European Council of Civil Engineers

UN WATER 2013 United Nations International Year of Water Cooperation

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

57th ECCE General Meeting – SC Environment and Sustainability
in Lisbon, Portugal

31 May - 1 June, 2013

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WATERLOSS

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

Water scarcity - Drought climates

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.

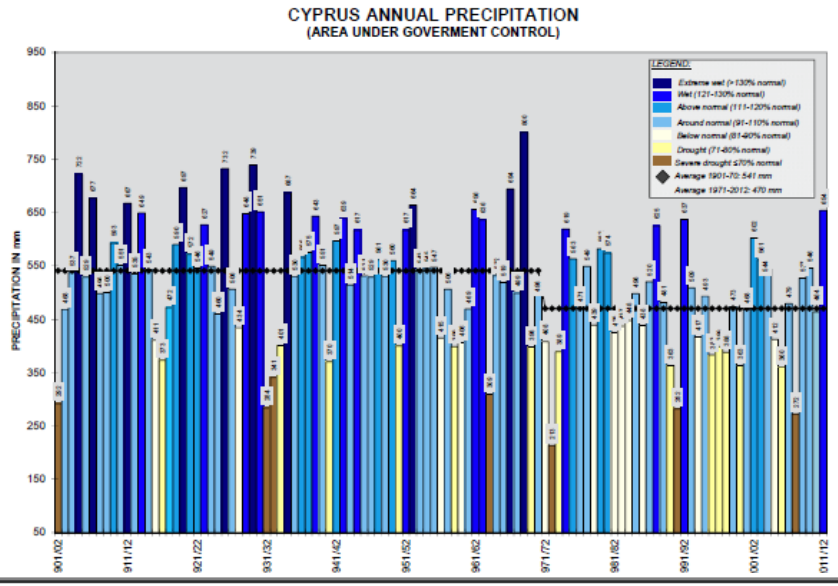
Problem Identification and the environment

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.

Water supply environment eg Cyprus

- 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 Mm^3. 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 200.000m^3 (?) 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



INFLOW OF WATER THE LAST 10 YEARS (MCM)											
	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13
October	0,18	0,51	0,15	0,22	2,57	0,34	0,227	1,160	0,065	0,308	0,748
November	0,79	1,10	2,56	2,22	3,61	0,60	0,635	2,523	0,128	1,482	3,182
December	10,06	6,36	4,45	1,35	0,95	6,00	3,151	23,111	5,090	5,769	50,878
January	10,71	89,16	10,05	3,29	2,15	2,63	13,248	42,973	7,627	92,634	13,246
February	44,00	33,47	18,19	9,09	14,16	5,18	28,622	37,708	12,834	41,536	9,267
March	42,35	9,16	8,12	5,27	7,37	2,85	27,170	21,849	21,389	29,378	6,024
April	18,37	6,22	4,31	1,56	3,06	0,93	14,547	6,546	10,193	11,391	
May	5,89	2,99	1,04	0,48	3,94	0,13	6,889	2,914	4,927	6,996	
June	3,07	1,30	1,29	0,05	0,31	0,00	1,627	0,921	0,958	1,513	
July	0,71	0,26	0,11	0,51	0,31	0,00	0,096	0,482	0,030	0,432	
Aug.-Sept.	0,00	0,00	0,10	0,00	0,41	0,08	1,020	0,000	0,324	0,315	
Total	136,1	150,5	50,3	24,0	38,8	18,7	97,4	140,2	63,6	191,8	83,345

Water shortage – Import water

Year 2008

Ocean Tanker

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:

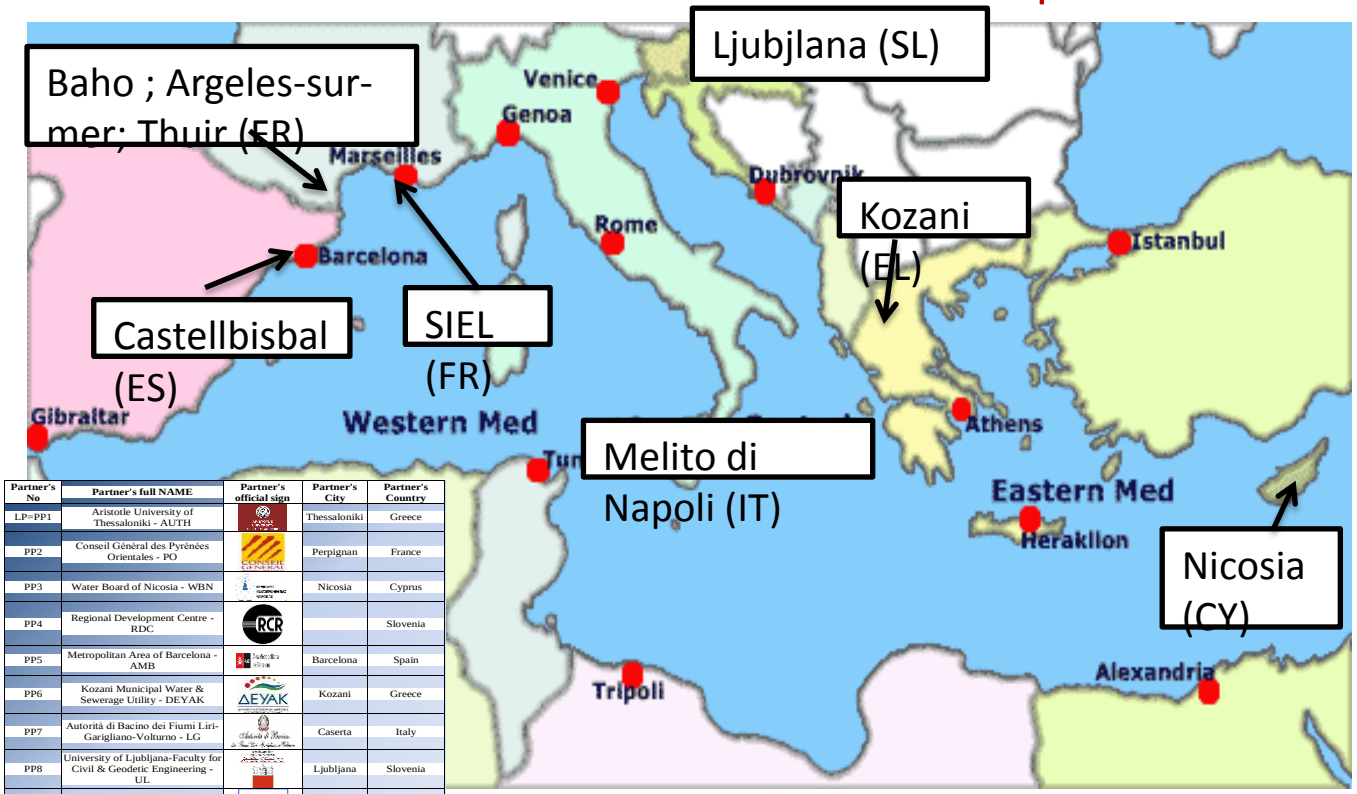
IWA - Water loss task force and

Waterloss-Med program - guiding lines. **www.waterloss-project.eu**

(Partners: Greece, France, Cyprus, Spain, Italy, Slovenia)

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

Pilot areas of WATERLOSS project



Partner's No	Partner's full NAME	Partner's official sign	Partner's City	Partner's Country
LP=PP1	Aristotle University of Thessaloniki - AUTH		Thessaloniki	Greece
PP2	Conseil Général des Pyrénées Orientales - PO		Perpignan	France
PP3	Water Board of Nicosia - WBN		Nicosia	Cyprus
PP4	Regional Development Centre - RDC			Slovenia
PP5	Metropolitan Area of Barcelona - AMB		Barcelona	Spain
PP6	Kozani Municipal Water & Sewerage Utility - DEYAK		Kozani	Greece
PP7	Autorità di Bacino dei Fiumi Liri-Garigliano-Volturno - LG		Caserta	Italy
PP8	University of Ljubljana-Faculty for Civil & Geodetic Engineering - UL		Ljubljana	Slovenia
PP9	Department of Herault - DH		Montpelier	France

Components of NRW

- Unbilled authorised consumption
- Apparent losses
- Real Losses

Water Balance – average daily 2011

WATER BOARD OF NICOSIA
WATER BALANCE, using the IWA methothology FOR THE YEAR 2011 (in cubic meters per day)

Distribution System Input Volume 64,227 100.00%	Authorised Consumption 49,423 76.95%	Billed Authorised Consumption 49,404 76.92%	Billed Metered Consumption 49,396 76.91%	**Revenue Water 49,404 76.92%**
			Billed Un-metered Consumption 8 0.01%	
		Unbilled Authorised Consumption 19 0.03%	Unbilled Metered Consumption 5 0.01%	**Non-Revenue Water 14,823 23.08%**
			Unbilled Un-metered Consumption 14 0.02%	
	Water Losses 14,804 23.05%	Apparent Losses 1,606 2.50%	Unauthorised Consumption 321 0.50%	
			Customer Metering Inaccuracies 1,285 2.00%	
		Real Losses 13,198 20.55%	Leakage on Transmission and/or Distribution 737 1.15%	
			Leakage and Overflows at Utility's Storage 64 0.10%	
			Leakage on Service Connections 2,484 3.87%	
			Leakage Losses that can be located 9,913 15.43%	

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

Water Balance – year 2011

9% - RL2.109.844m3

Data reliability ?

8,43% - RL3.176.487m3

WATER BOARD OF NICOSIA
WATER BALANCE, using the IWA methothology FOR THE YEAR 2011 (in cubic meters)

Distribution System Input Volume 23,442,714 100.00%	Authorised Consumption 18,039,427 76.95%	Billed Authorised Consumption 18,032,374 76.92%	Billed Metered Consumption 18,029,434 76.91%	**Revenue Water 18,032,374 76.92%**
			Billed Un-metered Consumption 2,940 0.01%	
		Unbilled Authorised Consumption 7,053 0.03%	Unbilled Metered Consumption 1,835 0.01%	**Non-Revenue Water 5,410,341 23.08%**
			Unbilled Un-metered Consumption 5,218 0.02%	
	Water Losses 5,403,288 23.05%	Apparent Losses 586,068 2.50%	Unauthorised Consumption 117,214 0.50%	
			Customer Metering Inaccuracies 468,854 2.00%	
		Real Losses 4,817,220 20.55%	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%	

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

ΣΥΜΒΟΥΛΙΟ ΥΔΑΤΟΠΡΟΜΗΘΕΙΑΣ ΛΕΥΚΩΣΙΑΣ
στην υπηρεσία του καταναλωτή

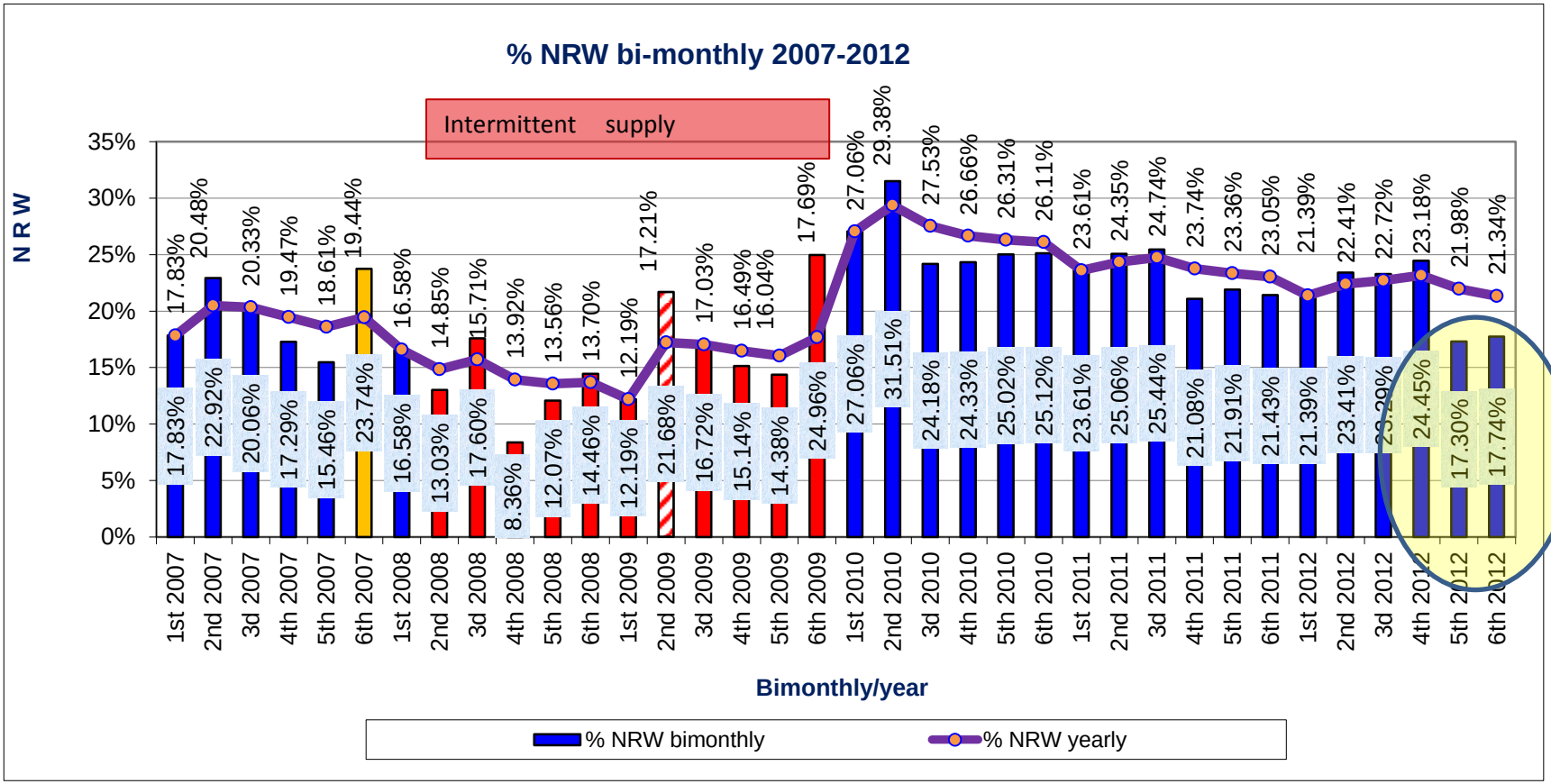
Importance of NRW-Reduction

- 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

  $\Rightarrow$ Water needs for Cyprus for one year

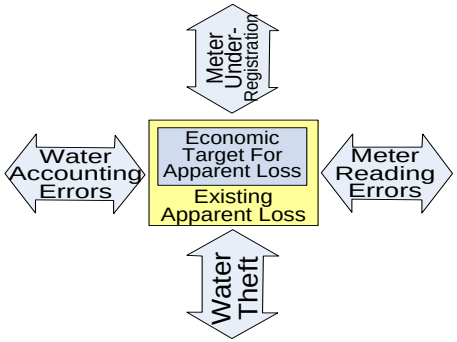
Progress of NRW for the Water Board of Nicosia 2007-2012



On 1/5/09 release of measures: 14hrsX3 days/week+10hrs Sunday c/o availability

ΣΥΜΒΟΥΛΙΟ ΥΔΑΤΟΠΡΟΜΗΘΕΙΑΣ ΛΕΥΚΩΣΙΑΣ
στην υπηρεσία του καταναλωτή

Main pillars of action – Non revenue water management. Apparent and Real Losses



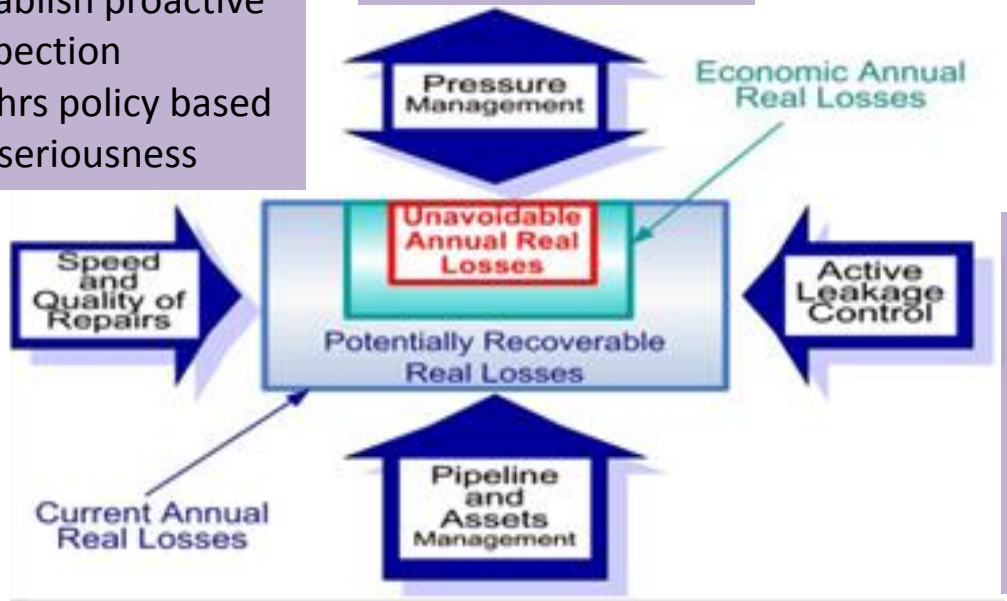
Main reasons:

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

- Detailed procedures and testing
- Replace meters
- legislation

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

Install PRVs and connect through water tanks

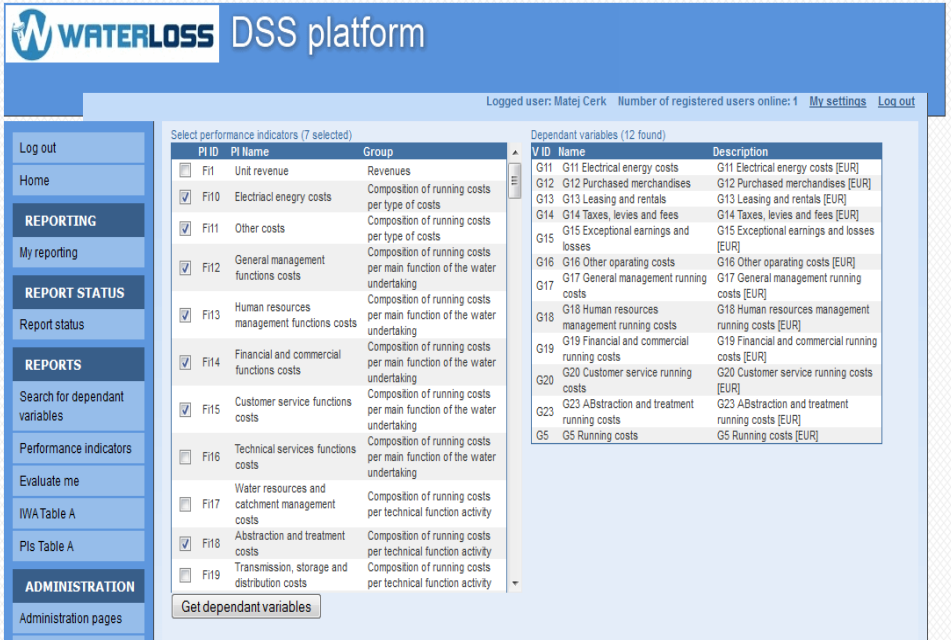


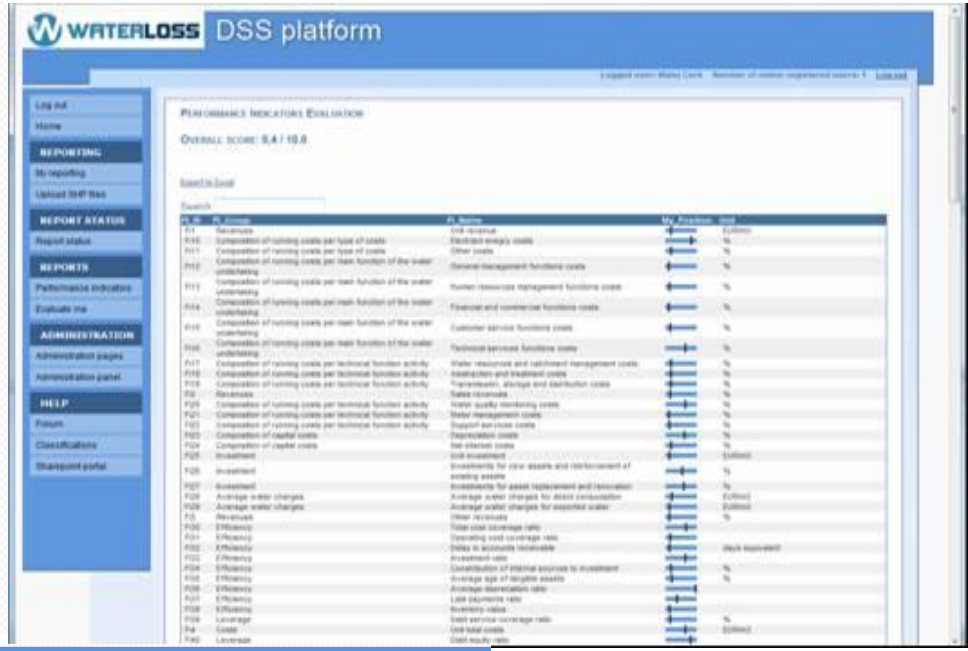
Buy more acoustic loggers, Increase crew for ACL, improve procedures

Replace if frequent incidents

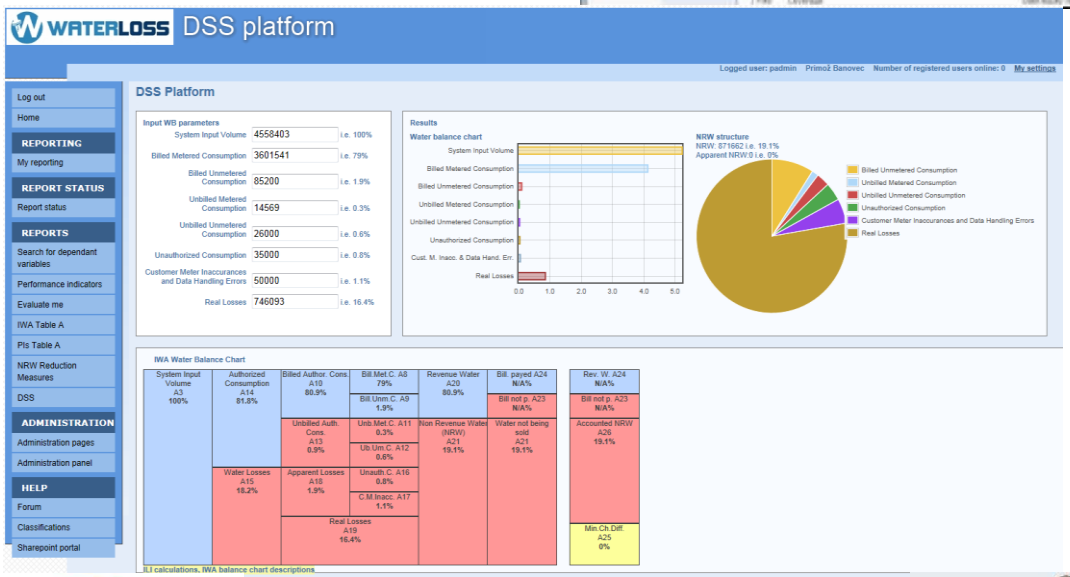
After classifying main NRW components consider methods of improvement

WATERLOSS Decision Support System





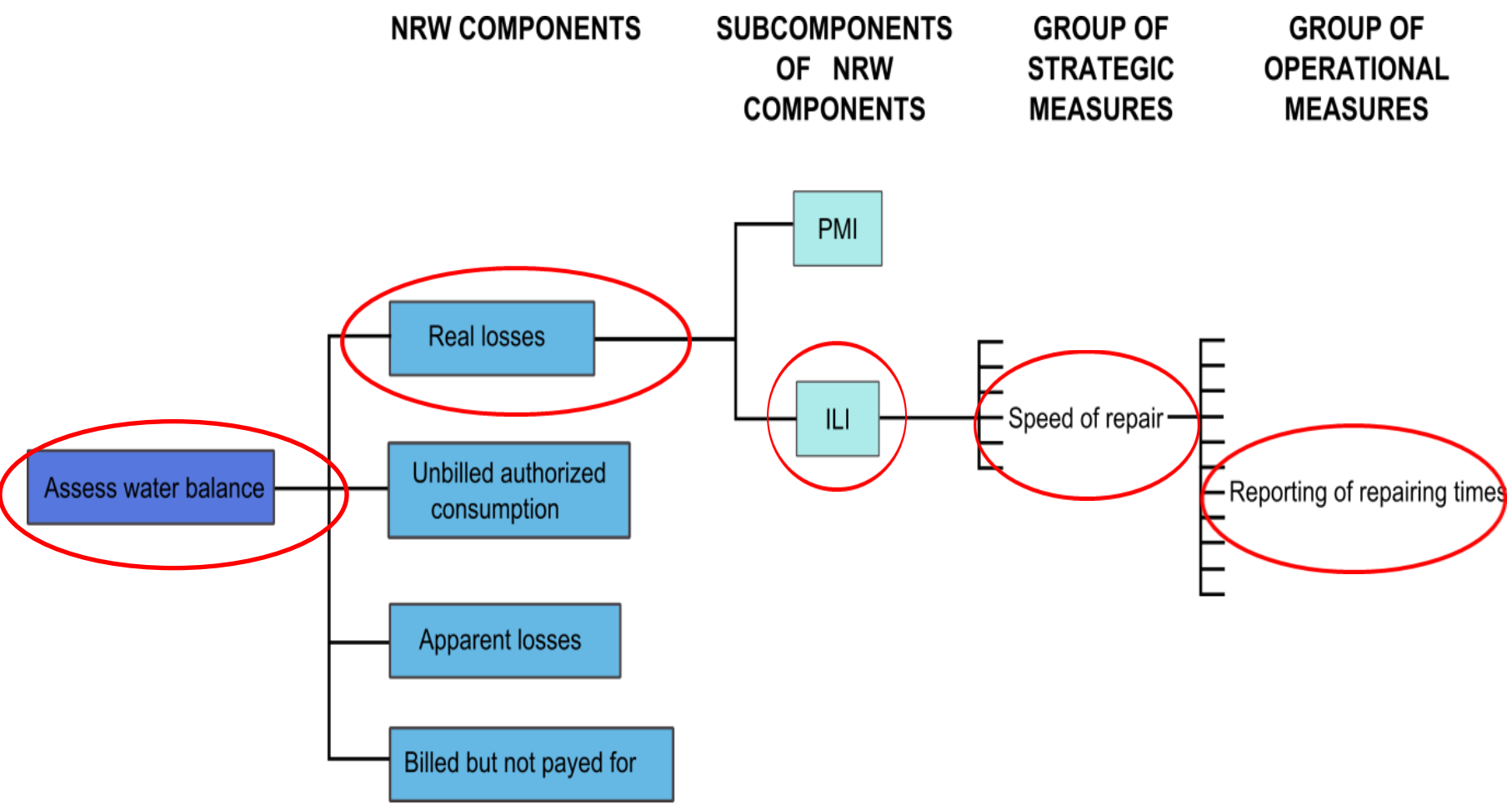
Search for performance indicators & related parameters



Procedure for assessment

Results including the Water Balance by IWA.

Components of NRW and strategic and operational measures for NRW-reduction



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**

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we DO care about water…

Thank you for your attention

George Demetriou
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