

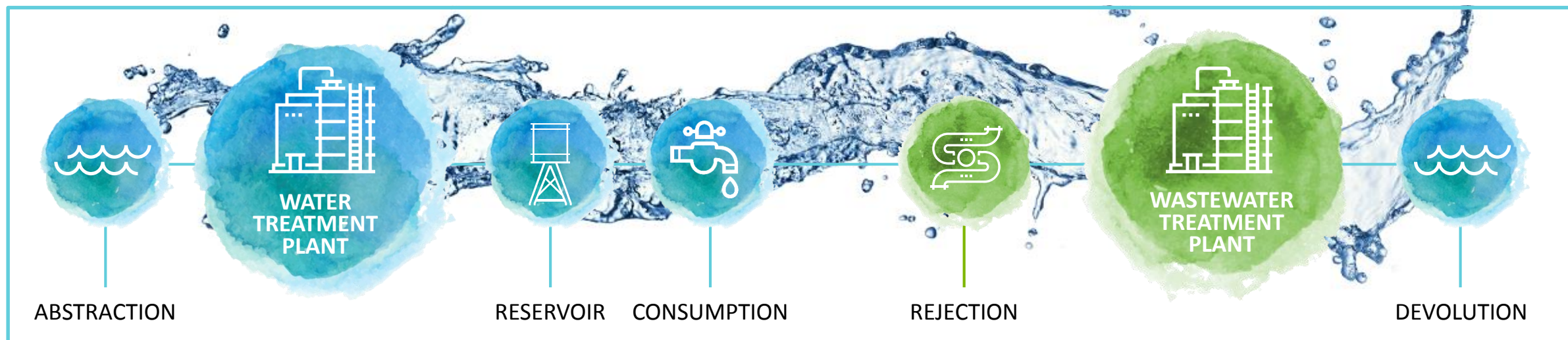
Circular Economy in a Water Utility

Águas de Portugal example

This is not an ADB material. The views expressed in this document are the views of the author/s and/or their organizations and do not necessarily reflect the views or policies of the Asian Development Bank, or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy and/or completeness of the material's contents, and accepts no responsibility for any direct or indirect consequence of their use or reliance, whether wholly or partially. Please feel free to contact the authors directly should you have queries.

ORGANIZATION

Águas de Portugal is a **state owned holding founded in 1993** with the mission of designing, building and managing **Water Supply and Waste Water Systems**, in a framework of economic, social and environmental sustainability.



REGIONAL WATER AND WASTEWATER UTILITIES



SHARED SERVICES



INTERNATIONAL



WATER SUPPLY AND WASTEWATER SYSTEMS

157 WTP

1155 water intakes

992 WWTP

16 386 km
Water trunks and networks

1734 reservoirs

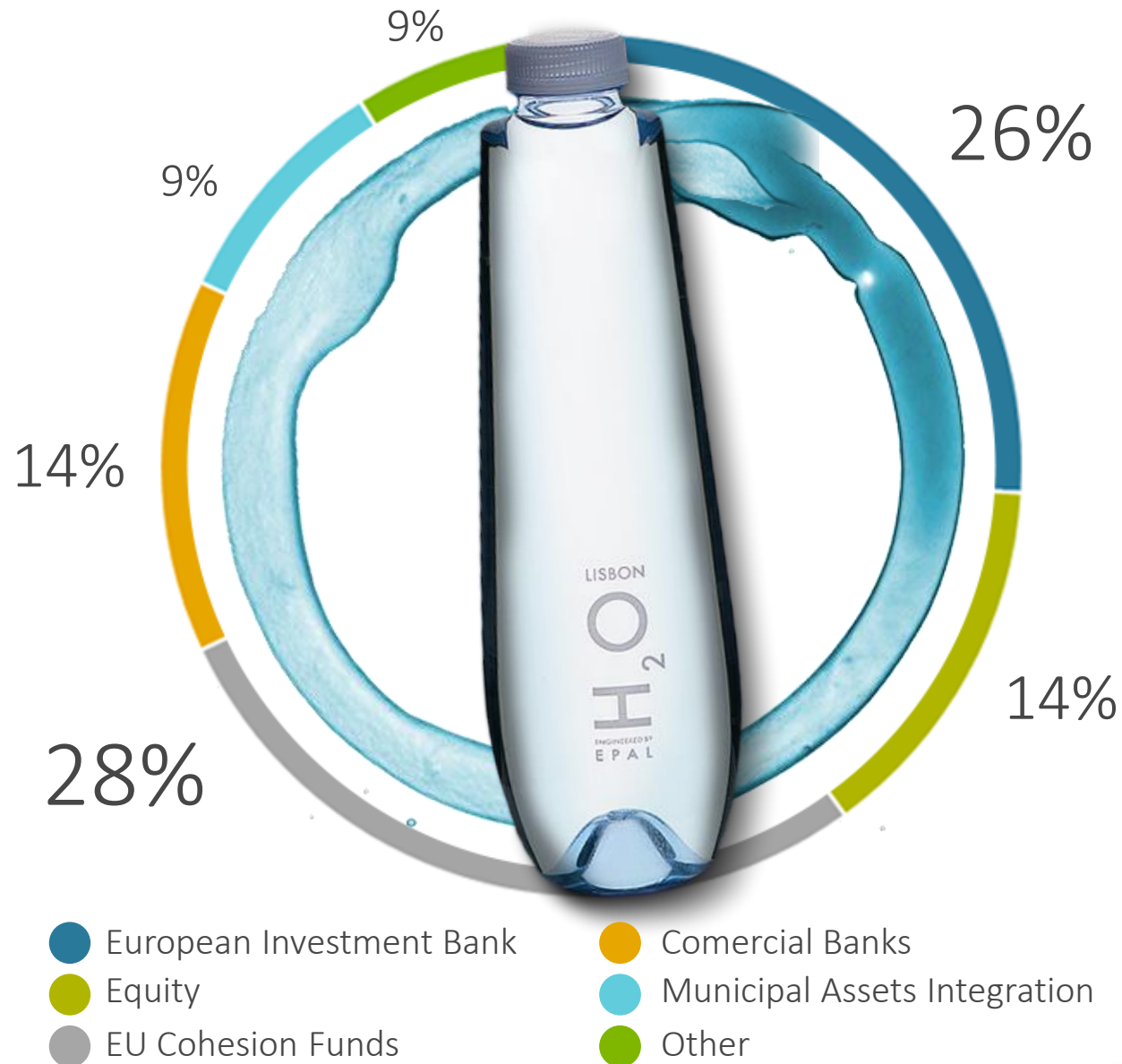
9 465 km
Sewerage network

2 719
Water and wastewater
pumping stations

AdP utilities
manage thousands
of infrastructures



INFRASTRUCTURES INVESTMENT 1993 TO 2018 **7.6 billion €**



Turnover | 2018

658 M€

Operational Result | 2018

165 M€

EBITDA | 2018

343 M€

Net Profit | 2018

87 M€

A WIDE RANGE OF SOLUTIONS FOR DIFFERENT CONTEXTS

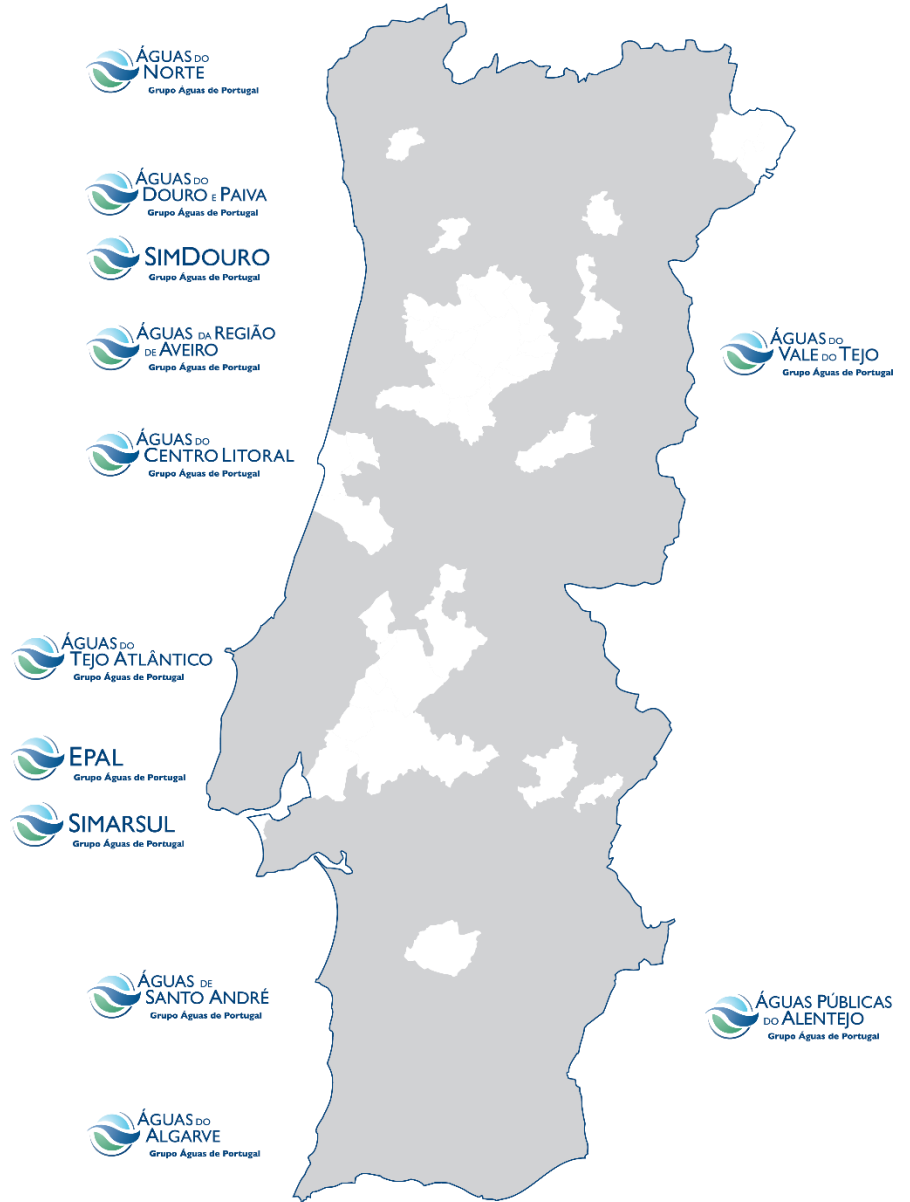
Services provision
to **80% of the**
Portuguese Population



In the last 20 years the
Águas de Portugal Group has
created **12 water supply
and sanitation regional
utilities** serving 8 million people

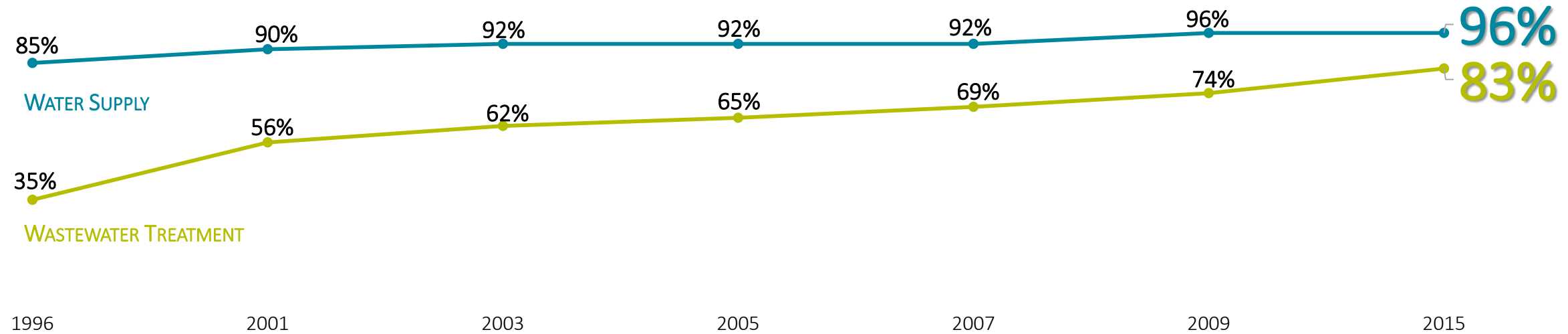


From highly density
urban areas to rural regions;
From **small decentralized systems**
to large **High-Tech and Smart Systems**

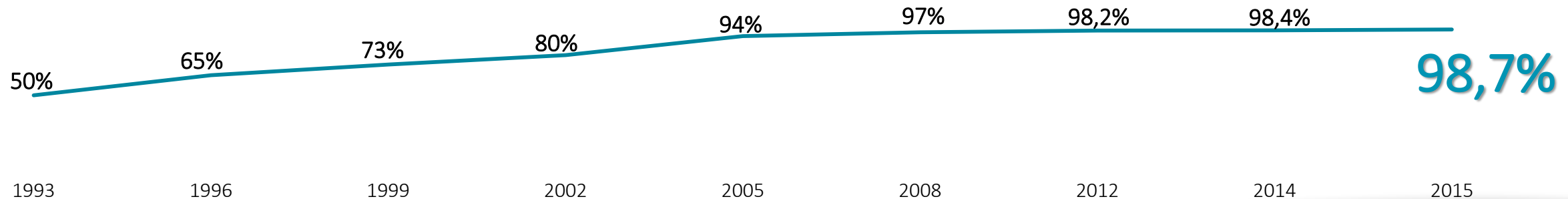


ACHIEVEMENTS

EVOLUTION OF SERVED POPULATION



WATER CONTROLLED AND ACHIEVING GOOD QUALITY

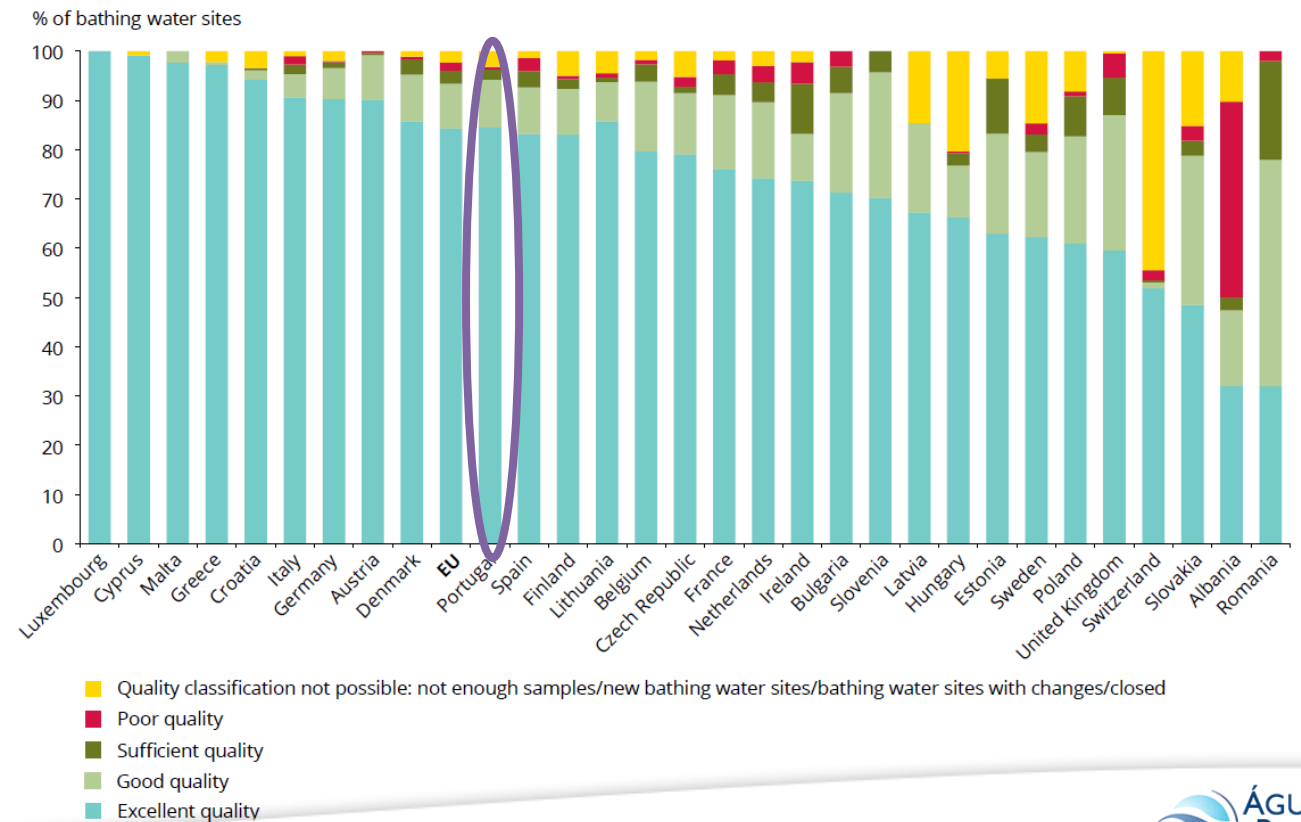


ACHIEVEMENTS



BATHING WATERS QUALITY

320 beaches with "Blue Flag" status





OUR PEOPLE, OUR COMPETENCES

3 155 professionals, working in the fields of **engineering**, asset management, operation and maintenance, investments planning, smart systems, energy efficiency, laboratories and others



ADP INTERNACIONAL

Moved by water

Moved by the future



OUR INTERNATIONAL ACTIVITIES



Rua Francisco Sotto Mayor n.º 72 A
Bairro Azul | Luanda | Angola



Av. 20 de Maio, n.º 9 | Vila Verde, Dili
Timor Leste



Av. Unidade Africana n.º 26 | Bissau
Guiné Bissau



Rua Daniel Napatima, 300 | Bairro
Sommerschield | Maputo | Moçambique



Rampa Terra Branca (Pred. Trib. Const.)
Chã de Areia | Praia | Cabo Verde

THE CIRCULAR ECONOMY

Regenerative and restorative economic model, where **resources** are managed in a way that **preserves their value and usefulness for the longest time**, thus **increasing their productivity** and **preserving the natural capital and financial capital** of companies and civil society.

- **Shift** from a **conventional model** that has been designed for linear production and consumption patterns to a model that supports the **circular economy**.
- **Water utilities** are providers of drinking water, treated wastewater and are also suppliers of **valuable resources**.



Image credit: [European Commission](#)

CIRCULAR ECONOMY



The water pathway

- Water efficiency
- Wastewater reuse



The materials pathway

- Resources efficiency
- Drinking Water Sludge to industry
- Sewage sludge and compost to agriculture



The energy pathway

- Energy efficiency
- Energy production

The water pathway



- **Bridge the gap** between water supply and demand
- The water pathway should be developed as a **closed loop system**, with cascading water quality options, using the **fit for propose approach**
- Ensure **diversified resource options**, efficient conveyance systems and **optimal reuse**

Water efficiency

Leakage management and control | active leakage control;
WONE – Water Optimization for Network Efficiency

Reduction in Water Consumption | encourage reduced
consumption by awareness raising for example with campaigns or water
metering



CHALLENGE

WONE

Water Optimization for Network Efficiency

Annual NRW volume of 40 million m³

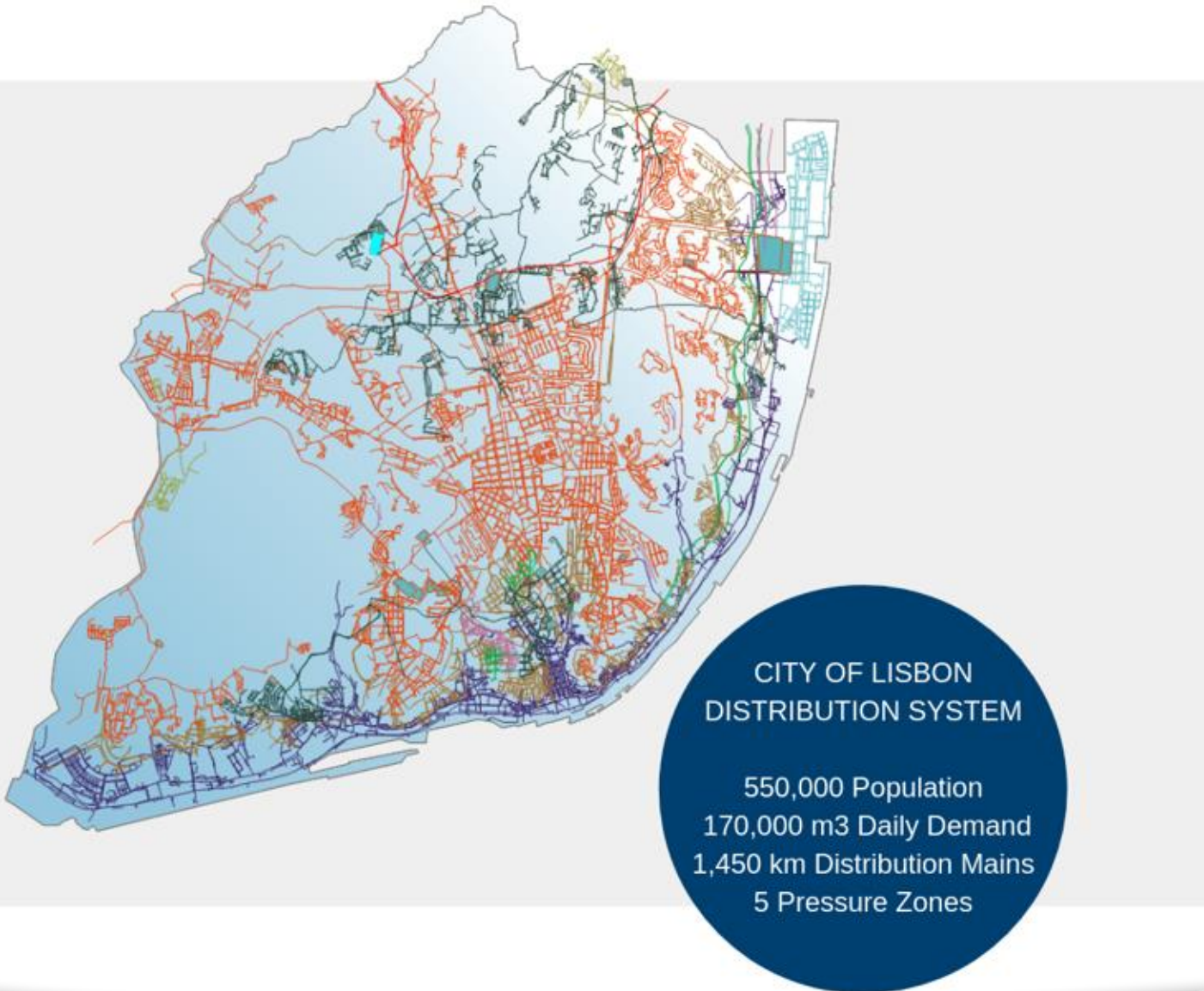
in Lisbon distribution network

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

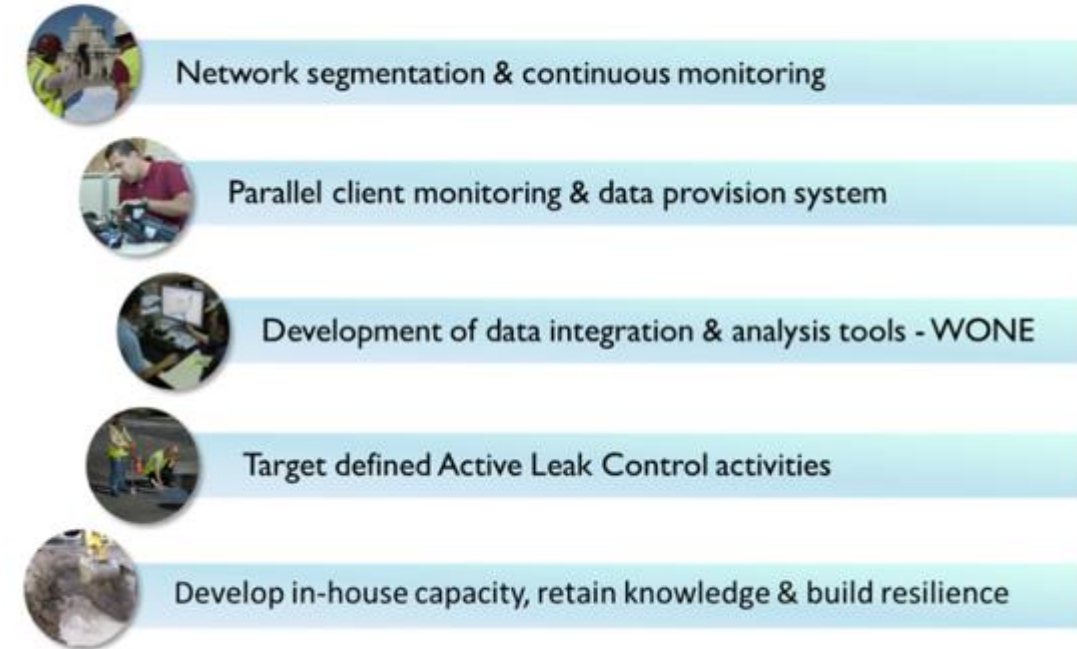
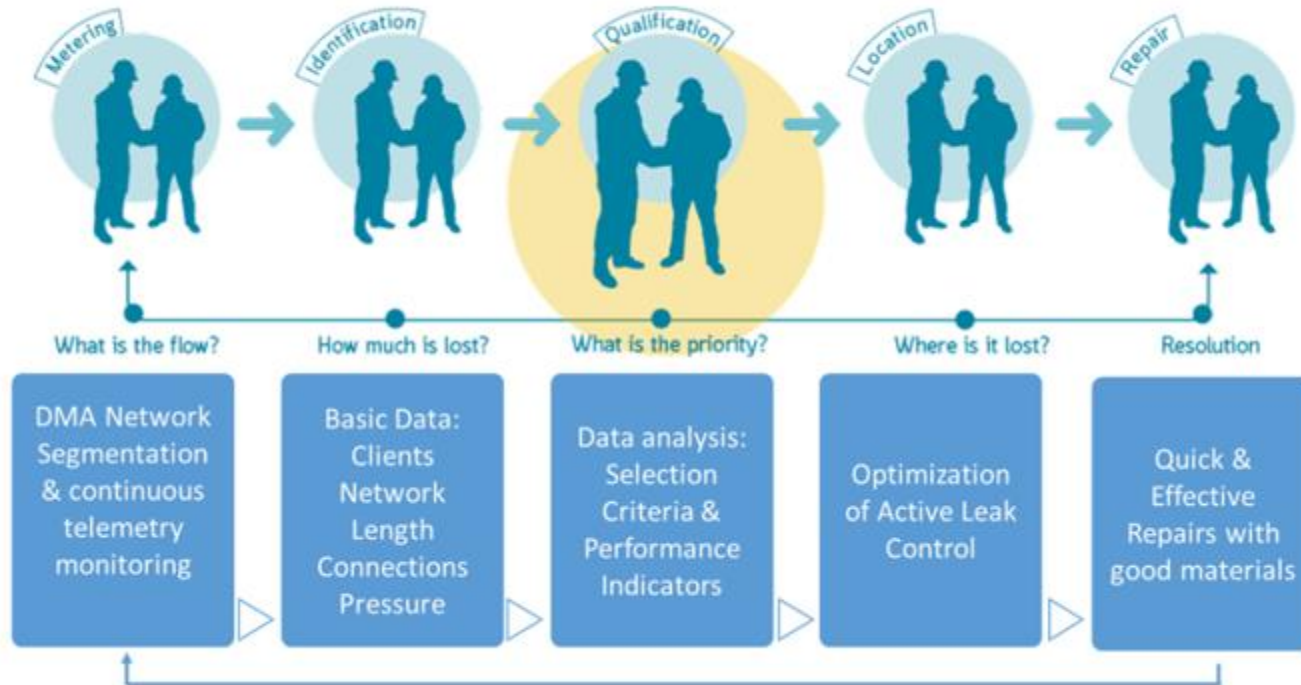
by adopting and adapting best practice used
by the most efficient global water utilities



SOLUTION

WONE

Water Optimization for Network Efficiency



- Data management for the 161 DMA implemented
- Integration and analysis software
- Practical performance indicators
- System alarm & Alert management
- Leakage assessment & Target setting
- Surgical control of leakage

**Internationally
recognised by many
awards and other
distinctions**

CHALLENGES

WATERBEEP
Smart efficiency

Lack of awareness and engagement among citizens to the water cause

To support users to make a responsible water consumption

To promote sustainable & efficient resource usage in the Lisbon distribution network



SOLUTION

WATERBEEP
Smart efficiency

A smart solution that gives **customers information** about their **water consumption**, allowing them to optimize the use of water in their homes or business

Encourages consumption reduction by **awareness raising**

Features

- Check the billed water consumption in recent months
- Discover the average daily consumption per person and compare it with the typical local figures
- Meter reading
- See the evolution of consumption over the choice of the costumer
- Check the water consumption (7 & 30 days), and every 15 min from previous day
- Receive consumptions alerts
- Receive water consumption information in a customized file



Wastewater reuse

Urban areas

Internal wastewater recycle | WWTP general and equipment washing; WWTP green areas irrigation; service water in internal processes

Urban green areas | Irrigation of urban green areas and municipality parks

Street cleaning | Water reuse in street cleaning by tanker trucks

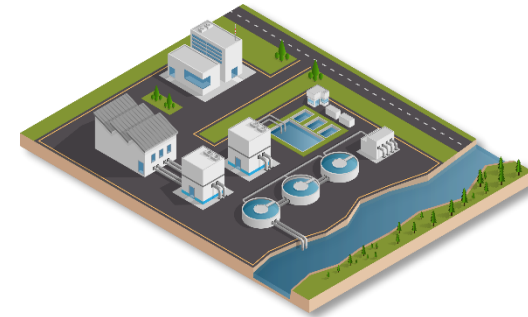
Industrial use | Building climate control



Water driving the circular economy



INTENSIVE AGRICULTURE



URBAN WATER CYCLE

TREATED WASTEWATER
(nutrients N+P)

SLUDGE
(nutrients & organic matter)

CHALLENGE



using technologies of reduced operational cost (solar radiation) and its use in the irrigation activity (pomegranate tree)



The materials pathway



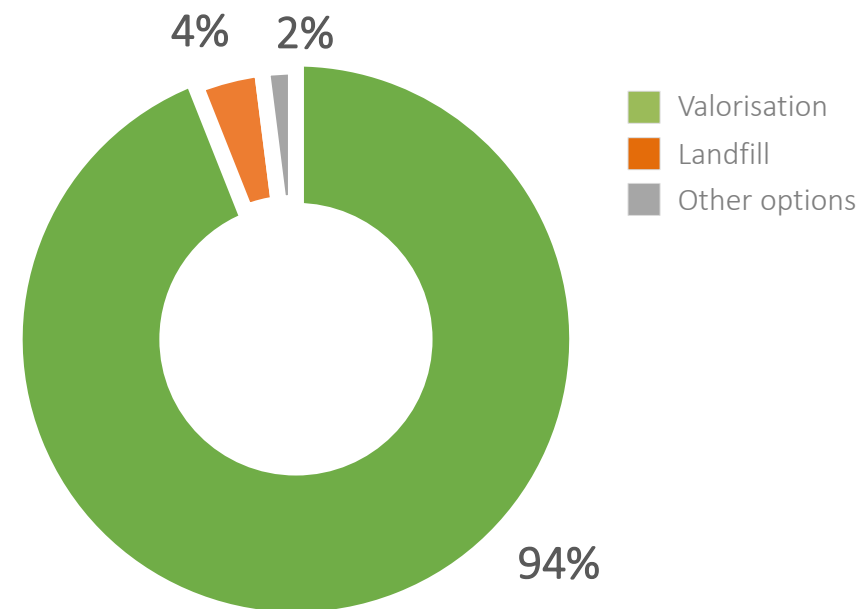
- **Resource recovery** must compete in a demand driven market
- Barriers like **scale dimension**, **consumer acceptance** and **price** must be overcome
- **Niche market** and **collaboration** might be drivers to the success

The materials pathway

Drinking water sludge to industry | Production of cement clinker; Production of ceramic materials

Sewage sludge to agriculture | Organic matter to improve soil structure and nutrients (N, P, micronutrients) to match crop needs

Sewage sludge management options (Jan- Sep 2018)



The energy pathway



Electrical energy consumption

730 GWh/year (709 from grid + 21,5 self-production)

Portugal consumption

1,4%

Emissions | 2018

333 mton CO₂

Water electric energy consumption

0,71 kWh/m³

WW electric energy consumption

0,48 kWh/m³

- **Water and wastewater systems** are important **energy consumers**, contributing to green-house gas emissions
- **Energy portfolio** should reduce **carbon-based energy consumption**, increase renewable energy consumption and increase **renewable energy production**

The energy pathway

PEPE - AdP Energy Efficiency and Generation Plan (2017-2020)

Increase on-site energy generation

- Increase self generation (doubling to achieve 50 GWh/year)

Optimize energy consumption

- Reduce energy consumption (9%)

Improve energy procurement and energy supply management

- Improve the conditions of electric energy acquisition

Increase electric mobility

Energy production

PV Solar Electricity |

PV plants: **316 units**

Installed power: **3 345 kW**

Implementation area: **24 000 m²**

Anaerobic Digestion | 28 WWTP with anaerobic digestion; biogas combined heat and power generation

AD Installed capacity: **140 000 m³**

Produced energy from biogas: **21 GWh**

Average neutrality WWTP with AD: **32%**



Energy consumption optimization

1. Audits and studies

- To conduct energy efficiency audits
- To assess consumption patterns

2. Operational measures

- Energy management systems and sensors
- Operational routines optimization to reduce energy consumption

3. Structural measures

- Acquisition of energy efficient equipment
- Plant revamping to become more energy efficient

111 infrastructures

With ISO 50 001 Certification

62 energy auditors

In our companies

Data from 2017



Electric mobility



Car fleet renewal:

- 127 new electric vehicles
- 76 Passenger cars
- 51 Light commercial vehicles
- 134 Electric vehicle charging points
- 240 ton / year CO₂ emissions reduction



Final remarks

- Shifting from a conventional model to a model that supports the **Circular Economy** is a global challenge
- **Water utilities** are providers of drinking water and treated wastewater but also of **valuable resources**
- **Water, energy and materials pathways** are all important to the **Water Circular Economy**
- The **water pathway** includes bridging the gap between water supply and demand, ensuring **diversified resource options, efficient conveyance systems** and **optimal reuse**
- The materials pathway include **sludge and other materials reuse and recovery**
- The **energy pathway** should reduce carbon-based energy consumption and **increase renewable energy production** (using water and WW resources like biogas)
- **Sustainable cost recovery** and **collaboration** might be drivers to improve **Water Circular Economy**

