1st Pan-EU Drought Dialogue Forum
“Drought and Water Scarcity in Cyprus”

Dr Kyriacos Kyrou
Director
Water Development Department
Ministry of Agriculture, Natural Resources and Environment

30 October, 2012
Hilton Park Hotel
Nicosia
Water scarcity and droughts in Cyprus

- Water scarcity has always been a serious problem for Cyprus
- “Cyprus and Malta are the “water poor” countries of Europe” (1)
- Droughts occur frequently
  - The island was nearly deserted many times in the past
- Limited water resources
  - Depend mainly on rainfall
  - Scarce & expensive to exploit
- Unevenly distributed rainfall
  - Temporally and geographically
- Many small catchments, but no perennial flow

(1) European Commission First Interim Report on Water Scarcity and Drought, November 2006
Declining rainfall in Cyprus

Statistical analysis reveals a stepped drop in precipitation since the early 70’s.
Projected Climate Change Impacts

Temperature: Change in mean annual temperature by the end of the century (°C)

Precipitation: Change in annual amount by the end of the century (%)
Use of water in Cyprus

- Agriculture: 64.0%
- Household: 28.4%
- Tourism: 4.7%
- Industry: 2.9%
Water Resources Management in Cyprus
Efforts to address the water scarcity challenge have defined the water policy of the Government, since independence in 1960.

Recognising the critical role of water, a sustainable water resources strategy was promoted, in the framework of an integrated environmental policy.

The water policy in Cyprus is based on two pillars:

I. Sustainable development of water resources

II. Water demand management
I. Sustainable Development of Water Resources
Water development projects

- Significant water supply, irrigation and wastewater treatment projects have been completed over the years.
- All residential and industrial units have been connected with excellent quality water, according to EU standards.
- 57 large dams have been constructed (Dams storage increased to 327.5 MCM).

- Polemidia Dam
  Capacity: 3.4 MCM
  Year: 1965

- Yermasoyia Dam
  Capacity: 13.5 MCM
  Year: 1968

- Asprokremmos Dam
  Capacity: 52.4 MCM
  Year: 1982

- Kouris Dam
  Capacity: 115.0 MCM
  Year: 1988

- For several years, the water development expenditure accounted for about 20% of the total Development Budget.
Need for additional measures

- Dependence on rainfall still continues

- The long and frequent periods of droughts have proven that storing rainwater into reservoirs only allows short-term planning

- Attention is turned to non-conventional water resources such as desalination and the use of recycled water
Seawater desalination

- Construction of new desalination plants and upgrading of existing ones
  - New plants expected to be completed by 2013

- Drinking water needs of large urban and tourist areas to be satisfied
  - Dependence on rainfall to be eliminated

- More quantities of dam water to be provided for
  - Irrigation needs
  - Provision of environmental flows
  - Recharge of the heavily over-pumped aquifers

- The use of desalinated water is expected to
  - Generate economic and social benefits
  - Improve the safety and reliability of drinking water supply
Recycled water

- Maximum utilisation of recycled water
- Tertiary treated recycled water of strict quality standards is used for irrigation of agricultural crops and aquifer recharge
II. Water Demand Management
Cultivation of a water saving culture

- Water saving measures have been promoted for decades now

- Cultivation of a water saving culture is an ongoing measure
Water metering and pricing

- Metering is applied to all water uses

- Water billing is based on the actual consumption metered at each individual water supply point
  - For drinking water, charges are based on rising block tariffs
  - For irrigation water provided through the government schemes, charges are established on a volumetric basis and penalty charges apply for over-consumption

- Existing pricing policies have been revised and adjusted to the provisions of Article 9 of the Water Framework Directive
  - Polluter-pays principle and adequate cost recovery, including environmental and resource costs have been introduced
Leakage reduction in distribution networks

- A systematic effort is made to reduce water losses

- Efficient, closed-piped systems are used to distribute water for both domestic and irrigation purposes

- Programme to replace old distribution networks
  
  — Over the past years, approximately €70 million has been spent to upgrade / replace domestic water supply networks in rural areas
Improved irrigation systems

- Modern and efficient irrigation systems covering more than 95% of total irrigated land
  - Conveyance efficiencies average 90-95% and field application efficiencies 80-90%
  - Irrigation distribution networks equipped with good quality filters, hydrants and meters
Water rationing during periods of drought

- Drastic rationing measures are implemented during periods of drought to reduce domestic and agricultural water supply

  - Actions of last resort when a drought situation continues over a long period of time

- Priority is given to the domestic sector

  - Drinking water restrictions to households could reach up to 20%

  - Irrigation water restrictions to agriculture could reach up to 70%
Addressing illegal abstraction

- Problem with non-licenced boreholes

- Groundwater aquifers have been heavily over-pumped deteriorating both their quantity and quality
  - Seawater intrusion into coastal aquifers

- Implementation of a pilot project with the aim to record the number of non-licenced boreholes and amount of water abstracted

- Introduction of a more stringent procedure regarding borehole drilling and abstraction permits through the *Integrated Water Management Law*
Institutional Framework for Integrated Water Management
Institutional Framework in Cyprus

- Water challenges are addressed through an integrated water management framework
  - *Water Protection and Management Law (WFD transposition)*
  - *Integrated Water Management Law*
  - *Pollution Control Law*

- *Integrated Water Management Law* is an important milestone for water management in Cyprus
  - Entered into force on 15 November 2010
  - Addresses problem of fragmented responsibilities
  - Simplifies complex procedures to enable the promotion of effective water governance
  - Introduces tools for the protection and development of water resources on the island
  - Enforces more stringent procedures regarding borehole drilling and abstraction permits
Water Framework Directive

- River Basin Management Plan (RBMP) is currently being implemented

- Drought Management Plan also established, due to the severe water scarcity and drought problems in Cyprus
### Significant Water Pressures in Cyprus

<table>
<thead>
<tr>
<th><strong>Significant Pressures</strong></th>
<th><strong>Examples</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Over-pumping and deterioration of underground aquifers</strong></td>
<td>Municipal wastewater, Livestock waste, Industrial waste, Solid waste disposal sites, Mining and quarrying, Aquaculture, desalination plants and ports</td>
</tr>
<tr>
<td><strong>Hydromorphological changes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Point Source Pressures</strong></td>
<td>Agricultural activities, Municipal wastewater, Livestock waste</td>
</tr>
<tr>
<td><strong>Diffuse Source Pressures</strong></td>
<td>Municipal wastewater, where no sewerage networks nor treatment facilities exist, Rainwater runoff</td>
</tr>
</tbody>
</table>
Cyprus RBMP at a glance (II)

Status of Cyprus Water Bodies (% of Water Bodies in Good Status)

![Graph showing the status of Cyprus Water Bodies from 2010 to 2027. The graph indicates the percentage of water bodies in good status for different categories such as Rivers, Lakes, Coastal, Groundwater, and Total. The data shows a trend towards higher percentages in good status over time.]
## Cyprus RBMP at a glance (III)

### Cyprus Programme of Measures

<table>
<thead>
<tr>
<th>97 Basic Measures</th>
<th>Administrative Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Economic and Fiscal Measures</td>
</tr>
<tr>
<td></td>
<td>Environmental Agreements</td>
</tr>
<tr>
<td></td>
<td>Emission Controls</td>
</tr>
<tr>
<td></td>
<td>Codes of Good Practice</td>
</tr>
<tr>
<td></td>
<td>Demand Management Measures</td>
</tr>
<tr>
<td></td>
<td>Efficiency and Reuse Measures</td>
</tr>
<tr>
<td></td>
<td>Desalination Installations</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation of Existing Infrastructure</td>
</tr>
<tr>
<td></td>
<td>Artificial Recharge of Aquifers</td>
</tr>
<tr>
<td></td>
<td>Educational Measures</td>
</tr>
<tr>
<td></td>
<td>Use of treated wastewater</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>56 Supplementary Measures</th>
<th>Administrative Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Economic and Fiscal Measures</td>
</tr>
<tr>
<td></td>
<td>Environmental Agreements</td>
</tr>
<tr>
<td></td>
<td>Emission Controls</td>
</tr>
<tr>
<td></td>
<td>Codes of Good Practice</td>
</tr>
<tr>
<td></td>
<td>Demand Management Measures</td>
</tr>
<tr>
<td></td>
<td>Efficiency and Reuse Measures</td>
</tr>
<tr>
<td></td>
<td>Desalination Installations</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation of Existing Infrastructure</td>
</tr>
<tr>
<td></td>
<td>Artificial Recharge of Aquifers</td>
</tr>
<tr>
<td></td>
<td>Educational Measures</td>
</tr>
<tr>
<td></td>
<td>Use of treated wastewater</td>
</tr>
</tbody>
</table>
Conclusions
Taking on the challenge

Future presents many challenges for Cyprus

- Climate Change
- Water scarcity and droughts
- Rapid social changes
- Economic development
- Escalating water demands in a continuously changing environment

A sustainable and integrated water resources management is a prerequisite for sustainable development, improvement of life quality and protection and preservation of the environment.
Thank you for your attention