



# **Water Scarcity and Droughts The Cyprus Dimension**

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## Outline

- **Water Scarcity and Droughts – Definition**
- **The European Action**
- **The Cyprus Dimension**
  - **Hydrology**
  - **Natural Water Resources**
  - **Socioeconomic characteristics**
  - **Water Scarcity**
  - **Water Uses**
  - **Measures (long term and short term measures)**
  - **Impacts (Economic, environmental, social)**
- **Summary**





## Water Scarcity and Droughts - Definition



(Information Note from the Commission for the ENV Council, 27 June 06)

- **Water Scarcity** refers to **long term** water imbalances, combining arid or semi-arid climate with a level of water demand exceeding the supply capacity of the **natural** system (low water availability)
- **Droughts** can be considered as a **temporary** decrease of the average water availability. They occur anywhere, in both, high and low rainfall areas and in any season. (deviation from an average situation on a limited period of time, leading to temporary water shortage)





## European Action (1)



- **More and more countries, among which EU ones, are experiencing droughts and are subject to water deficit that affects inhabitants and the ecosystem they depend on. A number of MS requested to initiate a European action on water scarcity and droughts (Environmental Council, 9 March 2006)**
- **The Commission presented a first analysis on these issues during the ENV Council of 27 June 2006**
- **Then, based on an in-depth assessment to consider further actions required at EU level, produced a 1<sup>st</sup> Interim Report presented to Water Directors on 30<sup>th</sup> November 2006**
- **The 1<sup>st</sup> Interim Report is to be updated soon and be presented to the Water Directors on 28<sup>th</sup> June and then widely disseminated**
- **In the light of its preliminary results, the Commission is planning to present a Communication on these issues in July 2007**





## European Action (2)



- **Aiming to active involvement of the interested parties, the Commission setup a Stakeholder Forum on water scarcity and droughts, which has been invited to contribute to the debate. After a process of assessment of different contributions, the forum will discuss the points to be included in the Communication to be adopted by next July.**
- **According to the above reports and the contributions' assessment, Malta and Cyprus are referred to be the “water poor” countries of Europe (with the lower water availability per capita in Europe (<math><500\text{ m}^3/\text{capita}/\text{day}</math>))**
- **Other countries that are considered to be “low water stressed” are Italy, Spain, Portugal, Belgium and Greece**



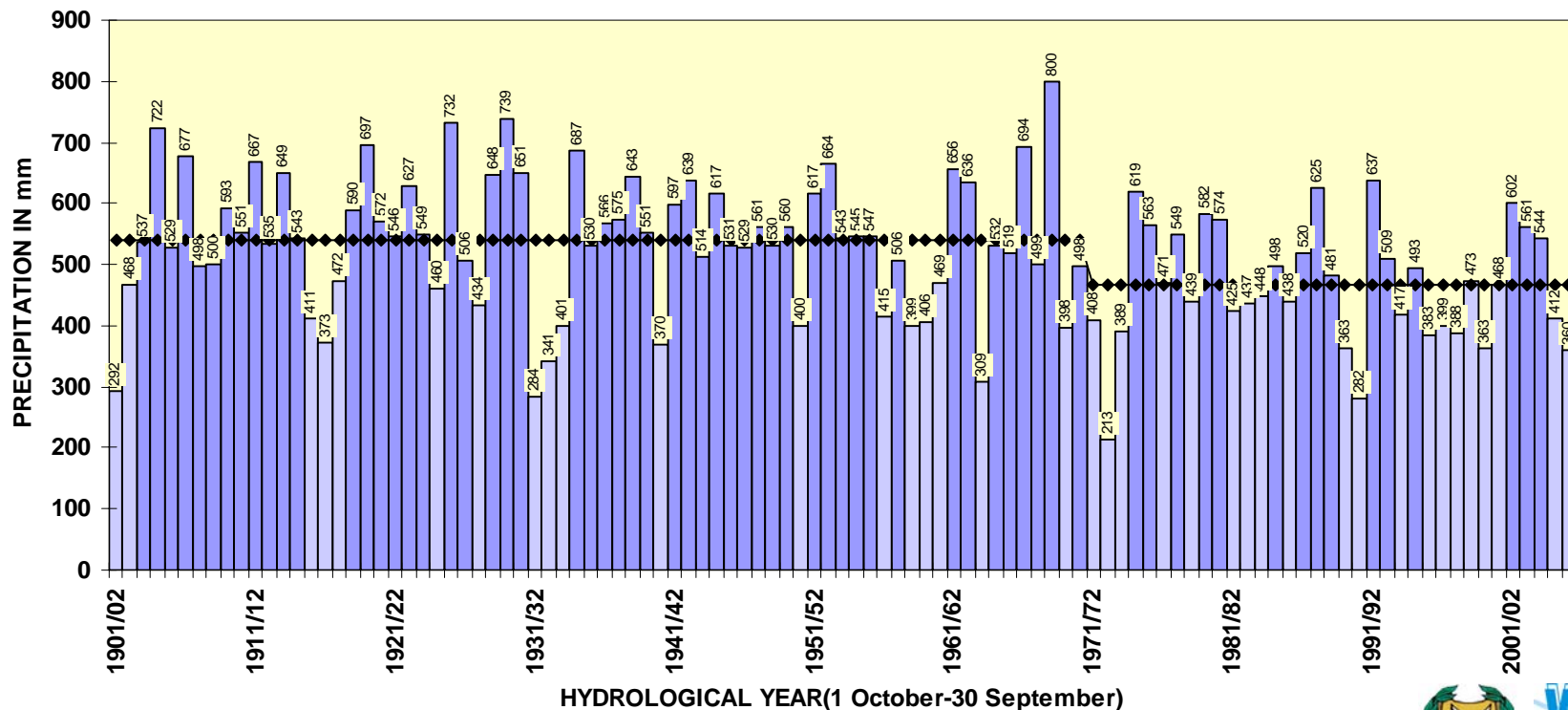


# Cyprus - Hydrology



- Annual Aver. precipitation: 500 mm (varying from 182 mm in 1972-73 to 759 mm in 1968-69)
- Stepped drop decrease 1971-2000. (20% in precipitation, 40% in runoff)

CYPRUS ANNUAL PRECIPITATION 1901-1976 (AREA UNDER GOV. CONTROL)





# Cyprus - Natural Water Resources



## Surface Water

- 1960: 16 dams of total capacity 6 MCM used mainly for irrigation
- Today: 108 small and big dams of total capacity 328 MCM used for domestic and irrigation purposes
  - 8 bigger dams – 268 MCM – 88% of the whole

## Groundwater

- The most accessible for most people, especially farmers  
As a result they have been heavily overpumped, especially during periods of drought
- Seawater intrusion of many coastal aquifers and deterioration of, both, quality and quantity of groundwater.
- The greatest part of the boreholes constitute the private ones (generally 120 MCM/year, that accounts for the 1/3 of total water resources of the island. (During the water allocation scenarios, the corresponding quantity for 2006-2007 was considered to be 91 MCM only).

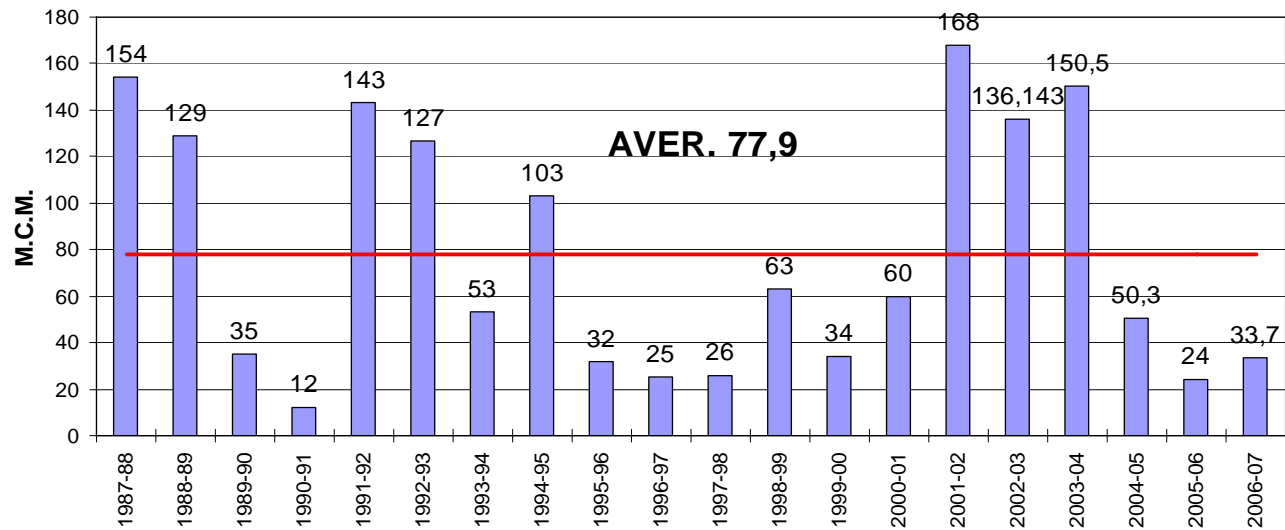




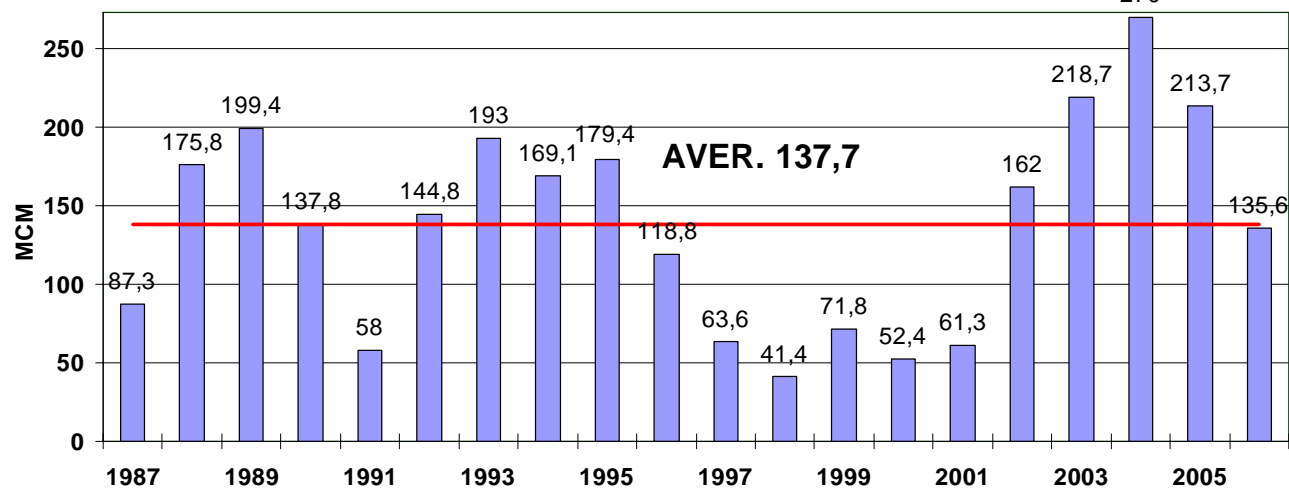
# Major Dams Inflow and Storage 1987-2007



### NFLOW 1987/88 - 30/4/07



### MAXIMUM STORAGE 1987 - 2006







## Cyprus - Socioeconomic Characteristics (1)



**Surface area 9.251 km<sup>2</sup>**

- **5.760 km<sup>2</sup> under the Government Control**

- 19% of these are forest land,
- 47% arable land and
- 34% cultivated land.

- **Population:**

- 1995: 746.900
- 2004: 837.300

- **Corresponding Popul. in the area under the Gov. Control:**

- 1995: 656.300
- 2004: 749.200

(increase mainly due to immigration increase and to a smaller degree to natural increase of population)

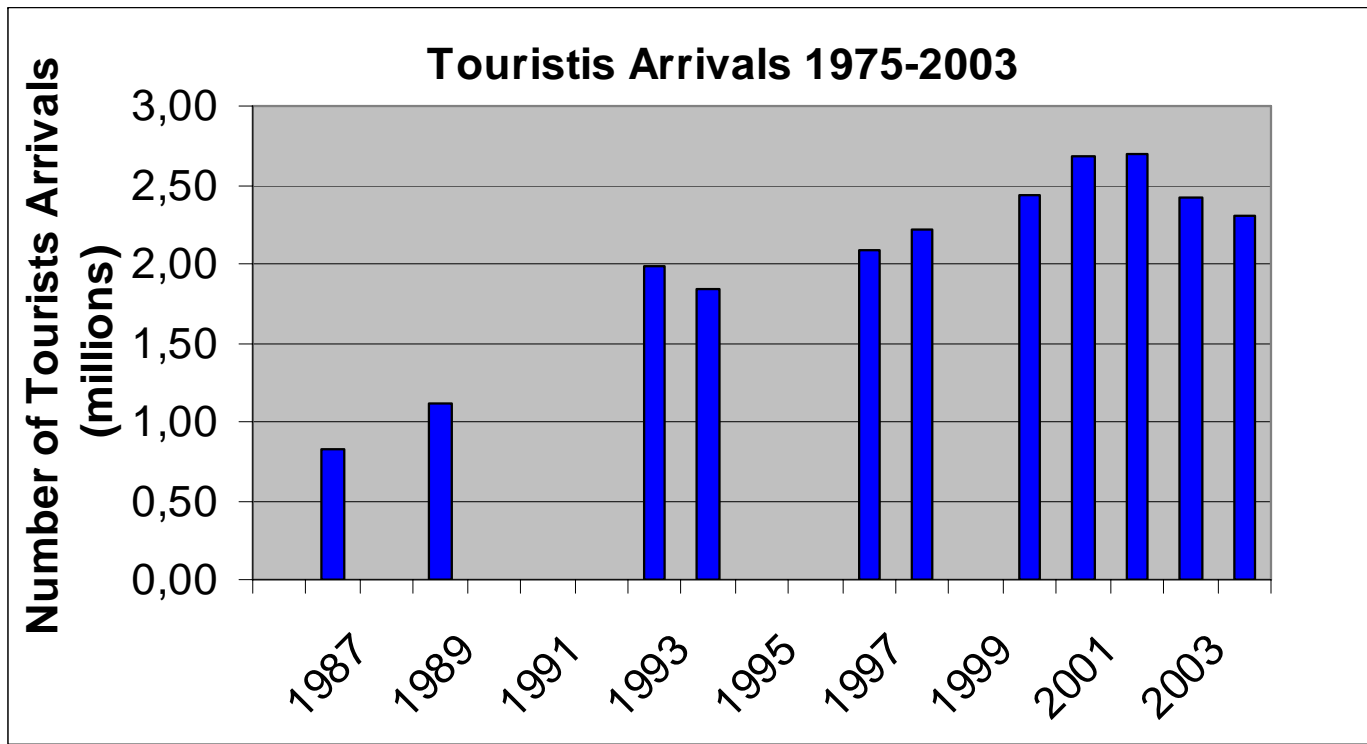




## Cyprus - Socioeconomic Characteristics (2)



**Trend of tourism: Generally positive. The number of tourists arriving in Cyprus in 1986 was 827.937 and in 2003 was 2.303.247, with an average length of stay of 11 days. Water demand per overnight stay estimated as 465 l/d, (plus other needs for recreation, landscaping, etc). At the same time, Cyprus passed through several development stages, that are also related to water demand issues.**

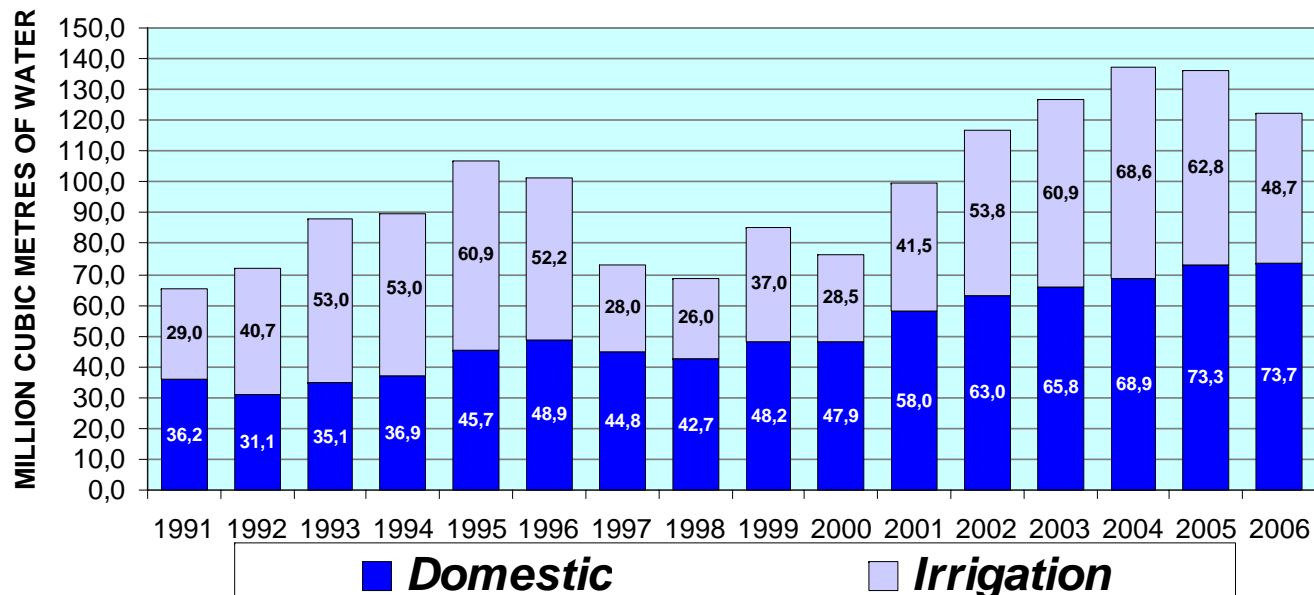




# Cyprus - Water Supply from GWW



- The domestic water supply from GWW increased from 36.2 MCM in 1994, to 73.7 MCM in 2006.
- At the same time irrigation uses from the GWW increased from 29,0 to 48,7 MCM
- In 2004 (the last of 4 consecutive rainy years with dams overflowing, irrigation water uses reached 68,6 MCM (no quota applied)
- While, during the drought period of 1997-2000 irrigation water use was of the order of 26 MCM





## Water Scarcity



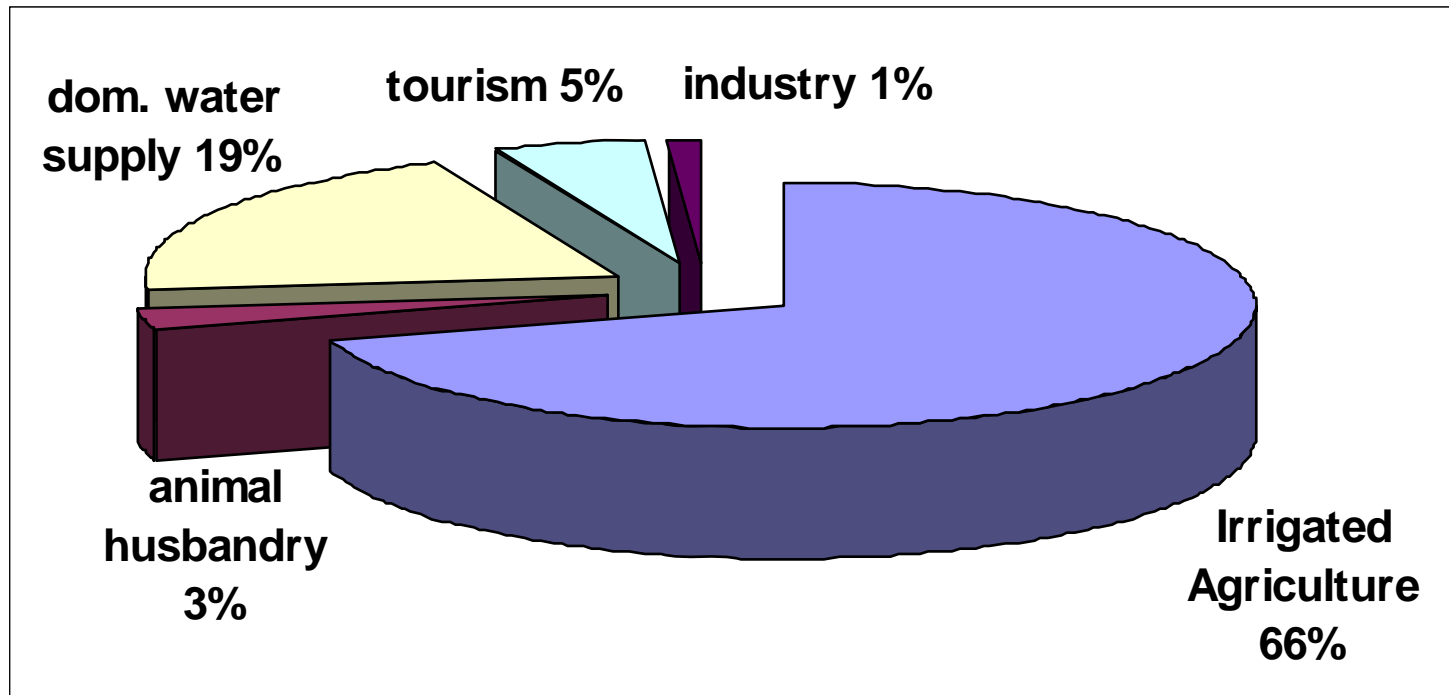
**Water Scarcity in Cyprus is a result of the general weather conditions of the region. However, it is getting more and more severe as:**

- **The global climatic changes with extreme events of droughts and declined rainfall**
- **Domestic water demand increase due to population increase (immigration), tourists arrivals and economic growth and welfare**
- **Irrigation water demand increase due to the construction of new irrigation schemes, in the framework of the implementation of rural development programs, in an attempt to support life in rural areas. (As a result, irrigated cultivations amount 369 km<sup>2</sup> on total of 1560 km<sup>2</sup> of the total agricultural ground)**





# Water Uses

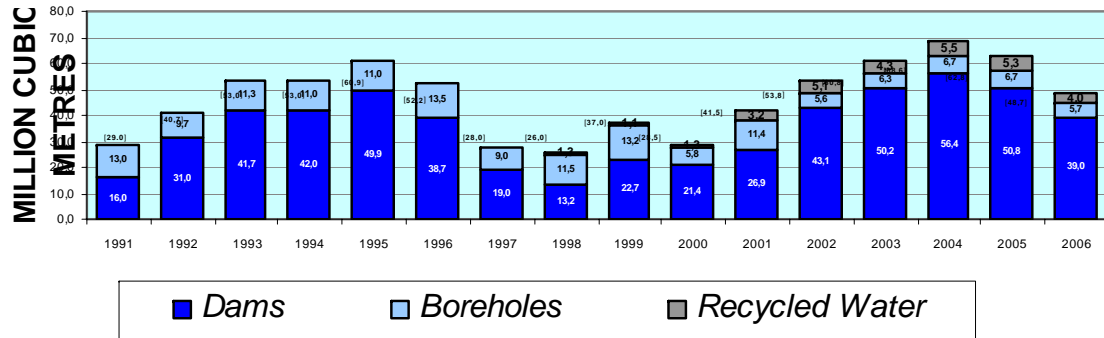




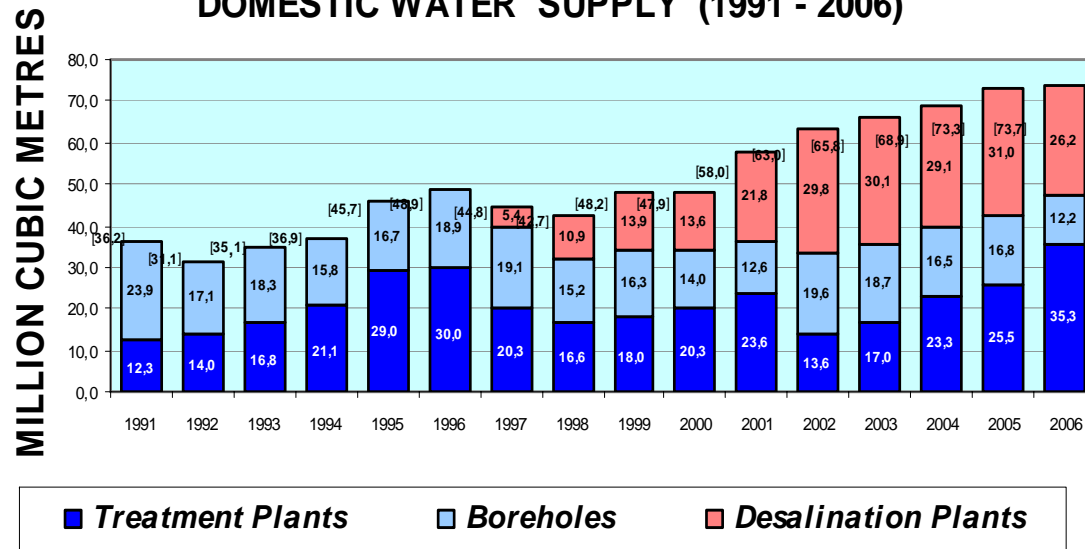
# Water Supply from Government Water Works



### IRRIGATION SUPPLY (1991 - 2006)



### DOMESTIC WATER SUPPLY (1991 - 2006)





## Cyprus - Measures (1)



- Throughout the past decades, the Gov. has applied a number of supply enhancement measures, regarding demand management and supply restrictions in order to mitigate the effects of water deficiency
- Long Term measures
  - efficient conveyance
  - water pricing on a volumetric basis
  - promotion of less water demanding crops
  - awareness campaigns
  - metering of water consumption in all uses
  - use of rising block tariffs
  - application of penalty charges for overconsumption in irrigation
  - no supply to new irrigation areas
- Short Term measures
  - Subsidization of BHs within the municipalities, connection of BHs to toilet tanks, grey water recycling systems
  - Application of quota system for water allocation to agriculture
  - prohibit the use of hosepipe for washing cars and pavements etc





## Measures – Further Objectives (2)

### A revised Long Term Plan put into action



- **Despite of the efforts and measures, water availability could not satisfy the demand. The Government had to revise its general water policy in order to cope with water scarcity and the severe drought periods of 1991-1992 and 1997-2000. The objectives were:**
  - **Provide water security so that everyone can access safe water**
  - **Increase reliability by making domestic water supply independent from rainfall**
  - **Water demand had to be regulated to adapt efficiency and availability**







## Cyprus - Measures (3)

### A revised Long Term Plan put into action



- **The means for achieving the above are:**
  - **Implementation of the Water Framework Directive. Although not directly designed to tackle quantitative issues, the WFD can be an instrument for addressing water scarcity and promote long term program of actions towards a wise water management plan.**
  - **Use of non-conventional water resources**
    - **Desalination. Despite of the environmental and high financial costs, it remains a means of achieving water security**
    - **Water reuse. 14,5 MCM/yr produced from tertiary treatment. By 2012, 52 MCM/yr (29% of the total agricultural demand). Main goal to cover needs of the existing water balance)**
  - **Revision and strengthening of the legal and institutional framework for promoting effective water management and allow all stakeholders to work together for effective water management.**





## Cyprus - Impacts (1)



**Water scarcity is becoming a major constraint to economic welfare and sustainable regional development**

□ **Economic Impacts**

- **High investment costs for infrastructure (£ 1 billion, 2001 value)**
- **High O&M (energy) costs to transfer water to long distances**
- **Agriculture remains the bigger consumer of water and yet affected from water deficiency. The measure of the quota system allows for the implementation of an action plan to manage the yearly water demand but the results are catastrophic for farmers, and cause severe losses to other parts of the economy as well (processing, manufacturing, trading etc. The assessment of such a loss is very complicated, combining direct and indirect financial, environmental and social ones.**
- **Water restrictions result in high operation and maintenance costs**
- **Still, being the bigger consumer, agriculture indirectly “abstracts” water from domestic water uses, resulting in the need to use desalinated water, with considerable economic and environmental impacts.**





## Cyprus- Impacts (2)



### ■ Environmental Impacts:

- Heavy overpumping
- Depletion of almost all aquifers
- Seawater intrusion in many coastal aquifers
- Recharge downstream of the dams not always respected
- Environmental impacts from desalination

### ■ Social Impacts:

- A major issue that is discussed on a technical and policy level
- Major constraint to economic welfare and sustainable regional development
- Does not allow the satisfaction of all uses
- Only satisfy the minimum needs of traditional uses (domestic use and agriculture)
- Can not permit the implementation of proposed new development connected to economical growth





## Summary



- Water scarcity in Cyprus is unavoidable, because of the natural and social conditions in the island.
- Recent climatic changes do not permit the reliability of the natural resource to cope with the demand.
- Some causes are **natural**, others are **anthropogenic**.
- The impact of natural processes can be aggravated by human responses and human behaviour, which can modify our physical environment in a way that may be catastrophic.
- The development of new infrastructure and the use of new water resources is not always the solution. The situation calls for making the appropriate Management Plans to cope with water scarcity and droughts in order to pass the most valuable natural resource to the next generations.





**thank you for  
your attention !**

