGROUND INFO

- Area = 9241 Km^2 (63% Government control)
- Troodos Mtns cover 3 500 km^2 (rises to 2 000 m)
- Kyrenia Mtns cover 400 km^2 (rises to 950 m)
- Mesaoria covers 2 500 km^2 (between the two mountain ranges)
- Remaining land forms narrow coastal plains, good for agriculture

- No perennial streams (but with deep alluvial beds)

- Population 672500 in 2000 (74% urban and 26% rural) – growth est. at 1% (800000 in 2020).
- Tourists 3.2 million (2006) at 11.3 overnights per tourist (expected to 4.3 million by 2020)

- Scarcity for domestic and irrigation supply (semi-arid climate) although most water resources have been developed (dams >300 MCM, desalination, reuse)
- Council of Ministers for water policy – executive power between MANRE and MI –WDD for implementation of policy – DO for enforcing laws and gwt permits
- Cyprus joined EU (2004) harmonizing legislation and implementing WFD and other environmental directives

Average island-wide renewable natural water resources (1951-1980) in MCM/year

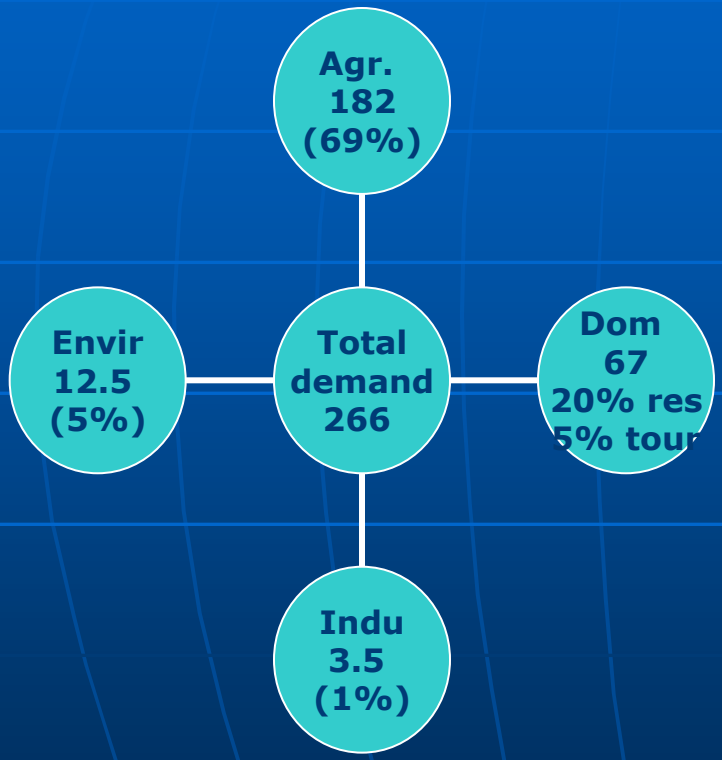
383 m^3/inhab/year (potential on average) ONLY 29% lost to sea

Surface Runoff	Infiltrating into aquifers	Spate irrigation	Lost to the sea	Stored in reservoirs	Average Annual water crop
	140	40	230	100	510
Groundwater	Irrigation and Domestic use		Lost to the sea	Deficit created by over-exploitation	Direct recharge of aquifers(b)
	220		230	-40	270
Total water crop					**780**

Resources, their mobilization and unconventional water production

- **Water storage capacity (108 dams) = 327 MCM being about twice the average runoff**
- **Regulation Index** (for 10 dams of 279MCM) (average flow of water resources controlled compared to natural irregular flow-100x148/212) **= 69.7%** showing great effort for water security
- **Artificial recharge** = 10 MCM/year
- Two RO **desalination plants** under BOOT= 91000 m^3/d or 31 MCM/y
- **Recycled water** =7 MCM/y used for agriculture and landscape (30MCM by 2012)

WATER DEMAND (MCM / Y)



Sector/Source (%)	Surface water	Ground water	Springs	Desalination
AGRI-CULTURE	43	57		
DOMESTIC	22	23	5	50
INDUSTRY		100		
ENVIRON-MENT	42	58		
TOTAL	37	49	1	13

PRESSURES

- **Exploitation index of renewable natural resources** (island wide annual abstraction + losses during transport over traditional renewable natural water resources or [(266 Government controlled +63 Occupied /780 MCM) x100]

  = 42%

  "Water Shortage" = If 50%

  "Critical" = >70%

- **Non-sustainable water production index** (proportion of total abstractions + losses over fossil +overexploitation or[(40+0 fossil/266)x100]

  = 15%

- **Pollution loads to water resources** (as BOD)

  = 24250 Kg/d

  [750 (industry)+ 3500 (urban)+20000 (animal husbandry]

Degradations / threats on water resources, ecosystems and population

- Livestock waste
- agricultural runoff (N, P, pesticides)
- climatic conditions (high)
- urban waste water (5 WTP)
- industrial waste water (10 major+31 small) and
- solid waste (5 major landfills) (medium); storm water and mines and quarries (1 active and 9 abandoned mines)

Seawater intrusion (13 of 19 groundwater bodies (68%) intruded or at risk)

Nitrate pollution from major irrigation schemes

No specific Country objectives have been set up except implementation of WFD which has started

Loss of storage for all dams to date amounts (by silting) = 2%
(100tns/km^2/year for the silting up rate or about 180 000 tons/year or for all dams= 0.06% per year)

MEASURES
to alleviate degradation

- Levying a tax on mineral nitrogen fertilizers
- Levying a tax on pesticides
- Subsidizing organic farming
- Subsidizing livestock waste management
- Set Abstraction Charges
- Upgrade existing wastewater treatment plants
- Desalination Plants to mitigate water stress
- Artificial Recharge
- Advice farmers on optimum operation from a water protection viewpoint

Access to drinking water and sanitation and collection/treatment of waste water

- **Durable access of population to an improved water source (min 20 litres per day per capita) = 100%.**

Average water demand (2001)
- Urban areas is 215 l/d/c (gross) or 180 (net)
- Rural areas 180 l/d/c (gross) or (150 net)
- Per tourist is 465 litres per stay night

(Water supply depends on vagaries of weather thus in year 2000 the average shortage was 23.4% of normal demand)

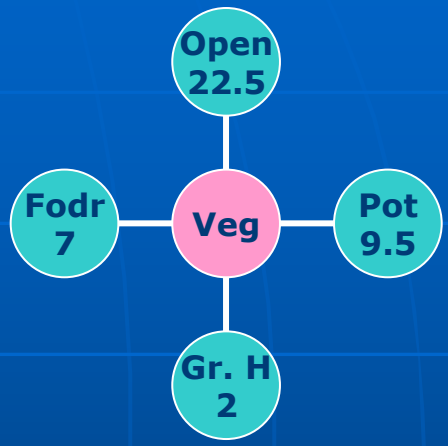
- **Population with access to an improved sanitation system (total, urban, rural) (MSSD-WAT_P05) incl. (public sanitation network, septic tank…). = 100%.**
- **Share of collected and treated wastewater by the public sewerage system = 60%. (6 main urban and 36 rural agglomerations)**
- **Share of industrial wastewater treated on site = apx. 40-60%**
  (3 – 4 MCM/y (262 industries of which 41 are significant)

Improve efficiency using WDM policies (Irrigation)

Demand (%)

Permanent (%)

Seasonal (%)



Efficiency index = 90-95% , field application efficiency of 80 to 90%)
Area under micro-irrigation=2700 ha (1974) to 35600 ha (1995)
Only few margins for improvement (in hilly areas)

Cost for irrigation water (GWW) est. as 0.115 C£/m^3.

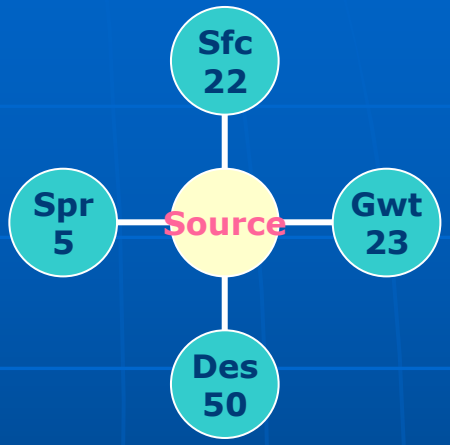
Cost Recovery Rate (CRR) for irrigation water is 76.6%

Value added is negative (est. 25 million C£ loss in 2005)

Thus, economic growth on the basis of irrigated agriculture is inversely proportional to the water demand for irrigation.

Improve efficiency using WDM policies (Domestic-Tourism)

Demand (%)



Source (%)

Efficiency index =72- 81 % (urban), 54-76 % (mun), 53-72% (rural)

Bulk water tariffs (2004): from 0.335 to 0.45 C£/m^3) for W. Boards

Total cost of domestic water (GWW) = 0.705C£/m^3 (incl. financial-env+resource cost)

Cost Recovery Rate = 73.1 % (financial)
to 62.1% (inc. env and resource cost)

Water Boards/rural towns/Hotels follow own conservation campaigns

Retrospective analysis 1/2

- **Scarcity – high cost of new schemes – droughts: WDM**
- **Droughts every 10 years lasting from 1-3 years**
- **Rainfall in 1970-2000 dropped by 100 mm**

Effective strategies towards improving water use efficiency in Irrigated Agriculture:

- ***Conservation (micro-irrigation)***
- ***Water rationing***
- ***Conservation of groundwater***
- ***Water pricing***
- ***Cropping patterns***
- ***"water awareness"***
- ***Reuse of treated sewage effluent***

Retrospective analysis 2/2

Effective strategies towards improving water use efficiency in Domestic Water:

- ***Reduction of unaccounted water***
- ***Legislative measures for water conservation ("hose ban")***
- ***Water pricing***
- ***Incentives for the use of marginal water for gardening and other purposes***
- ***Water rationing***
- ***water awareness* of consumers**

Main obstacles for better efficiency in water management

- **Fragmentation of responsibility (technical matters versus legal and management responsibilities (Single Water Authority?)**
- **Lack of an umbrella law covering water**
- **Relaxed supervision and control**
- **Water pricing (no uniform rates by water utilities – sfc vs gwt)**

"Pool of savings" by better Water Demand Management

Irrigation (limited)

- Very limited (highly efficient systems)- Few margins (hilly areas)
- Possible savings from losses of major irrigation networks (20%)
- Demand to decline or stabilize (182 mcm/y)
- Recycle water to meet part of demand (from 3 to 40 mcm/y by 2012)

Domestic water and for tourism (14 -34)

- If losses down to 15% and leakage to 10% then savings could be 4 to 12 mcm/y (2006) and 6 to 18 by 2020 (demand 100 mcm/y)
- Savings from grey water use of 4 mcm/y (2005) may also increase

Industrial water (1)

- Demand stabilizes from 4 (2006) to 5-7 mcm/y by 2020
- Savings amount to max. of 1 mcm/y by 2020 if losses are reduced to 15%

Past Changes in Water Demand

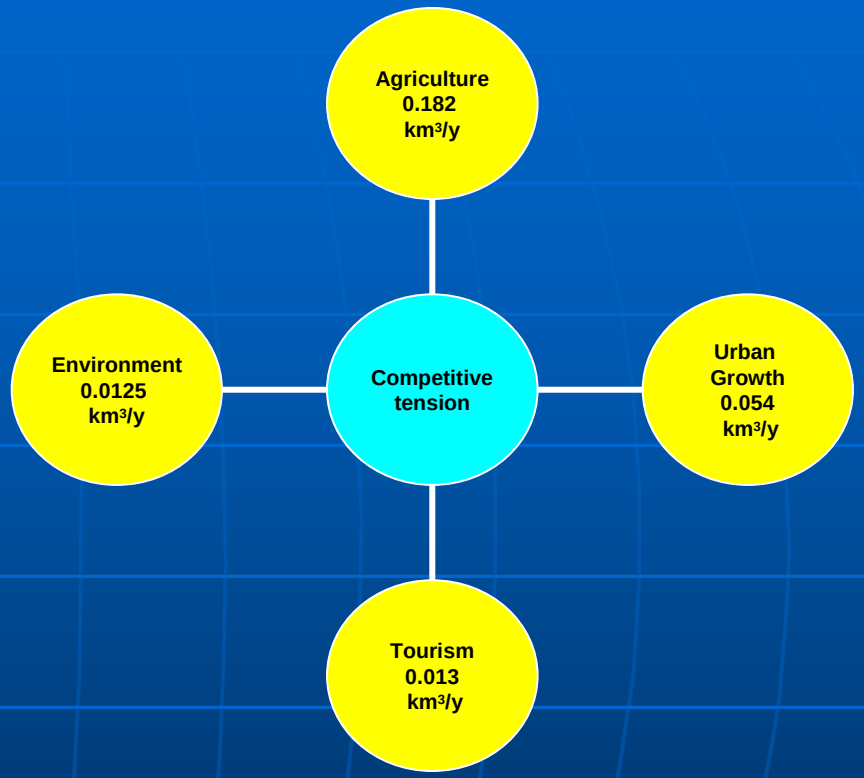
- **Irrigation:** Large Irrigation Schemes; Built water infrastructure –result of master plans, feasibility studies/ sound workmanship; But new lands included for high IRR for financing and thro' political lobbying and pressure from farmers Thus new demand was developed. Foreseen cropping pattern was not followed

  Adjustments /technical allowances common in development works, but prudence needed in view of aridity. Repercussions more pronounced during droughts.

- **Tourism:** Successful policy for Cyprus as a quality destination exerts an ever increasing pressure on water

- **Urban growth:** Urban growth as opposed to rural areas and high standard of living demands for more water

- **Environment:** Gaining prominence thro' WFD and modern thinking exerts pressure on use of water resources



Competitive tension amongst main water users especially during droughts

Competitive pressure/ Conflicting use/ Limited water availability

Significant reallocation of the valuable water resources is needed.

Trends for water demand with possible consequences

- **Domestic & Tourism:**
  increasing (67 to 100 mcm/y by 2020)

- **Industrial:**
  stabilizing to increasing (4 to 7 mcm/y by 2020)

- **Agricultural:**
  stabilizing to declining (182 mcm/y)

Extra stress on the water resources to meet the 13% expected increase

- More dams carry a high price tag
- groundwater reservoirs are over-pumped (characterized as being "at risk" under WFD definition)

Overall range of possible savings

WATER EFFICIENCY

Domestic water:

76% for major cities

64% for major municipalities /villages

Savings of water by raising this index to 85% (PLANBLEU hypothesis)

4–12 mcm/y (on 67 mcm/y of 2005)

6-18 mcm/y (on 100 mcm/y of 2020)

Irrigation water:

Water efficiency index is 90 -95%

No significant savings could be expected except from main irrigation networks (80% efficiency)

Evolution of water policies in Cyprus

Water Policy Eras:

- **1960-1990 : Water development and mobilization**
- **1970 onwards : Water Conservation**
- **1990 onwards : Water Demand Management**

Water resource development initially focused on groundwater because of the high cost of surface water development. Depletion of aquifers and increase of demand necessitated change in policy (1960s onwards) το:

NOT A DROP OF WATER TO THE SEA

Water resources surveyed …

- five major development projects delineated (10 dams of 170 mcm of water)

Present storage capacity over 300 mcm

Objectives of Present Water Policy

1. **Secure sustainable balance of supply vs demand** (at least cost)
2. **Check increasing demand** (by pricing mechanisms and info to end users)
3. **Irrigation water to actual crop needs**
4. **Modify cropping pattern** (lower water demanding crops/ winter crops)
5. **Reduce losses in urban distribution systems** (increase efficiency of domestic use)
6. **Emphasize high value crops**

The ongoing Development Plan

1. **Construct additional water works** (N. Troodos -18 mcm/y)
2. **Improve O&M of water works for optimal exploitation**
3. **Reuse treated effluent**
4. **Suppress evaporation from reservoirs**
5. **Secure 180 (**urban**) and 135 liters/cap/day (**rural population)
6. **Use non-conventional sources** (desalination)
7. **Promote WDM through technical and pricing mechanisms**
8. **Promote institutional reorganization**
9. **Protect water resources from pollution**
10. **Harmonize with EU's water policy**

Cost Recovery Rates (CRR)

- **Irrigation supply** = 76.6%
- **Domestic supply** = 73.1 % (62.1 % if environmental and resource costs are incorporated)
- **Recycled water** =15.4% (disconnected from financial costs as an incentive)

Studies on affordability and price elasticity are needed for WDM measures

Main economic and financial indicators related to WDM (WDD 2006)

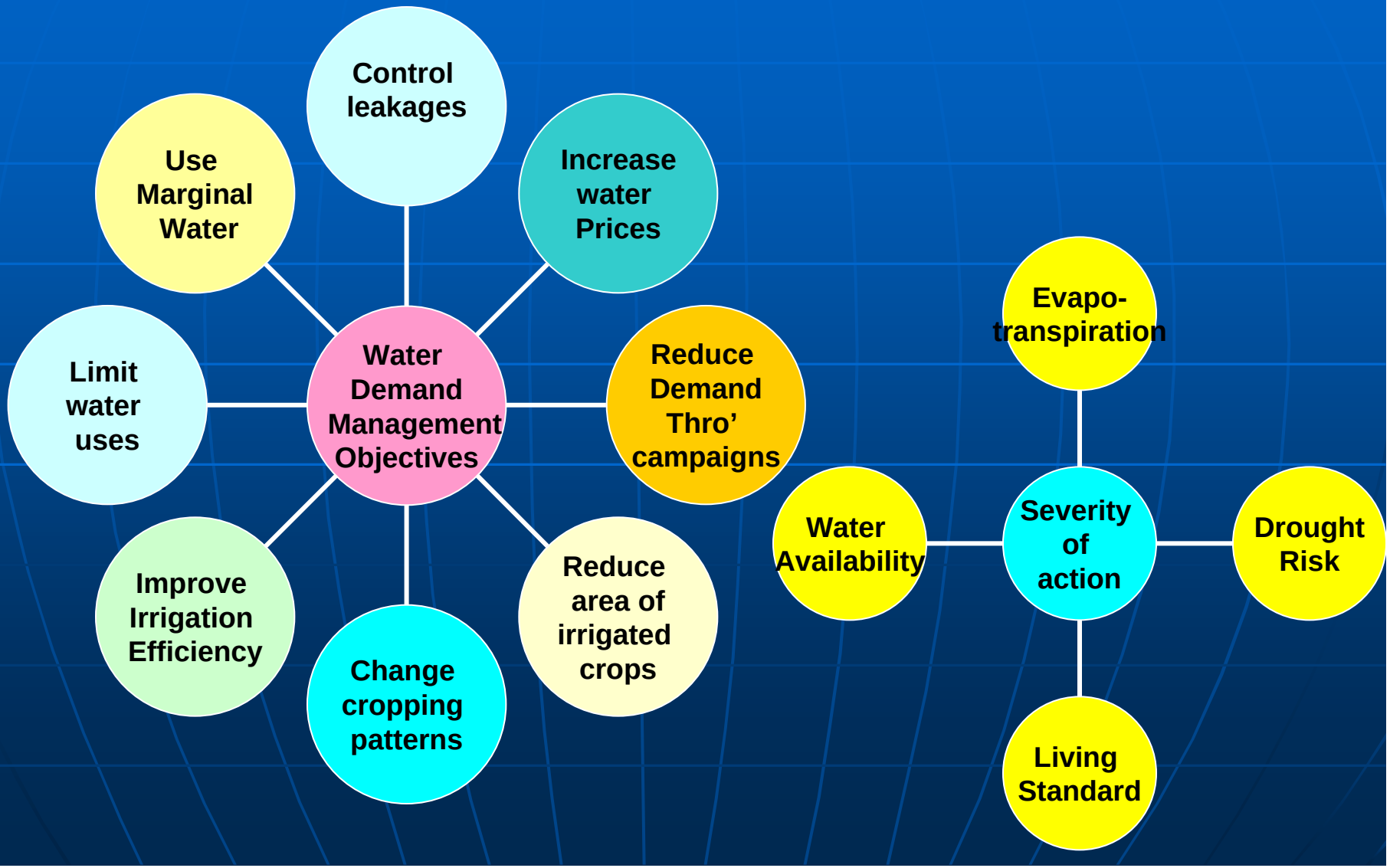
Expenditure on WDM

- 0.7% of budget (Cy£ 0.12 million -subsidies for drilling of wells for non-potable uses, use of "gray" water, connection of wells to lavatories and for water saving campaign), or
- 2% if training of staff is accounted, or
- 30% if improving Village Water supply systems is included

Revenue (treated effluent sales)

- 0.6% of the total revenue, or
- 9.2% if revenues from village water supply is included

Possible actions to reach Water Demand Management objectives



Strong points of the National situation

- The powerful economy;
- The educational level of people both urban and farmers;
- The training Cypriots had by having to endure severe water rationing in the past due to frequent droughts and their awareness of the water shortage problem;
- The impressive water development works that have been implemented; The inter-basin transfer of water and relative large flexibility for water mobilization;
- The operation of two desalination plants providing a secure, but alas expensive supply for domestic purposes;
- The house-to-house water connection and the high percentage of houses connected to sewage systems;
- The fact that water meters are installed in all water distribution systems;
- The use of improved systems of irrigation;
- The high expertise available in water management and an effective public service;
- The well organized farmers unions, cooperative banks, consumers associations and other bodies of society;
- Political parties sensitive to water management problems;

Weak points of the National situation

- The proportion of rural population to that of the urban;
- The need and wish to prevent further urbanization;
- The value of land and its large added incremental value when under irrigation;
- The traditional inclination of the rural population to agriculture;
- The high standard of living and the associated water consumption that accompanies it;
- The seasonal nature of tourism and its selective spatial distribution;
- The developed agricultural demand due to the large irrigation projects implemented;
- The small size of society and the effective extent of political lobbying;
- Being an island without possibility of tapping distant sources of water;
- The arid to semi-arid nature of the climate;
- The reluctance for social acceptability of recycled water;
- The relative sluggish enforcement of water legislation on the excuse of socio-economic conditions;
- The fragmented water management administration between technical issues and legislative enforcement;

Thank you for your attention

Σας Ευχαριστώ