



EPAL

Grupo Águas de Portugal

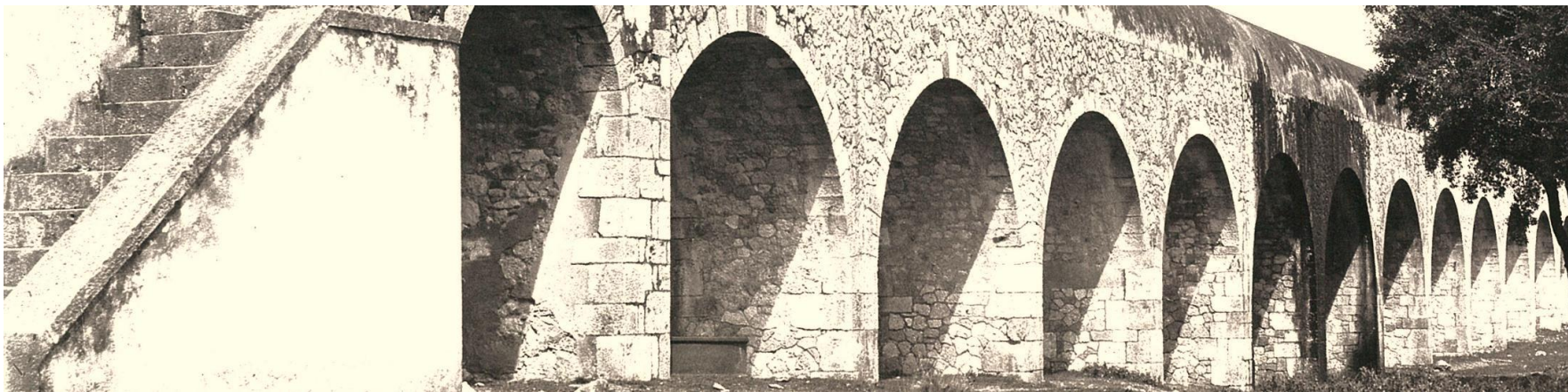
155 YEARS OF HISTORY

- **Non-Revenue Water - EPAL Case Study**
- Nuno Medeiros | Andrew Donnelly | Ricardo Guimarães



27th April 2023

- Foundation of **Companhia das Águas de Lisboa (CAL)** in **1868** marking the start of modern era of water supply in the capital city.
- At its very beginning, **EPAL** was created to solve a resiliency problem – namely supplying the needs of the city’s inhabitants
- Alviela aqueduct: **Inaugurated in 1880** with 114 km of open surface channel from Olhos de Água spring to Barbadinhos



A PROCESS OF
CONTINUOUS
CHANGE

Capacity enhancement from the 1940s to 1970s



Still... the water supplied was not enough for the demand.

Construction of Canal Tejo

- Concluded in 1940; 42 km in length , 2.5 m diameter
- 1960 –Vale da Pedra WTP (2nd phase in 1975; 3rd phase in 2017)



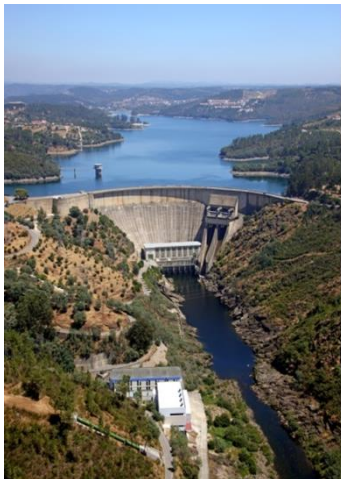
A PROCESS OF
CONTINUOUS
CHANGE

Construction of Castelo de Bode system

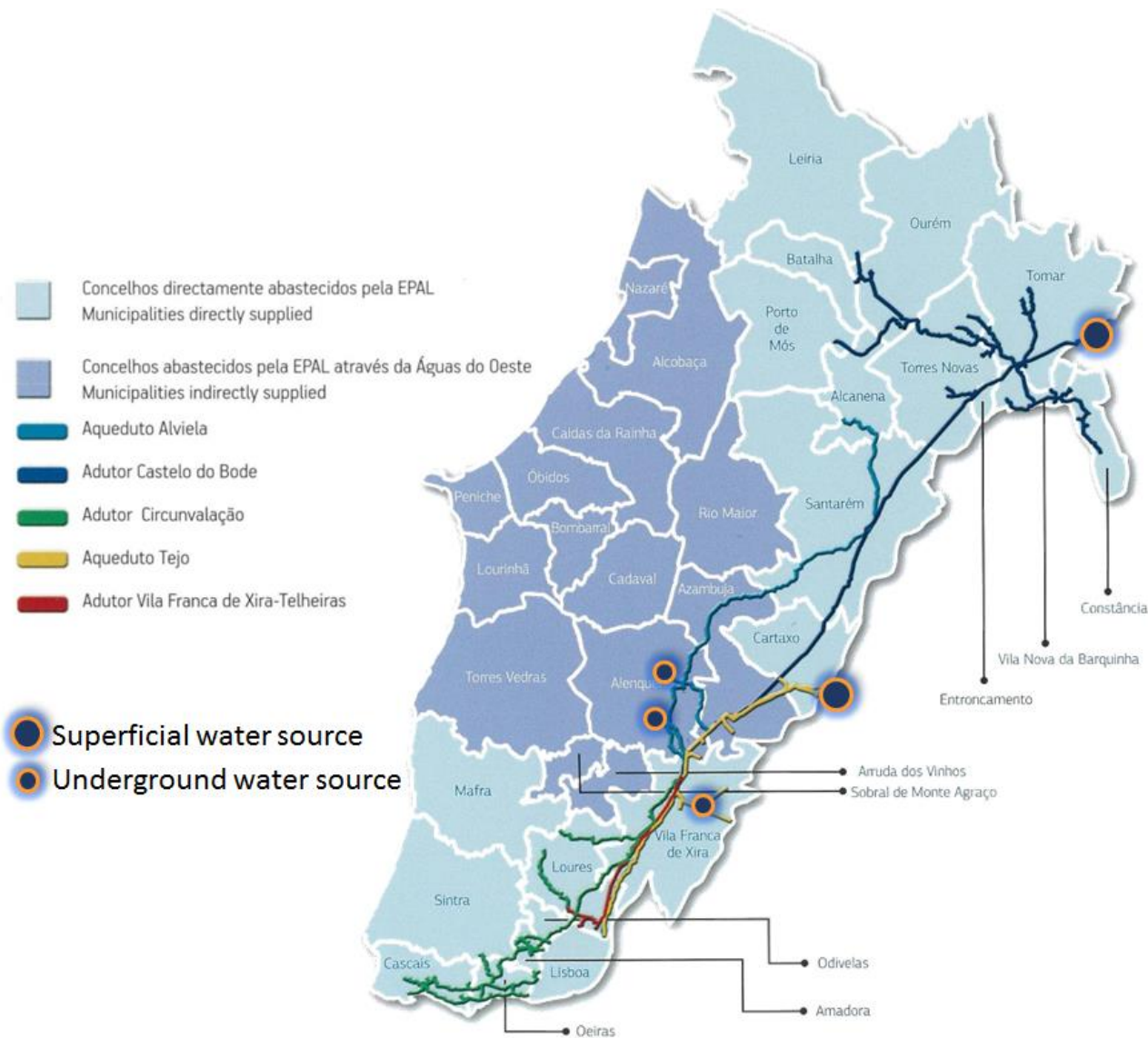
- Inaugurated 1987 with 90 km of 1.8m diameter mains & initial capacity of 375 000 m³/day
- Asseiceira WTP: Increased capacity in 1996 (500 000 m³/day) and 2007 (625 000 m³/day)

Construction of Circunvalação Trunk Main

- By-pass trunk main around Lisbon to supply neighbouring municipalities, inaugurated 2001 with 48 km of 1.8/2m diameter mains & capacity of 410,000 m³/day
- Permitted a significant increase in operational flexibility & robustness with volume of water entering/passing through the city network reduced by more than 1/3



A PROCESS OF
CONTINUOUS
CHANGE



Production and Bulk supply system

- Area 7 100 km²
- Bulk water supply to 34 Municipalities
- Population supplied around 3 M
- Water supply 204 M m³
- 750 km pipelines
- 2 Water Treatment Plants
- 23 Chlorination Points
- 38 Pumping Stations
- 40 Water Tanks

Distribution supply system (Lisbon)

- Area – 85 km²
- 365.000 Direct supply clients
- 564.000 Population
- Average daily demand: 150.000 m³
- 1450 km distribution mains
- 6 Chlorination Points
- 10 Pumping Stations
- 14 Reservoirs

EPAL in 2023, 155 years of history

The water supply system encompasses assets with a valuation exceeding €800 million.

In 2015, EPAL began to manage **Águas do Vale do Tejo**. This company being responsible for water supply and wastewater treatment in the Beiras and Alentejo regions, supplying around 1 million people (more 70 Municipalities).



WATER SUPPLY

	EPAL	AdVT
Water intakes (underground)	11	309
Water intakes (superficial)	2	43
WTP	2	46
Other Treatment Infrastructures	3	84
Reservoirs	42	697
Pumping Stations	41	189
Water mains (km)	737	3 890
Water networks (km)	1 420	-

WASTEWATER TREATMENT

	AdVT
Pumping Stations	293
WWTP	395
Septic tanks	15
Sewage collectors	857



COMBATTING NON-REVENUE WATER

The City of Lisbon distribution network

- WONE Project Overview

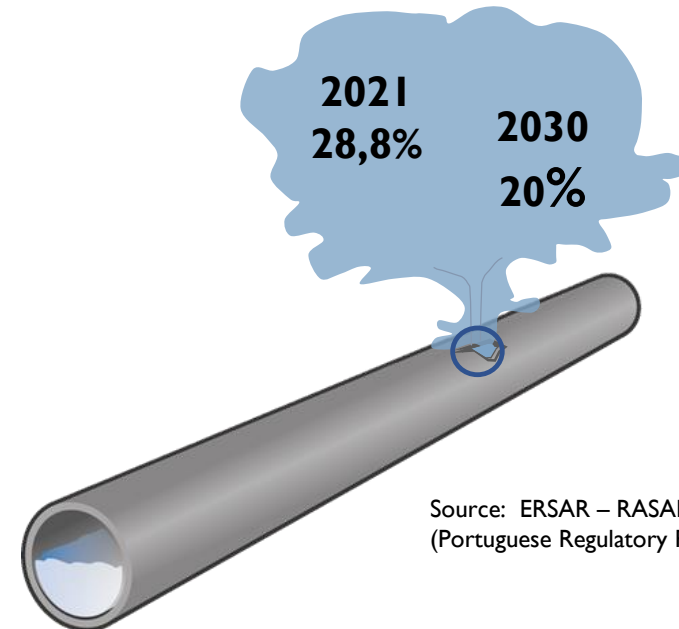




- Majority of Water sector publically owned
- Mix of private, public & concession operators
- Divided into bulk treatment companies, separate from distribution utilities

Problems contributing to Non-Revenue Water (NRW):

- Poor measurement of system water balances;
- Aging networks and often built with poor quality materials;
- Deficit of knowledge regarding networks: GIS, technical, operational;
- Insufficient data, standardization & systematization of reporting;
- Insufficient technical teams with low skill levels and poor knowledge.



Source: ERSAR – RASARP 2022
(Portuguese Regulatory Report)

How to **build capacity** and network knowledge to **reduce water losses** and **sustainably maintain** those gains



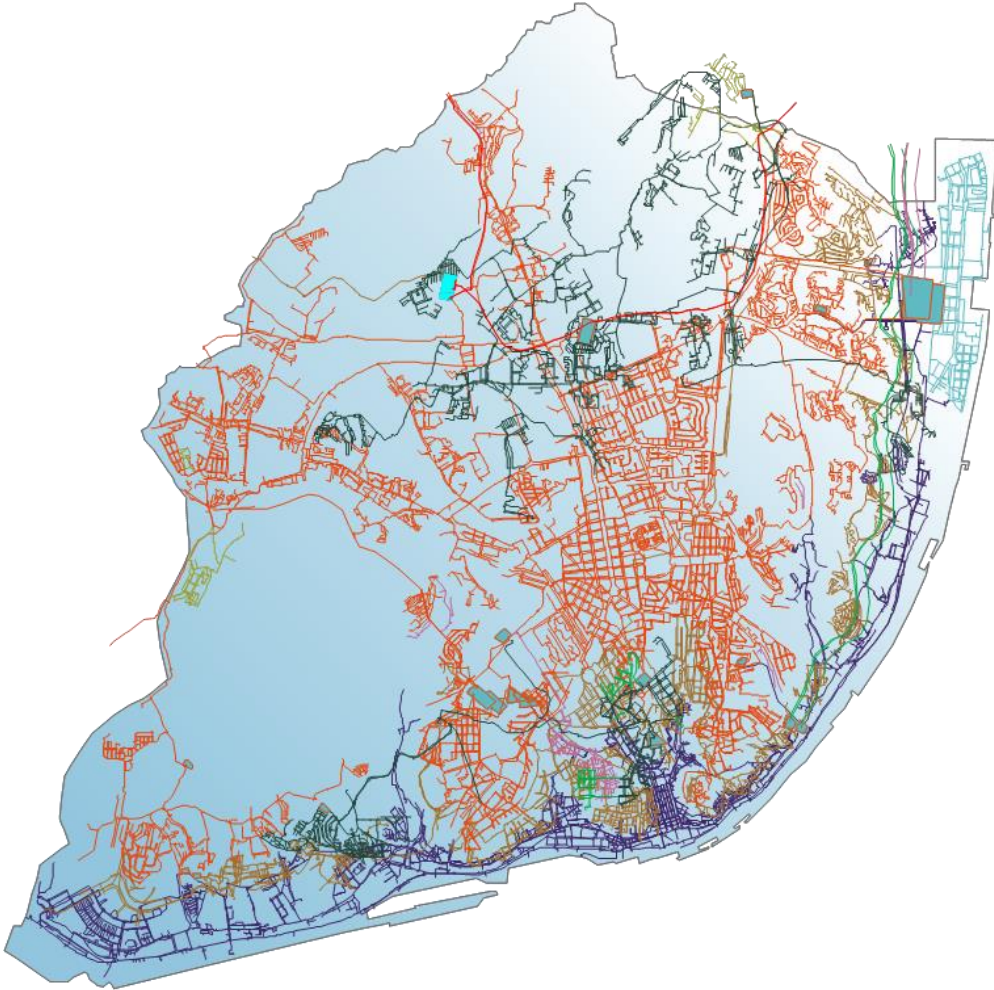
Active Leakage Control 'find and fix' in **DMAs** supported by **software application** data analysis



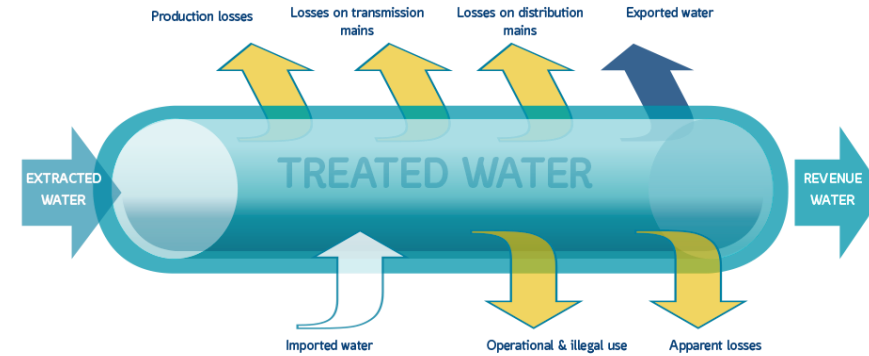
How EPAL reduced leakage by **200 m³/hour** from **500** to less than **150 litres/connection/day**



Focus on the essential

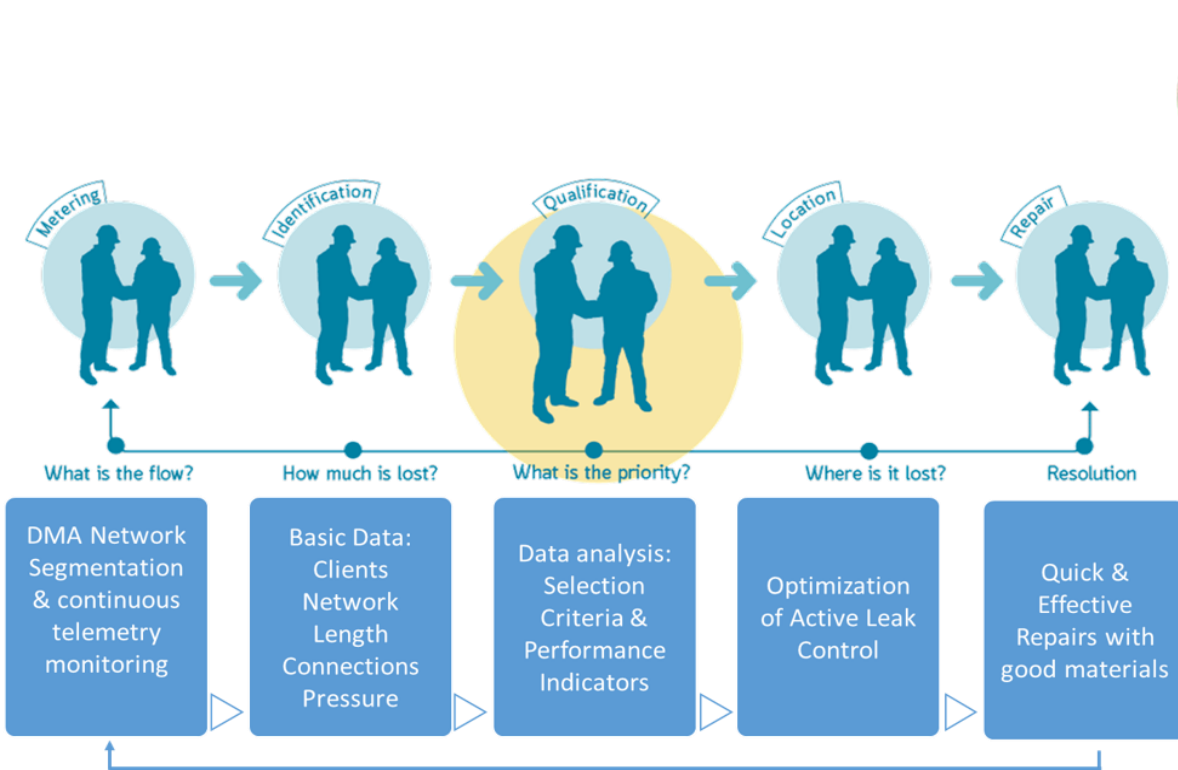


Annual NRW volume of 40 million m³ in Lisbon distribution network early 2000. Value of water lost in excess of €25 million per year



To reduce NRW and promote sustainable & efficient resource usage in the Lisbon distribution network, by **adopting and adapting best practice used by the most efficient global water utilities**

Strategy to reduce water loss



Network segmentation & continuous monitoring



Parallel client monitoring & data provision system



Development of data integration & analysis tools - WONE



Target defined Active Leak Control activities

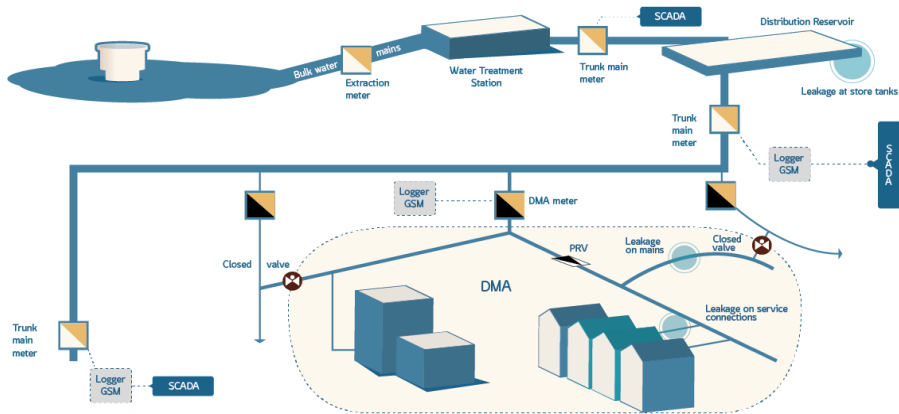


Develop in-house capacity, retain knowledge & build resilience

PHASES TO IMPROVE NETWORK KNOWLEDGE

1. DMA PLANNING & SET UP

- Create metering points & telemetry
- Design & boundary validation
- 162 DMA Implementation

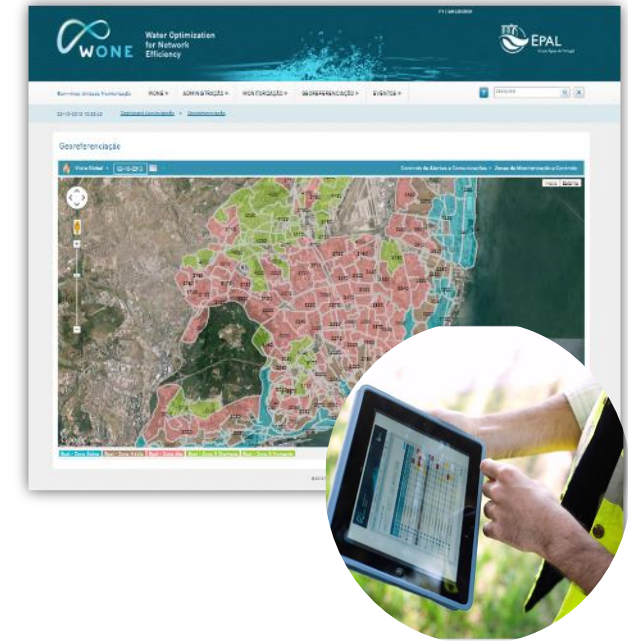


2. CONTINUOUS MONITORING

- Recording of pressure & flow
- Passive system with active alarms

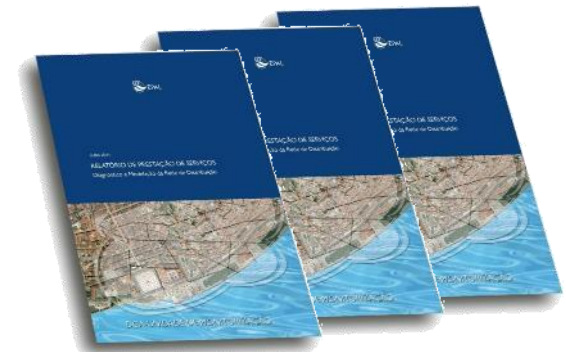
3. DATA ANALYSIS

- Integration in analysis software
- Practical Performance Indicators
- System Alarm & Alert Management
- Leakage assessment & Target setting
- Surgical Control of leakage



4. INFORMATION REPORTING

- DMA Proposals & Reference Manuals
- DMA Analysis & Audit Project Reports



Strategy supported by an innovative tool

Distribution Network

1.250 km sectorised mains
4000 Monitoring Points
162 DMAs



Strategy supported by an innovative tool

Leak detection campaign reports and leak repair requests sent directly from on-site



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WONE Water Optimization for Network Efficiency

Welcome Unidade Monetizada | WONE | ADMINISTRATION | CLIENTS | MONITORING | GEOREFERENCING | EVENTS

3/21/2014 2:56:00 PM | Monitoring Dashboard > DMA Daily Control - Net

DMA: [dropdown] Date: 3/21/2014 [calendar] [REFRESH] Export: EXCEL [dropdown]

FRIDAY, MARCH 21, 2014 | THURSDAY, MARCH 20, 2014

Alert	Detail	Net	Combi.	DMA	FRIDAY, MARCH 21, 2014					THURSDAY, MARCH 20, 2014			
					Flow Minimum (m3/h)	Flow Minimum (m3/h)	Snap. Flow Minimum (m3/h)	Flow Maximum (m3/h)	Total Volume (m3)	Min/Avg Flow Coefficient (37%-50%)	Retriev. Night Losses (m3/h) (6-10)	Retriev. Night Losses (m3/h/km) (0.6-1.2)	Ranking (45/70)
●	+	■	■	2280 - Olivais Sul	2.3	2.3	1.7	39.8	390.2	13.8%	NaN	NaN	0
●	+	■	■	2270 - Olivais Norte	11.7	10.6	8.7	76.4	944.8	27%	2.6	0.1	0
	+	■	■	2280 - Olivais à Chelas ZM	2.0	0.8	-1.2	13.4	185.2	10.1%	0.5	0.1	0
	+	■	■	2290 - Vale Formoso de Cima	2.0	2.3	2.0	15.7	201.9	27%	1.1	0.4	0
	+	■	■	3000 - Alto do Restelo Oeste	4.8	5.7	4.4	39.1	532.8	25.5%	2.2	0.2	0
	+	■	■	3010 - Caselas	3.0	3.3	2.5	22.1	294.7	26.7%	0.8	0.1	0
●	+	■	■	3020 - Alto do Restelo	3.4	3.4	3.1	45.5	556.9	14.7%	0.6	0.1	0
●	+	■	■	3030 - Ajuda e Alvito	6.1	6.2	5.9	39.0	541.8	27.4%	3.1	0.3	0
	+	■	■	3040 - Escola Manuel da Maia	8.8	8.0	7.2	37.2	546.2	34.9%	4.8	0.7	15
●	+	■	■	3050 - Bairro Calçada dos Mestres	3.5	4.0	3.8	30.4	345.2	28%	NaN	NaN	0
	+	■	■	3060 - Infante Santo	12.1	10.8	10.4	63.6	862.8	30.1%	5.0	0.6	0
	+	■	■	3070 - Campo de Ourique	8.4	9.3	8.8	88.7	1084.2	20.8%	0.9	0.1	0
●	+	■	■	3089 - Estrela	16.7	14.2	12.0	118.8	1537.4	22.2%	4.7	0.3	0
●	+	■	■	3090 - Mae d Agua	19.3	14.5	6.2	93.2	1292.8	26.9%	NaN	NaN	0
●	+	■	■	3100 - Bairro Alto	12.8	10.7	10.2	85.1	1224.8	20.9%	NaN	NaN	0
●	+	■	■	3110 - Pontinha Metro	8.2	9.5	8.4	23.2	385.3	59.2%	6.3	0.8	65

Daily report with performance indicators

Strategy supported by an innovative tool

Leak detection
campaign
reports and leak
repair requests
sent directly
from on-site



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WONE Water Optimization for Network Efficiency

EPAL Grupo Águas de Portugal

Bem-vindo Ricardo Guimarães WONE ADMINISTRAÇÃO CLIENTES MONITORIZAÇÃO PAZ GEO EVENTOS HIDRANTES pesquisa

09/11/2021 08:03:45 Dashboard Monitorização → Configurar Comunicações de Roturas

Comunicações de Roturas

Ano Responsabilidade
Âmbito Validação EXCEL

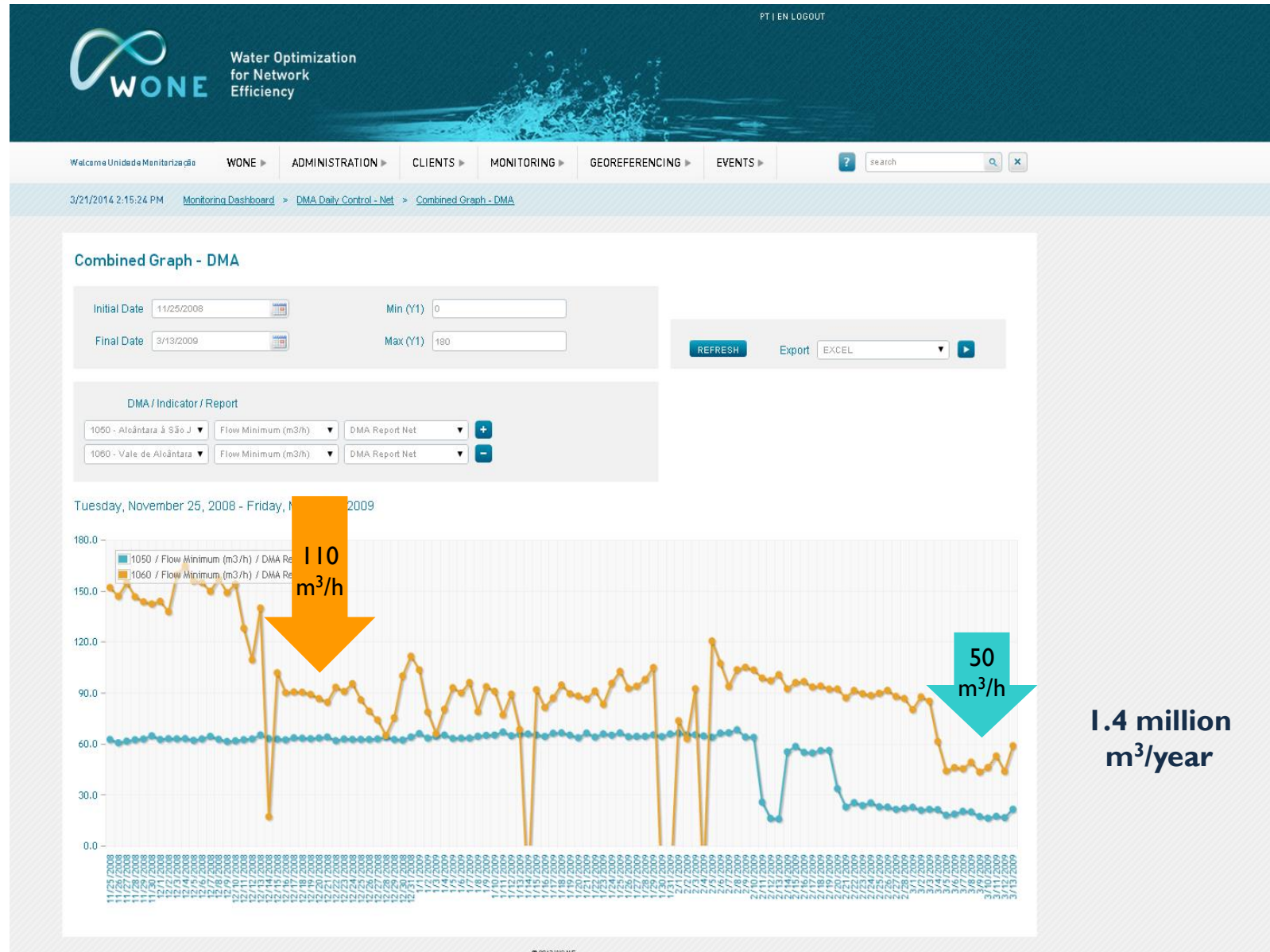
Código	Data Comunicação	Âmbito	Responsabilidade	ZMC	PAZ	Nº OT	Data Reparação	Validação	Criado Por	Plataforma
21/526	08/11/2021 14:07:31	PAZ	MANUTENÇÃO LX	3270	03			VALIDADA	v.rosa@wta.pt	PLATFORM_MOBILE
21/525	08/11/2021 14:03:25	PAZ	MANUTENÇÃO LX	3270	03	233290		VALIDADA	v.rosa@wta.pt	PLATFORM_MOBILE
21/524	05/11/2021 14:26:29	PAZ	MANUTENÇÃO LX	3270	03	233266		VALIDADA	v.rosa@wta.pt	PLATFORM_MOBILE

ID Âmbito (*)
Código Auto. Responsabilidade (*)
Código Manual ZMC
Criado Por Nº PAZ
Plataforma Orgão
Data Comunicação Cód. Órgão
Data Envio Visibilidade
Nº OT Assinalado no Local
Estado OT Validação
Previsão Reparação Sem Rotura
Data Reparação
Entidade Resp. Reparação
Fim Rotura Particular
Imagens

Obs. Gerais
Obs. Reparação
Morada
Arruamento
Nº Polícia
LAT
LON

Strategy supported by an innovative tool

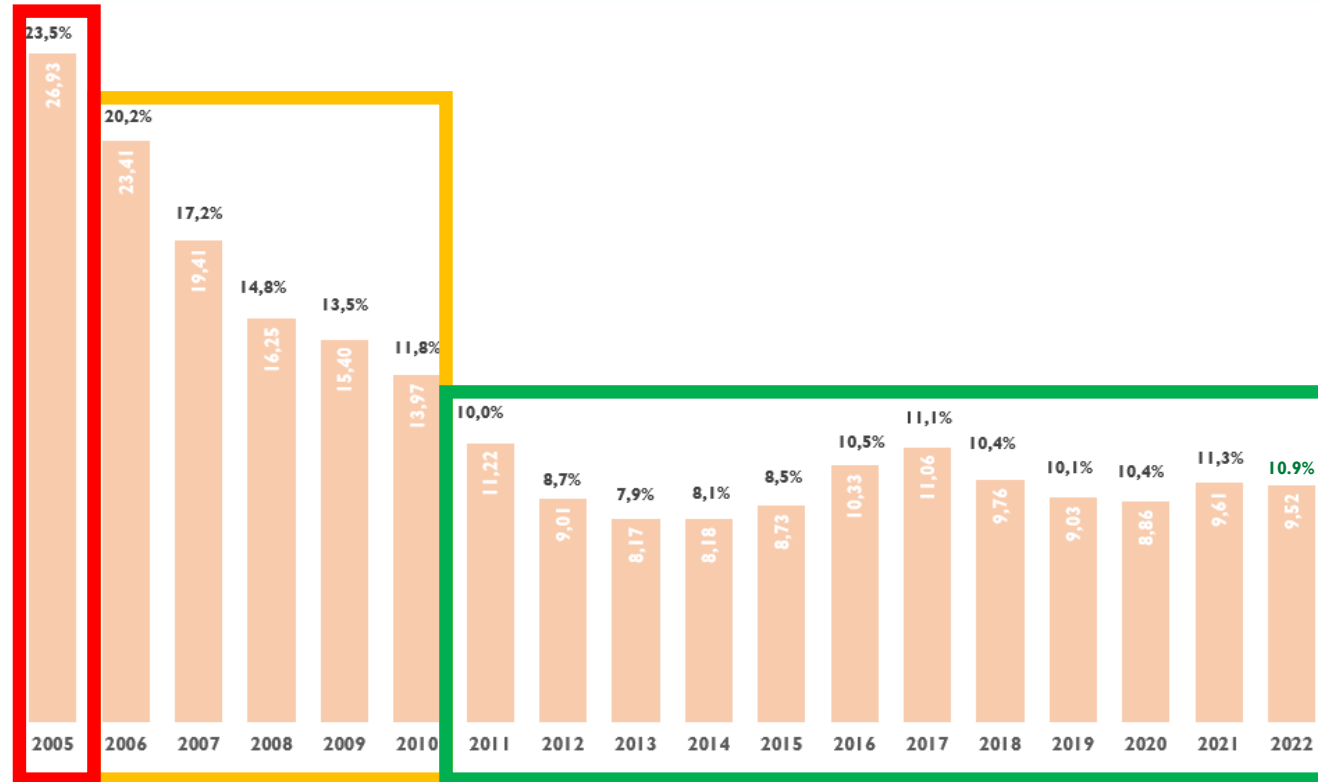
Leak reduction
in two DMAs
paid for entire
DMA project for
whole city in 2
years!



1.4 million
m³/year

NRW SUCCESS

National Average
28,8%
(2021)



- Impact of Network Rehabilitation & long-term, consolidated Active Leakage Control activities
- Enhanced network management & control capacity
- Positive results across all performance indicators
- Improved Resilience & greater know-how created within EPAL
- Recognised successful case study by IWA, World Bank, European Commission & EIB



Taking knowledge to others

Since 2009 EPAL has helped other utilities (worldwide) to reduce water losses:

- Training the utility's technical teams;
- Providing EPAL's technological solutions;
- Advising on ways to achieve more efficient management of water resources;
- Working in partnership helping to create more resilient companies in areas suffering from water scarcity;
- Proving why water loss control should be one of the priorities for promoting change at utilities.



KEY RECOMMENDATIONS

Provoke a cultural change at all levels & areas, adapting new concepts of management

Build water loss control capacity, both physical infrastructure & sufficiently trained staff

Acquire and retain empirical knowledge of the network within the organisation

Success achieved by creating a dedicated water loss control team, supported directly by management, with resources and responsibility over fundamental factors;

Water loss control concepts are well-known, the challenge of sustainably managing such systems over the long-term with constant vigilance is the key goal



<http://www.epal.pt/EPAL/menu/epal/publicações-técnicas>

And overall...

Common-sense solutions, Smart People



EPAL

Grupo Águas de Portugal

THANK YOU!

Nuno Medeiros | Andrew Donnelly | Ricardo Guimarães

27 April 2023