Cyprus Experience with Desalination and Water Reuse

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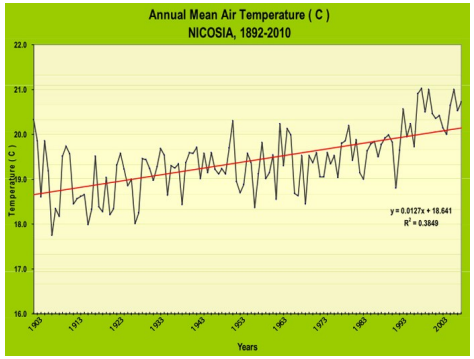
17WC:165187

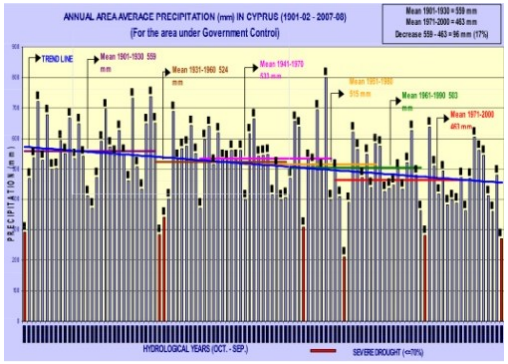
WC.IDADESAL.ORG | OCTOBER 15-20, 2017 | SÃO PAULO, BRAZIL

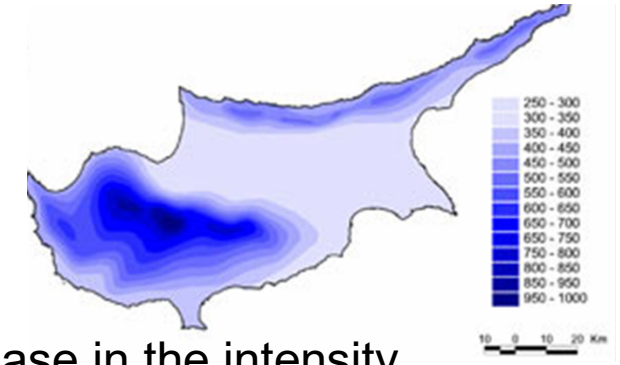
Short description about Cyprus

Cyprus is an island in the Mediterranean Sea

- Area: 9250 Km^2
- Population: 850,000 (under Government control)
- Type of Climate: Semi arid climate
- Cyprus is one of the "water poor" countries of Europe with limited water resources and frequent occurrence of droughts





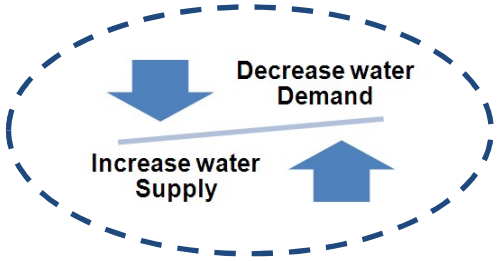


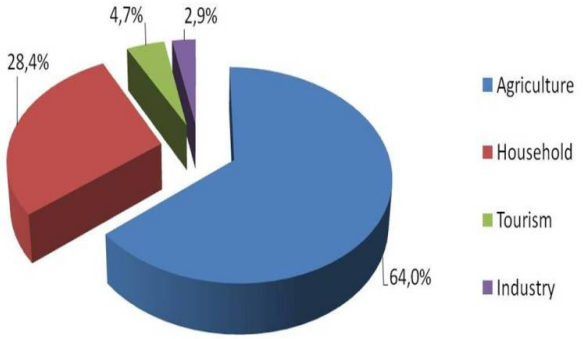
Climate models predict rise in temperature and increase in the intensity and frequency of extreme drought events

Water Management Master Plan

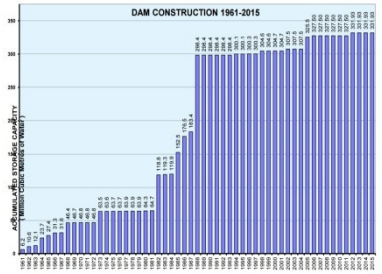
The Republic of Cyprus, during the late sixties started the implementation of a Water Master Plan

- **Objective**: to satisfy in a sustainable way the different users of water and safeguard human & other life
- **Measures implemented:** to increase water availability and decrease water demand





Rainfall:	476 mm
Inflow into groundwater	201
Outflow to the sea	62
Groundwater Balance	139
Inflow into surface storage	82
TOTAL Available (SW+ GW)	**221**
SW Releases	60
GW extraction (Pumping)	146
TOTAL Releases/ Extractions	**206**
DEMAND	**250**
DEFICIT	**– 44 (+33*+8**)**



Increased storage capacity through dam construction

Water Demand Management Measures

- Education and Awareness Campaigns
- Leakage Reduction in Distr. Networks
- Economic incentives
- Water saving devices
- Cropping patterns
- Improvement of Irrigation Efficiency
- Quota control
- Water Pricing and Metering
- Institutional changes

- Despite the significant measures, available water was not enough
- In August 2008 transportation of water from Athens to Limassol with tankers took place: 8 MCM were transferred with a cost of €56 M

Desalination Plants – (PPP) Projects

- In Cyprus desalination plants operate under **B**uilt, **O**wn – **O**perate, **T**ransfer (BOOT) Contracts, where private companies using their own funds, undertake the design, construction and operation of the Plants over a fixed period.
- The Government has the obligation to buy a minimum quantity of desalinated water each year over that fixed period.
- The Contractor produces desalinated water of a specified quality and quantity and delivers it to the Water Development Department's storage reservoirs

Pricing of Water Purchased

- **The Unit Price** is made up of four components:
  - C: Capital Expenditure
  - OM: Operation and Maintenance
  - E: Energy
  - SOM: Standby Operation and Maintenance
- **Different Unit Prices** are applied:
  - Unit Price for operation: C + OM + E
  - Unit Price for Stand-by : C + SOM
  - Unit Price for additional quantities: OM + E

Desalination Plants 2017

DESCRIPTION	DHEKELIA EXTENSION	LARNACA REFURBISHMENT	LIMASSOL	VASSILIKOS
CONTRACT TYPE	BOOT	BOOT	BOOT	Purchase Contract
START OF PRODUCTION	18 July2008	Summer 2014	1 July 2012	Summer 2013
PERIOD	20 Years	25 Years	20 Years	20 Years
CAPACITY	60.000 m3/day	60.000 m3/day	40.000 m3/day	60.000 m3/day
MINIMUM DAILY PRODUCTION	54.000 m3	54.000 m3	36.000 m3	54.000 m3
MINIMUM YEARLY PRODUCTION	19.710.000 m3	19.710.000 m3	13.140.000 m3	19.710.000 m3
PURCHASE PRICE OF WATER	€0.69/m3	€0.59/m3	€0.87/m3	€0.81/m3
ADJUSTED PRICE FOR 2016 (ELECTRICITY TARIFF AND LABOR INDEX)	€0.83/m3	€0.47/m3	€0.92/m3	€0.77/m3

Conditions of Contracts for the *Wastewater Treatment Plants*

- FIDIC Contract - Design Build Operate: Two phases Contracts

- **Phase 1:** Design - Build – Commissioning – Testing- One year operation as defects Liability period.
- **Contracting Authority:** Urban Sewerage Board
- **Requirements:** Only the quality of the treated effluent.
- **Treatment Method:** the tenderer to select proven method.

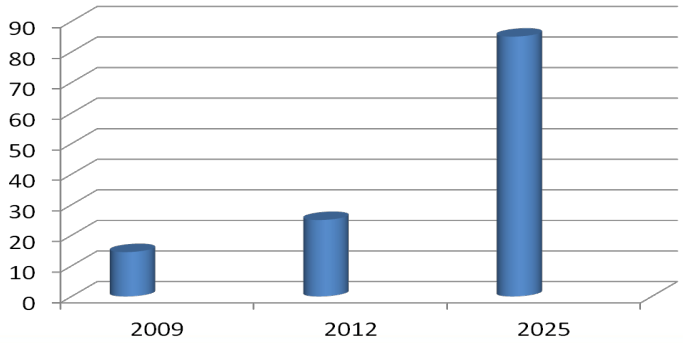
- **Phase 2:** Operate for 9 years (all the costs i.e. chemicals/electricity are borne by the Contractor. The contractor could also use renewable energy resources at his own cost)
- Contracting Authority: Urban Sewerage Board.

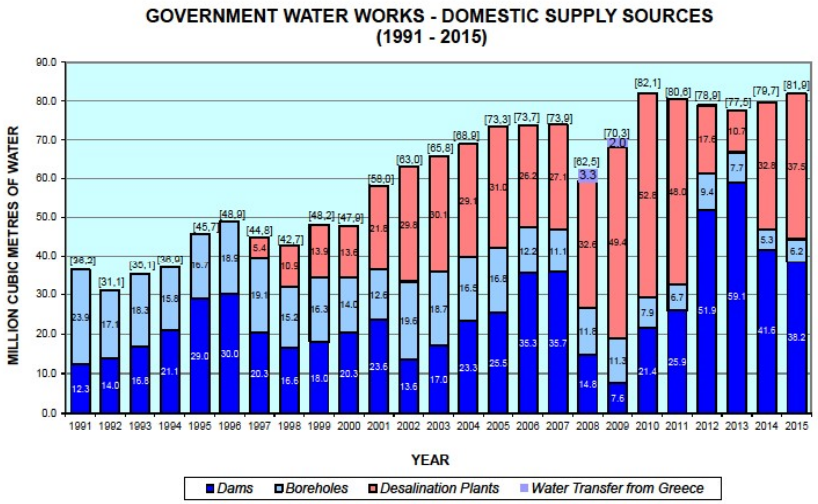
- **Financing:** The Urban Sewerage Board through taxation of the citizens. There are two types of taxes:
- Sewerage fee: paid once a year based on the value of the house
- Sewerage system use: paid every two months based on the drinking water consumption

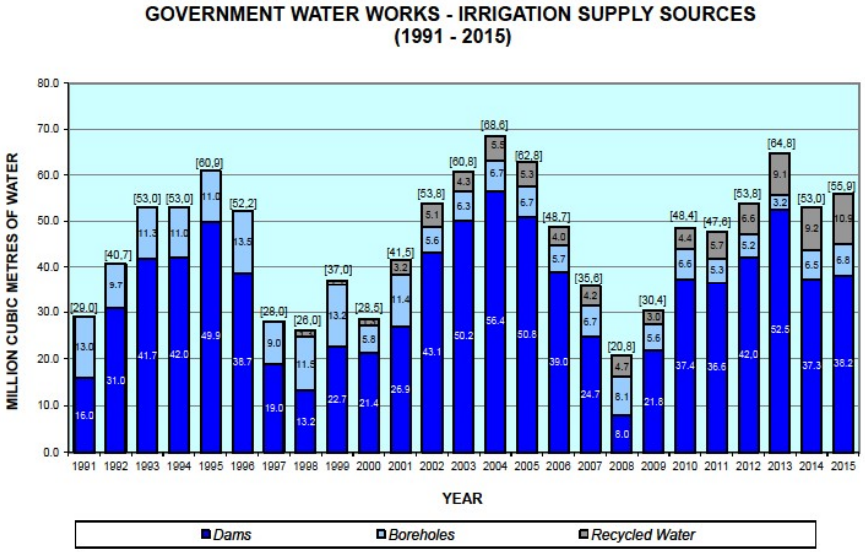
- **Award Criterion:** Exclusively the lowest price (phase 1 and phase 2), provided that the tenderer fulfills the economical and technical qualifications specified in the tender documents.

Reuse of Treated Effluent

- In Cyprus The cost for the construction and the operation and maintenance of the tertiary treatment plant carried out by the Urban Sewerage Boards is undertaken by the Government through Water Development Department.
- The treated effluent is used for irrigation and recharge of aquifers.
- Aquifers are used as storage reservoirs mainly in winter. The water from the aquifers is extracted and used for irrigation.
- The treated effluent is suitable for the majority of the crops and Irrigation is done under the Code of Good Agricultural Practice
- The quality is under control and remains constant
- The farmers use less quantities of fertilisers because the treated effluent already contains nutrients such as Phosphorous and Nitrogen




GOVERNMENT WATER WORKS - DOMESTIC SUPPLY SOURCES
(1991 - 2015)
MILLION CUBIC METRES OF WATER
YEAR
Dams
Boreholes
Desalination Plants
Water Transfer from Greece


GOVERNMENT WATER WORKS - IRRIGATION SUPPLY SOURCES
(1991 - 2015)
MILLION CUBIC METRES OF WATER
YEAR
Dams
Boreholes
Recycled Water

From the photographic competition of Water Board of Larnaca 2015 - first prize

Thank you

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