Water management
Non-Revenue Water Reduction Management -
(Drought climates and the case of Nicosia, Cyprus)
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Presentation outline

• Water scarcity considerations and Identification of the environment
• Water efficiency and Non-Revenue Water
• Strategic approach and Non-Revenue analysis
• Importance of Non-Revenue Water
• Main pillars of actions
• Decision Support System
• Guiding issues/actions
• Benefits
Considerations

• The lack of precipitation in many countries produces a very demanding budget for water supply efficiency.

• Water is a necessity for health and life - Need to keep attention about the consequences due to lack of water.

• Economic crisis increases the need to take care.

• Economic, Social, environmental issue.

• The role of Civil Engineers.
Eg Cyprus
• Subtropical climate of Semi-arid type
• Very mild winters - warm to hot summers. Rain occurs mainly in winter, with 8 months summer being generally dry.
• The warmest climate (and warmest winters) in the Mediterranean part of the European Union.
• Average annual temperature (coast) 24 °C day 14 °C night.
• Middle of summer (July – August) is hot – 35 °C day and 23 °C night.
Cyprus is suffering from an on-going shortage of water. The country relied heavily on rain to provide household water and for many years now, with very few exceptions, the average annual rainfall seems to be decreasing.

Reservoirs keep water, however, demand has increased annually – a result of local population growth, foreigners relocating to Cyprus and the number of visiting tourists – while rain water supply has fallen.

108 dams - Total water storage capacity 300 Mm³. Dams was the principal source of water.

Water desalination plants have been gradually constructed, investing highly, in order to deal with the prolonged drought. production of 200,000m³ (?) daily.

Efforts to raise public awareness.

Encourage domestic water users to act more responsibly for the conservation of this increasingly scarce commodity.

Water is precious
Water shortage – Import water

Year 2008

2008-2009: Cyprus, Nicosia
The scarcity of water lead to the application of intermittent supply. Supply 12hrs/48hrs
*Intermittent supply* and 3d party activities lead to
• Increase of Non Revenue water.
• High budget deficits.

2012:
*Cost of production* (Episkopi Desalination) **very high** (85€sents/m3) compared to the current price WBN buys water from the WDD (77 €sents/m3)
▶Need to Manage efficiently and effectively
Water availability and the Non-Revenue Water issue

• Do we use the available water efficiently?

What is NRW?
• NRW: The *water supplied* that gives “no revenue”.
  = Actual Supply – registered consumption.
• Do we know it?
• How accurate can we be? (accuracy of instruments)
• Completeness (quantity & quality) of data.

⇒ Need for a strategy to estimate NRW
Strategic approach

**Basis of actions followed:**
IWA - Water loss task force and Waterloss-Med program - guiding lines. [www.waterloss-project.eu](http://www.waterloss-project.eu) (Partners: Greece, France, Cyprus, Spain, Italy, Slovenia)

Examine the cause and the effect of each Non-Revenue water component

**Pilot areas of WATERLOSS project**

- Baho; Argeles-sur-mer; Thuir (FR)
- Castellbisbal (ES)
- SIEL (FR)
- Melito di Napoli (IT)
- Ljubljana (SL)
- Kozani (EL)
- Nicosia (CY)
Components of NRW

- Unbilled authorised consumption
- Apparent losses
- Real Losses
## Water Balance – year 2011

### Distribution System

<table>
<thead>
<tr>
<th>Distribution System</th>
<th>Input Volume</th>
<th>Authorised Consumption 18,032,374 76.95%</th>
<th>Billed Authorised Consumption 18,039,427 76.95%</th>
<th>Unbilled Authorised Consumption 7,053 0.03%</th>
<th>Water Losses 5,403,288 23.05%</th>
<th>Real Losses 4,817,220 20.55%</th>
<th>Unbilled Un-metered Consumption 5,218 0.02%</th>
<th>Apparent Losses 586,068 2.50%</th>
<th>Non-Revenue Water 5,410,341 23.08%</th>
</tr>
</thead>
</table>

### Revenue Water

- Billed Metered Consumption 18,032,374 76.91%
- Billed Un-metered Consumption 2,940 0.01%
- Unbilled Metered Consumption 1,835 0.01%
- Unbilled Un-metered Consumption 5,218 0.02%
- Unauthorised Consumption 117,214 0.50%
- Customer Metering Inaccuracies 468,854 2.00%

### Analysis of Water Losses and estimation of Background Losses and Leakage Losses that can be located according to statistical analysis

- Leakage on Transmission and/or Distribution 268,846 1.15%
- Leakage and Overflows at Utility's Storage 23,443 0.10%
- Leakage on Service Connections 906,565 3.87%

- Leakage Losses that can be located 3,618,366 15.43%

### Data reliability

9% - RL2.109.844m³

8.43% - RL3.176.487m³

WATER BOARD OF NICOSIA

WATER BALANCE, using the IWA methodology FOR THE YEAR 2011 (in cubic meters)
Importance of NRW-Reduction

• NRW can be considered as a source of water supply.
• NRW varies from city to city.

• World Bank study- 2006: Developing countries
  – Loss of water – 45M cubic meters/day
  – Not paid water – 35 M cubic meters/day
    • Theft
    • Corruption
    • Poor metering

⇒ Water needs for Cyprus for one year
Progress of NRW for the Water Board of Nicosia 2007-2012

On 1/5/09 release of measures: 14hrsX3 days/week+10hrs Sunday c/o availability
Main pillars of action – Non revenue water management. Apparent and Real Losses

Main reasons:

- Very low flow rate – water tanks on roofs, small leaks in private systems
- Theft
- Meter inaccuracies – under-registration
- Meter reading errors

Review processes, Establish proactive inspection
24 hrs policy based on seriousness

Install PRVs and connect through water tanks

Buy more acoustic loggers, Increase crew for ACL, improve procedures

Replace if frequent incidents

After classifying main NRW components consider methods of improvement
Search for performance indicators & related parameters

Procedure for assessment

Results including the Water Balance by IWA.
Components of NRW and strategic and operational measures for NRW-reduction

NRW COMPONENTS

Assess water balance
Real losses
Unbilled authorized consumption
Apparent losses
Billed but not payed for

SUBCOMPONENTS OF NRW COMPONENTS

PMI
ILI

GROUP OF STRATEGIC MEASURES

Speed of repair

GROUP OF OPERATIONAL MEASURES

Reporting of repairing times
Benefits

- Satisfied customers/citizens.
- Less energy consumption.
- Less carbon footprint from Water supply chain.
- Less Non-Revenue Water.
- More just pricing.
- Better image.
- Better knowledge of the system.
- Less system input volume.
- Less # leaks recorded.
- Decrease in overtime work.
- Better system operation.
- Decrease apparent losses, etc.
Conclusions

• Utilities have to **manage effectively** to avoid losses either in productivity or due to waste of Water. Quality management is essential.

• **Technology** can be used to upgrade the management of Non-revenue water.

• Water loss can be considered as the **biggest bad consumer of water**.

• **Keep and assess critical variables** and indicators related to the economics of water.

• **Collection of data** and assessment must be continuous. A Decision Support System/tool (DSS) can help simplifying processes.

• Continuously **improve the infrastructure and the processes**. It worth.

• Implementation and **utilization of experience gained**. Expand the benefits and lessons learned to other systems.

• **Opportunity for Civil Engineers**
we DO care about water...

Thank you for your attention

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