

Rural Wastewater Treatment Workshop

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CONTENTS

Short AdP presentation

How did we get here?

Rural systems approach

Tools and achievements

Current challenges

Portugal in a glance

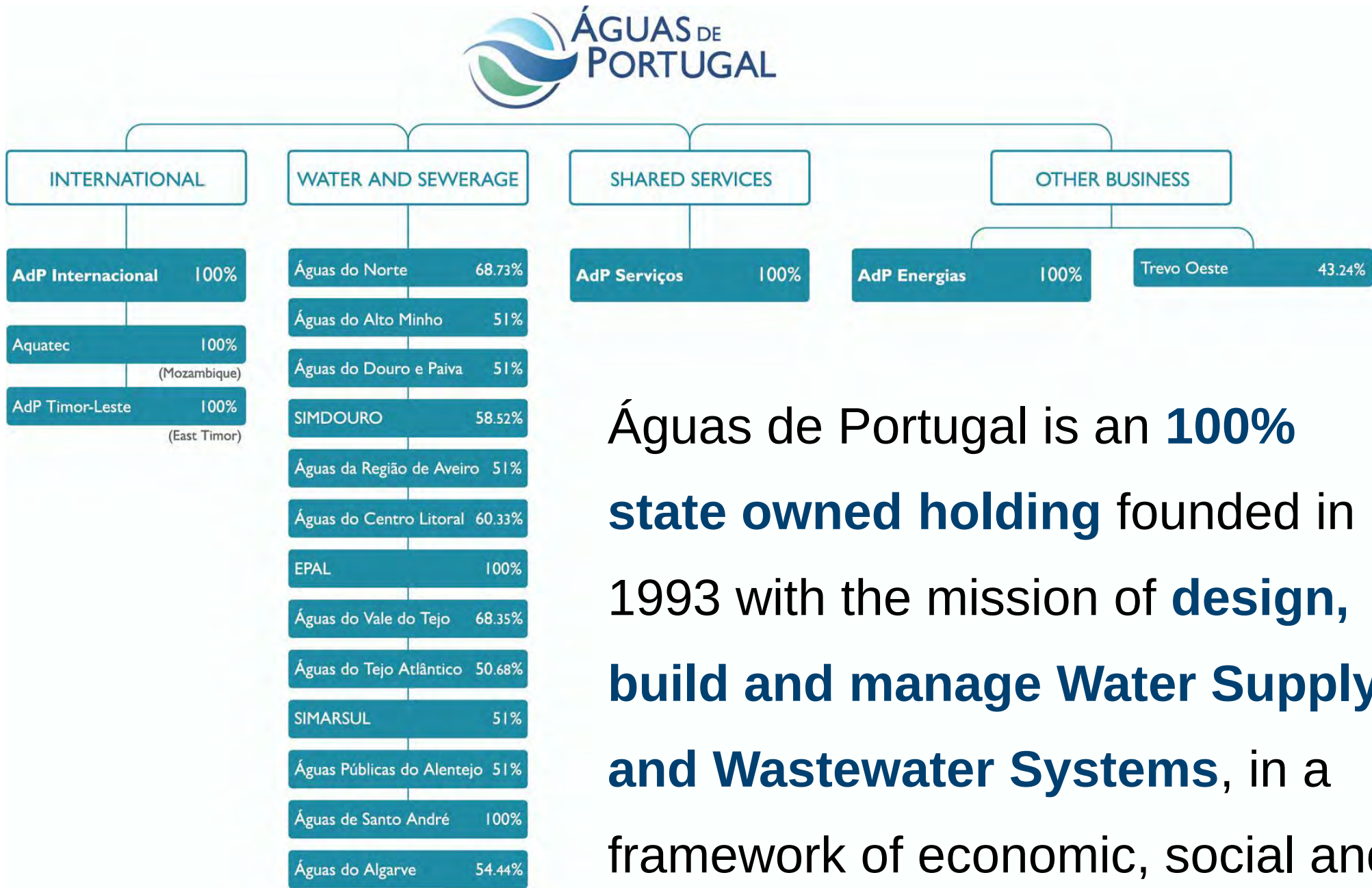
- 10 million inhabitants
- Mediterranean climate
- Strong asymmetries in flow regime: inter and intra-annual
- Strong asymmetries on demographics: country side and litoral;
- Water regulation schemes (involving several large dams).
- Shared river basins with Spain
- Tourism and beaches
- 70% of water demand for irrigation





AdP TODAY

OUR GROUP



Águas de Portugal is an **100% state owned holding** founded in 1993 with the mission of **design, build and manage Water Supply and Wastewater Systems**, in a framework of economic, social and environmental sustainability.

7,400 M€

Total assets

691.5 M€

Turnover

80%

of portuguese population served

3,308 Employees

and 13 operational companies

(2019)

WATER SUPPLY AND WASTEWATER SYSTEMS



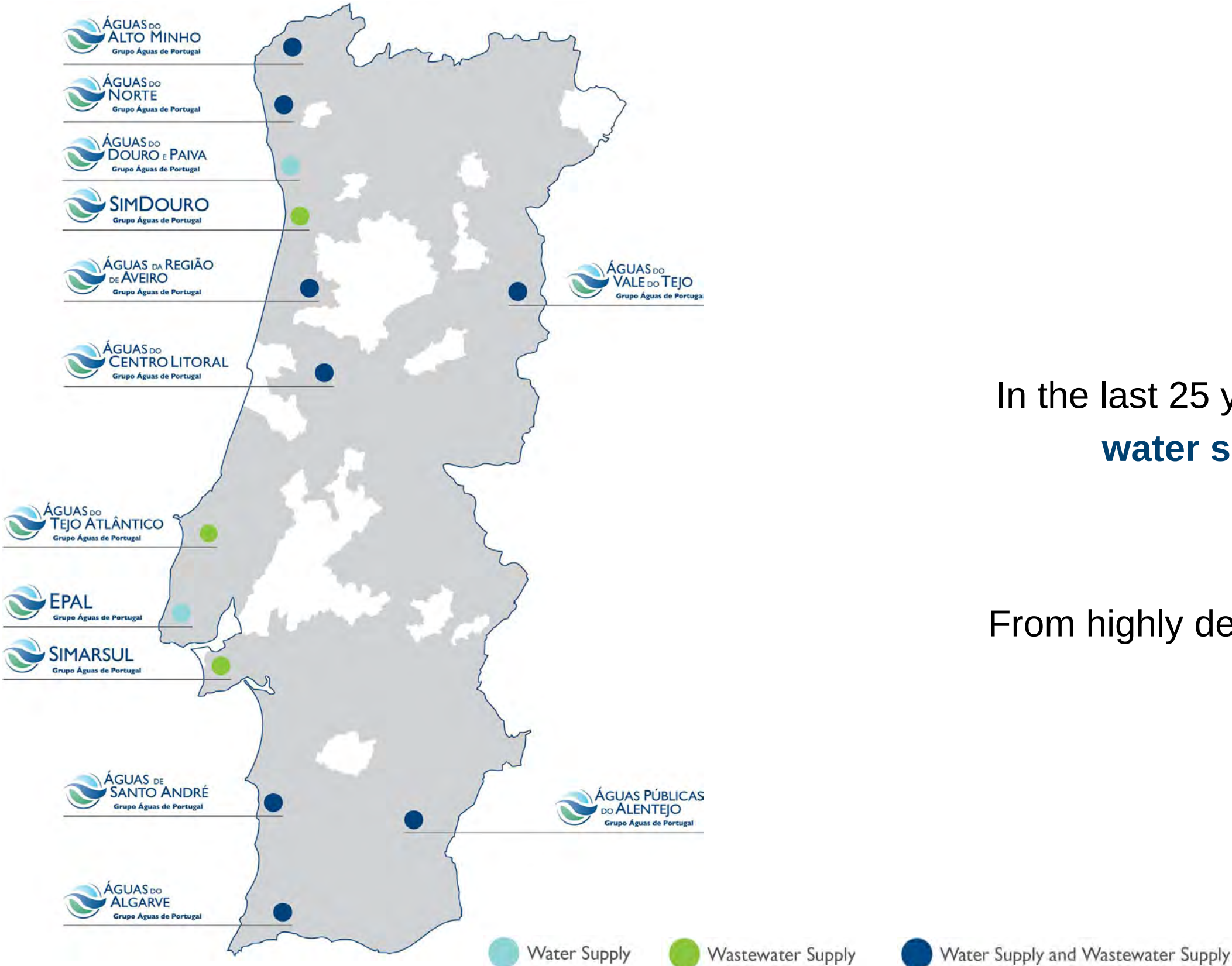
- **150**
WTP
- **1 135**
Water intakes
- **970**
WWTP
- **16 386 km**
Water trunks and networks
- **1 680**
Reservoirs
- **9 465 km**
Sewerage networks
- **2 510**
Water and wastewater pumping stations

(2019)



AdP utilities
**manage thousands
of infrastructures**

A WIDE RANGE OF SOLUTIONS FOR DIFFERENT CONTEXTS



Services provision to
80% of the Portuguese Population



In the last 25 years, the AdP Group has created **many water supply and sanitation regional utilities**



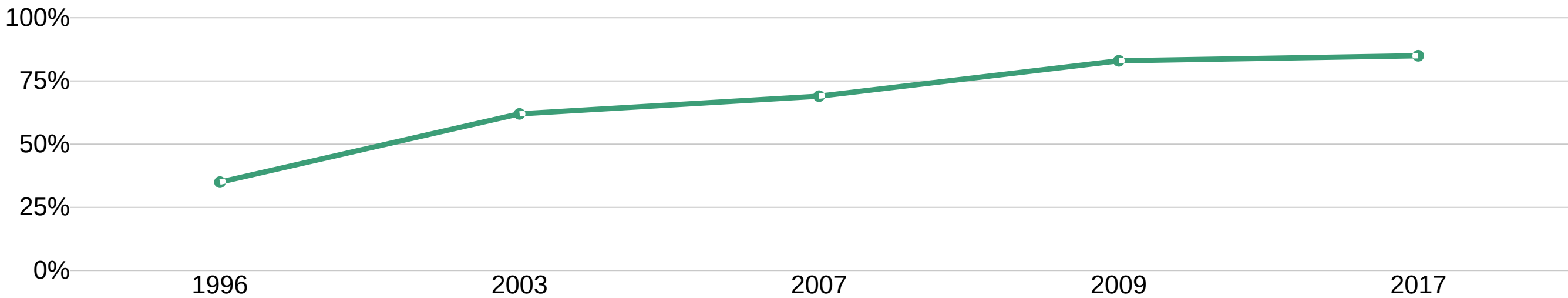
From highly density urban areas to rural regions. From small decentralized systems to **large high-tech and smart systems**



ACHIEVEMENTS

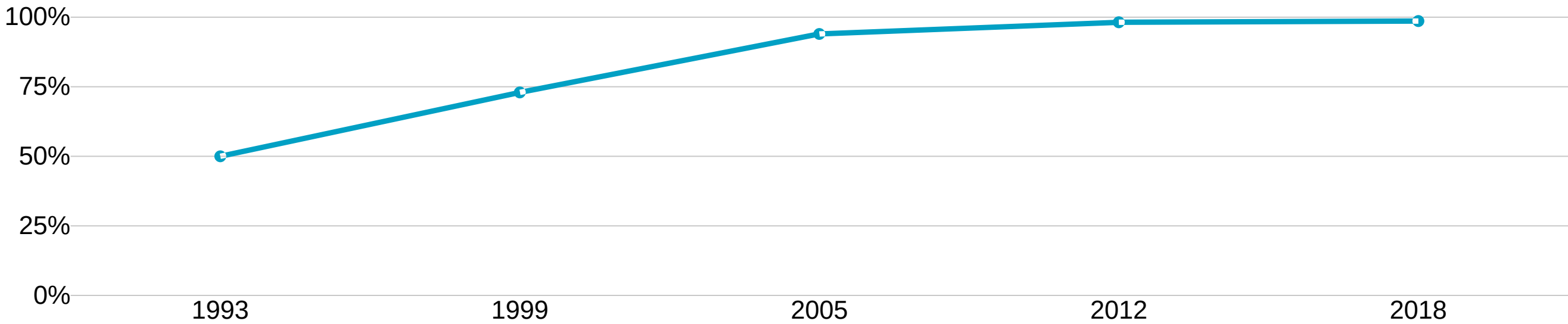


Population served by wastewater services*



Source: PORDATA
*Does not include private solutions

Water controlled and achieving good quality



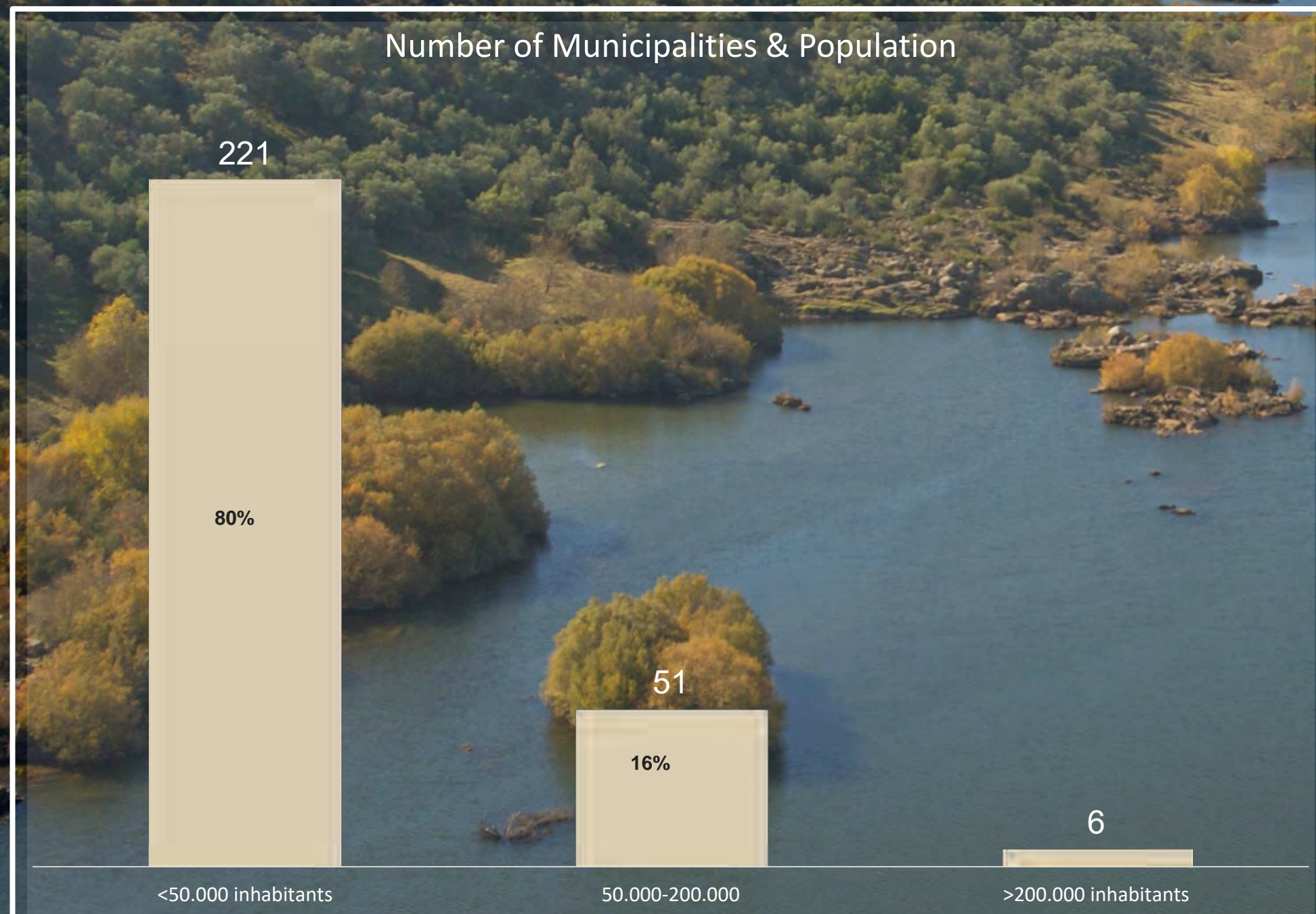
Source: ERSAR (Portuguese Water and Waste Sectors Regulator)



HOW DID WE GET **HERE** ? The Multimunicipal Model

Portugal 25 years ago...

Fragmented municipal operators



15%

Population served by waste water treatment systems

50%

Safe water distributed to the population

75%

Population connected to a public water supply systems

PORTUGAL 25 years ago...

Infrastructure Gap

Heavy investment required and available funds wasted...

Low performance, low quality

Unsafe water, intermittent supply, polluted rivers

Inefficiency

No corporatization; municipal direct management

Talent deficit

Insufficient skilled professionals on small operators

Unsustainability

Only a small part of the costs were being recovered

Lack of transparency

No information to consumers and stakeholders

One exception

EPAL, public utility operating under commercial law, water provider of 20 municipalities around Lisbon.

An institutional reform was needed

1993

Central Government decided to built upon the example and experience of EPAL

The Institutional Reform



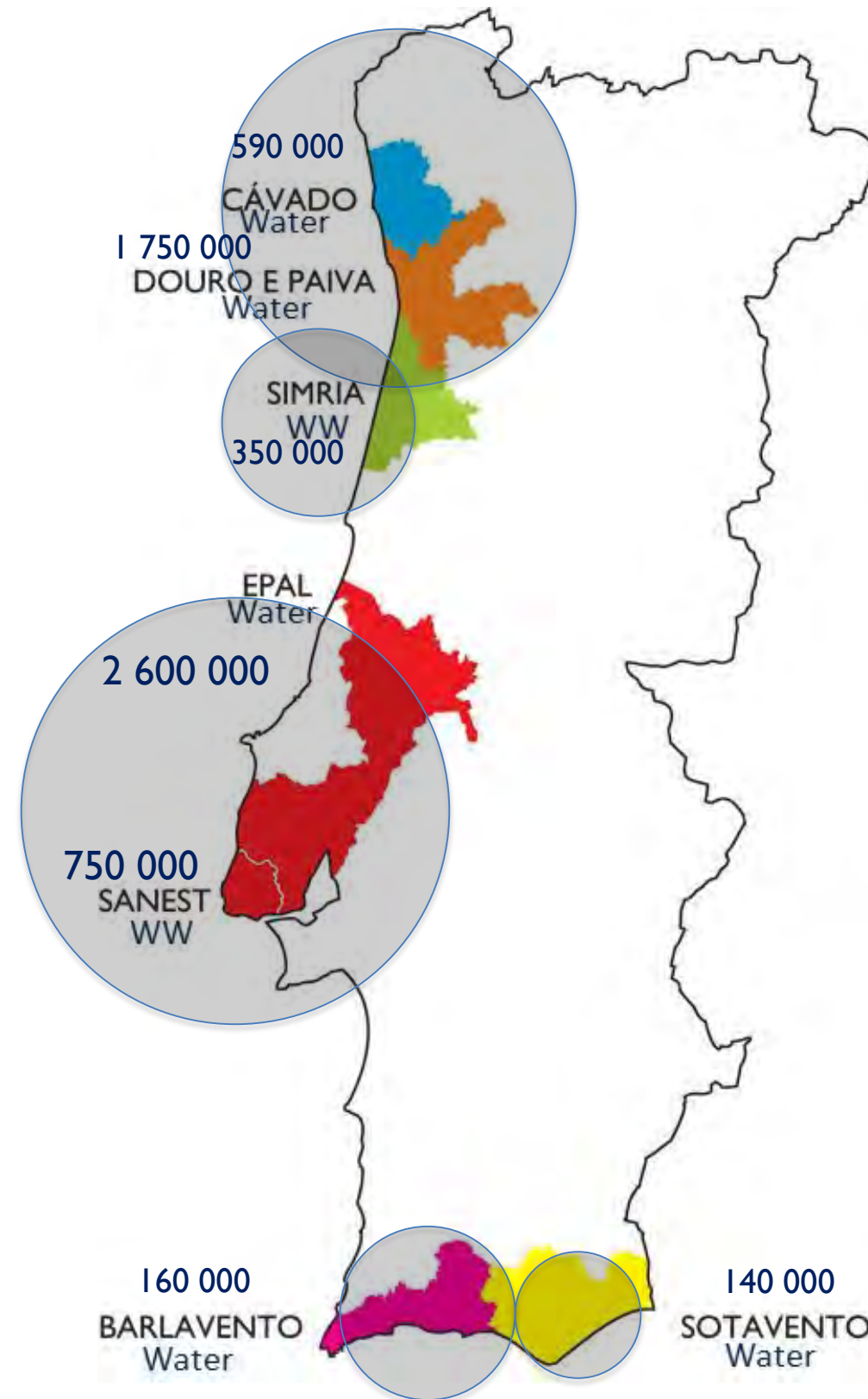
The Multimunicipal Systems

- **Multimunicipal companies provide wholesale water services** to the municipalities, through an **in-house contract** is awarded by the Government to these SOE.
- **Contract includes a capital investment plan** for the duration of the contract.
- **Full cost recovery tariffs are set annually** by the Regulator on the basis of a budget presented by the company.
- **Cost-of-service model** with a fixed return on capital
- **Benchmarking by the National Regulator** by annually monitoring a set of KPI's.



First Generation of Multimunicipal systems

- Focus on regional critical challenges
- Separated companies for water supply and wastewater
- Densely populated metropolitan areas
- Mature projects and master plans available
- Grants from Cohesion Fund were made available

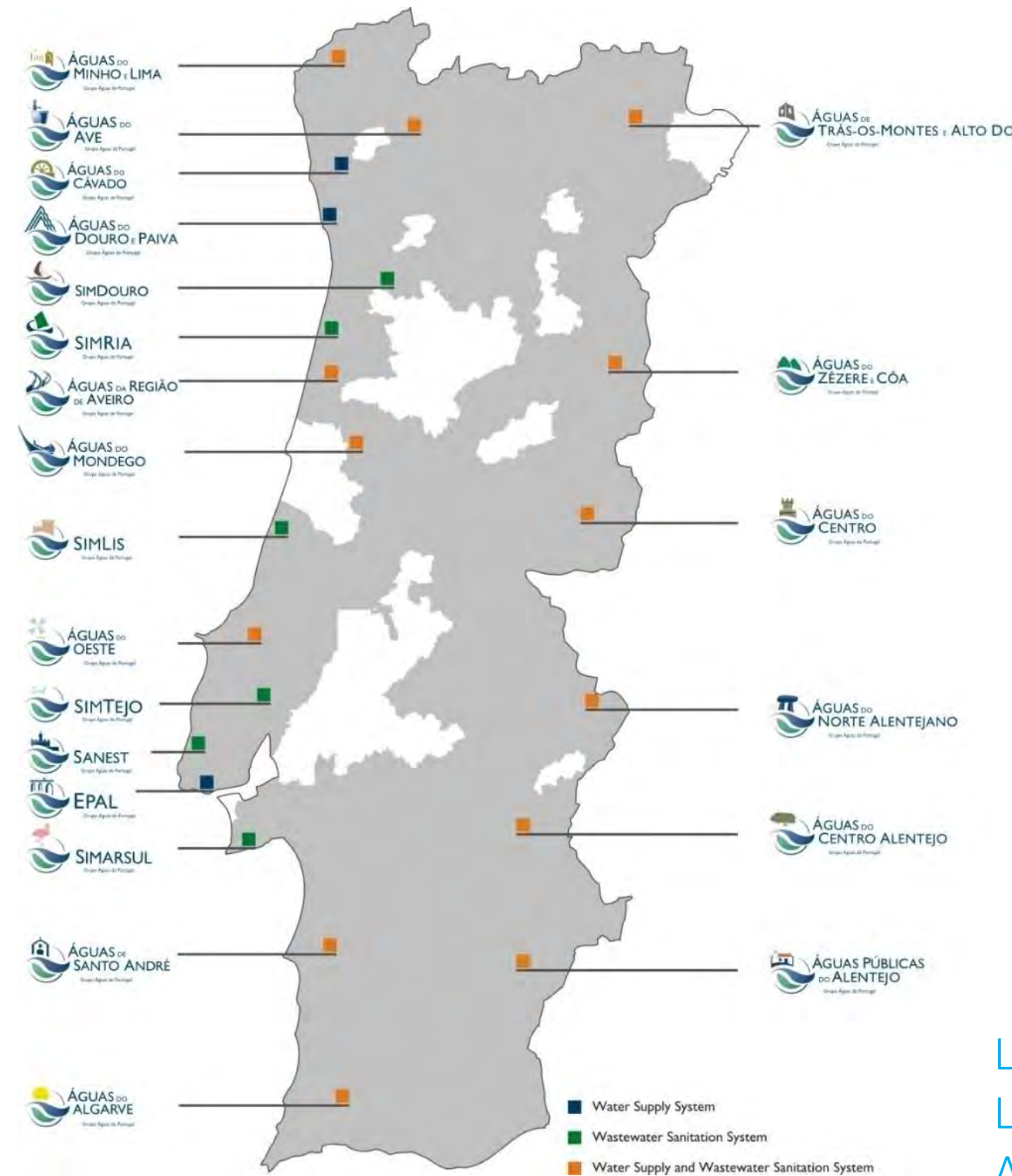


RESULTS ACHIEVED BY 1999

- **Relevant scale economies** and efficient regional infrastructural systems.
- **Great improvement** in water services in metropolitan areas.
- **Effectiveness** in EU funds application.
- **Accomplishment** of EU environmental standards.
- **Full cost-recovery** implementation in bulk water services.

Multimunicipal systems 2nd Generation

In face of the good results, in **2000** the Central Government decided to extend the solution to other parts of the country



But...



Low population density
Low income
Aged population
Decreasing demography
Frequently adverse topography

HOW TO CLOSE THE RURAL ACCESS GAP TO WASTEWATER TREATMENT AND SANITATION SERVICES ?

Small and very small WTPP were needed (more than 500)

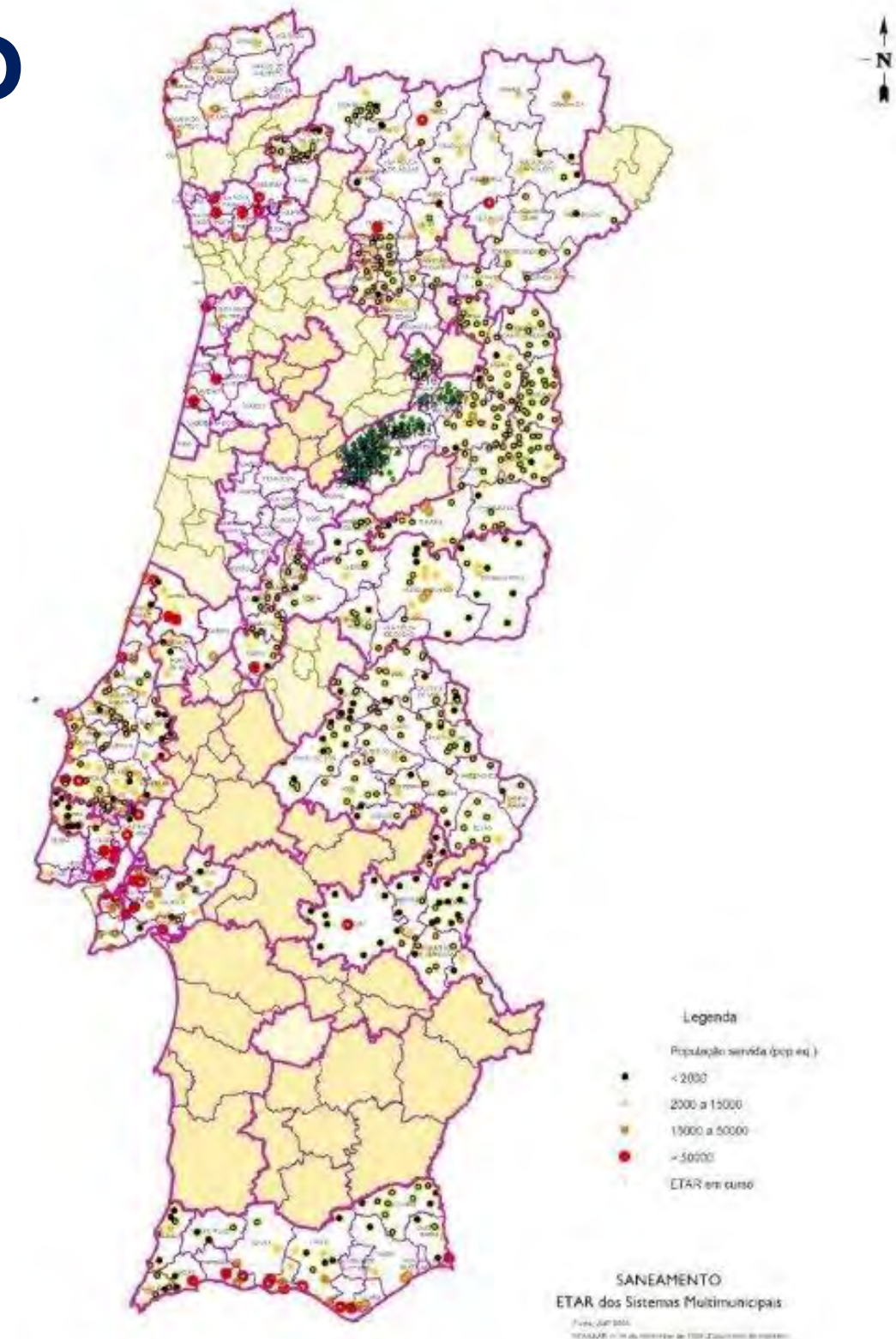
Largest part below 2000 Inhab.

Serve only 6% of the national population

Represent 20% of the global investment

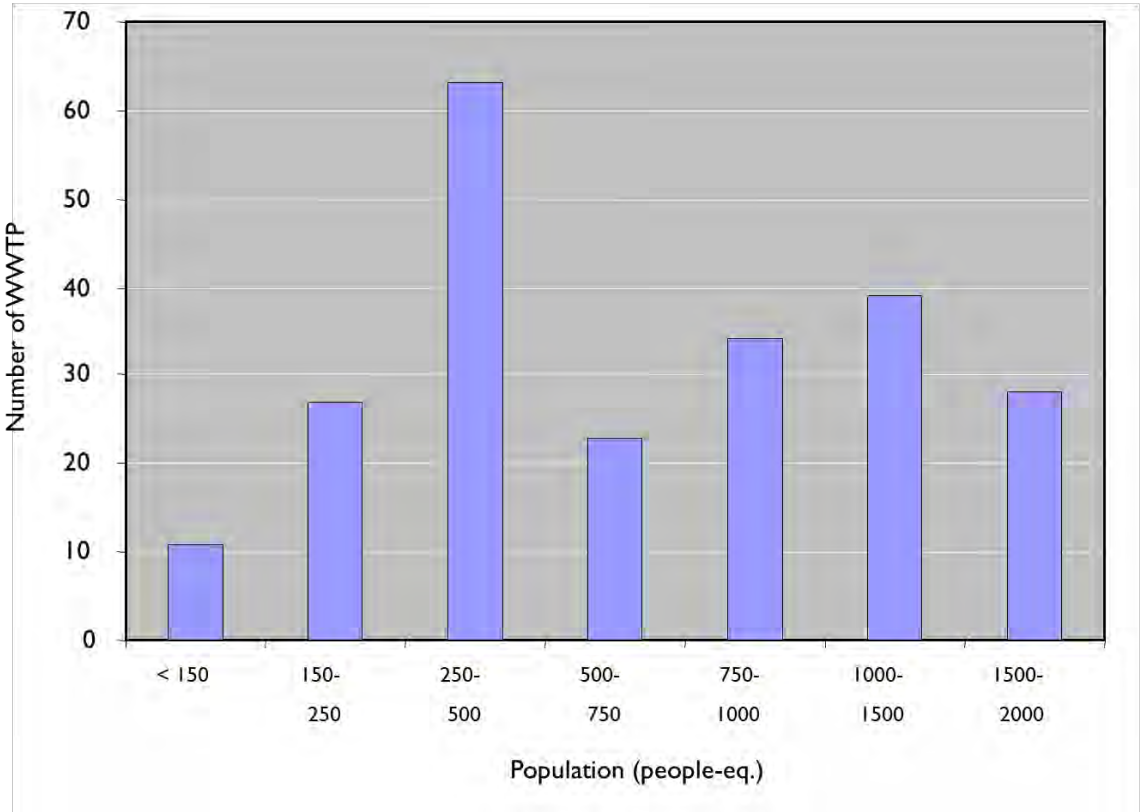
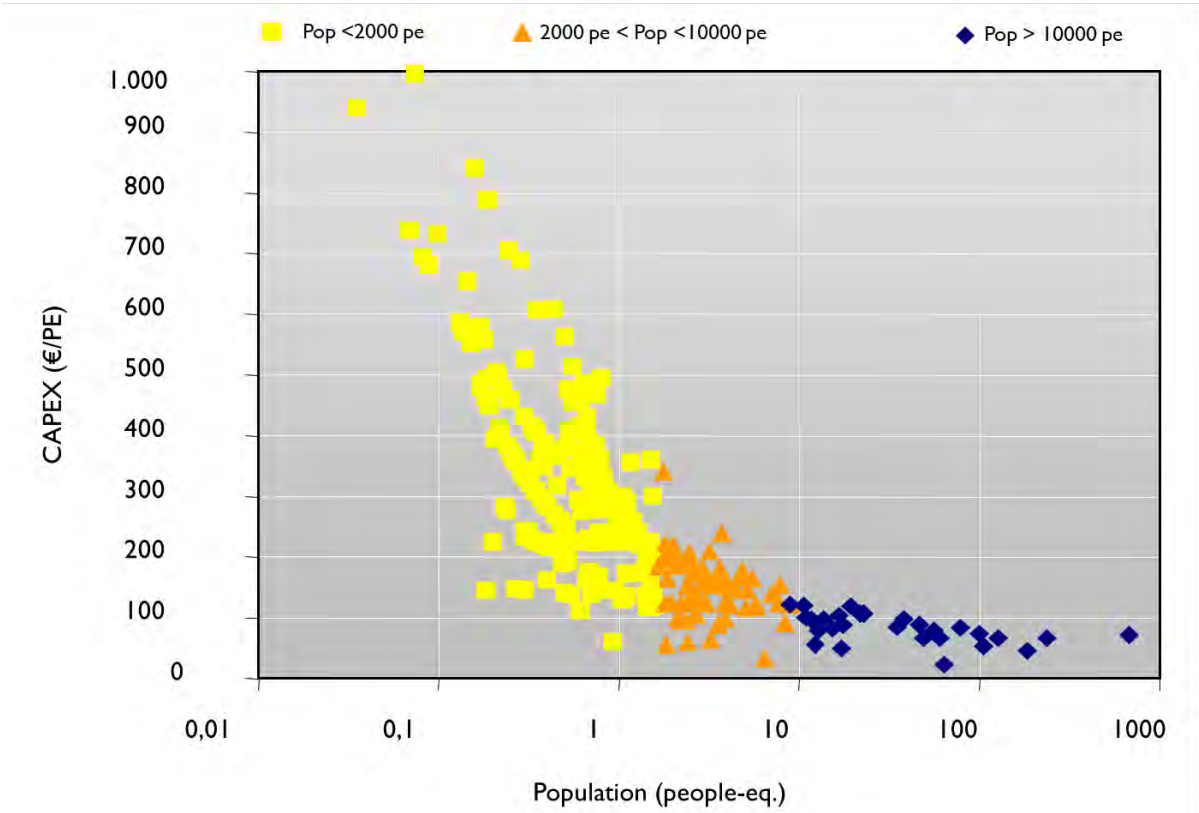
Represent an high investment per capita

Slow investment process



AdP's small size WWTP

	WWTP SIZE		
	< 2 000	2 000 - 10 000	> 10 000
TOTAL WWTP	70%	22%	8%
TOTAL POPULATION (hab.-eq.)	6%	11%	83%
TOTAL INVESTMENT	19%	17%	64%
INVESTMENT PER CAPITA *(€/PE)	266	146	70



Our Goals

- Standardization of < 2000 PE WWTP
- Minimization of project, tendering and construction time
- CAPEX and OPEX optimized solutions
- Full compliance with legal discharge limits
- Optimization of O&M teams
- Optimization of small WWTP management



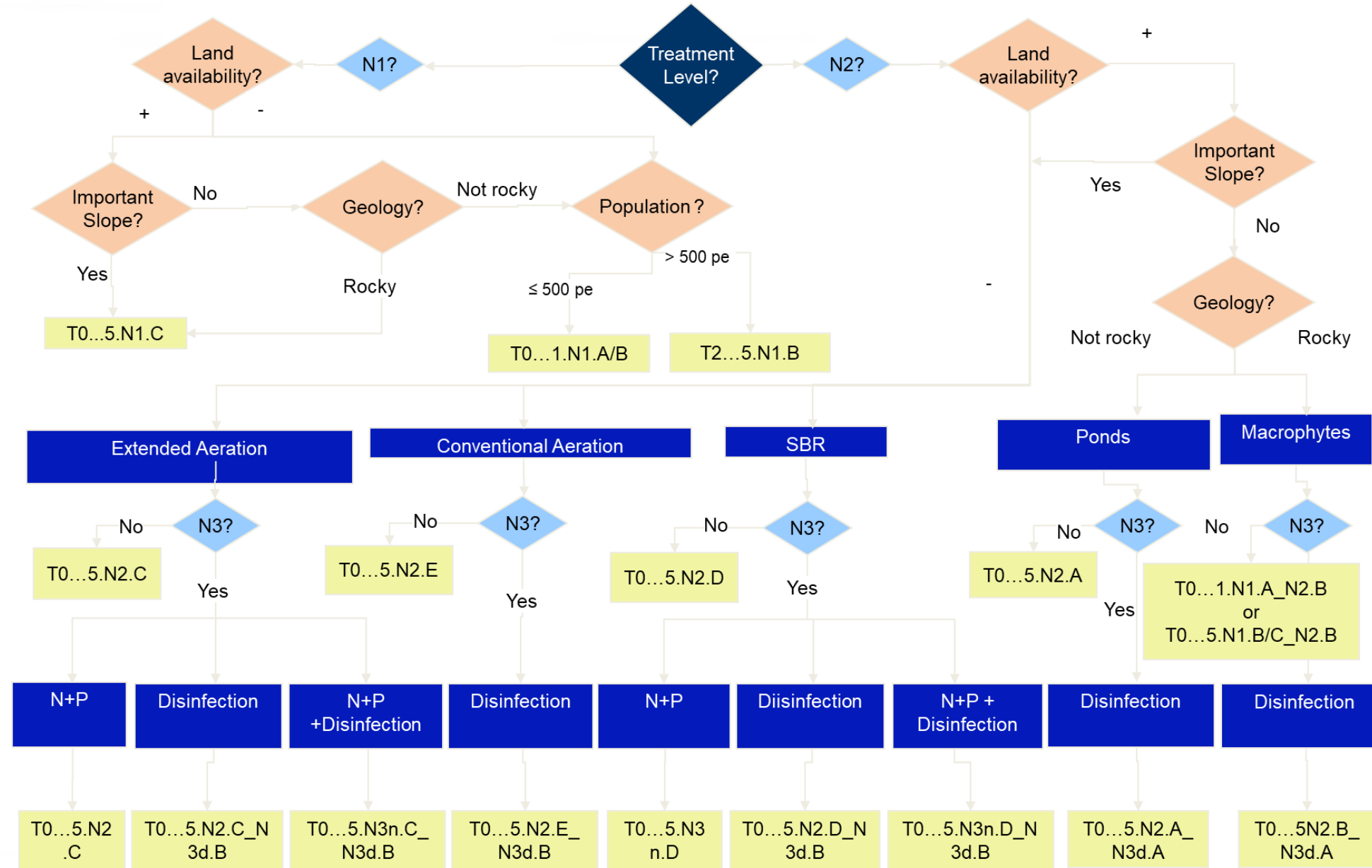
Our approach

- A global solution, from inlet works to discharge rather than a “technological” solution focused on each of the different treatment stages
- Production of decision support software
- Production of standard documents :
 - Price lists
 - Drawings
 - Project specifications (process, civil, equipment, electrics)
 - Tender documents



Tool

AdP standard solutions – decision support tool



- Population
- Required treatment level
- If tertiary, N+P, disinfection or both?
- Available land
- Site characteristics (plain or sloping, rocky or not)

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AdP standard solutions – decision support tool

The range Standard Solutions

T0 – 250 PE

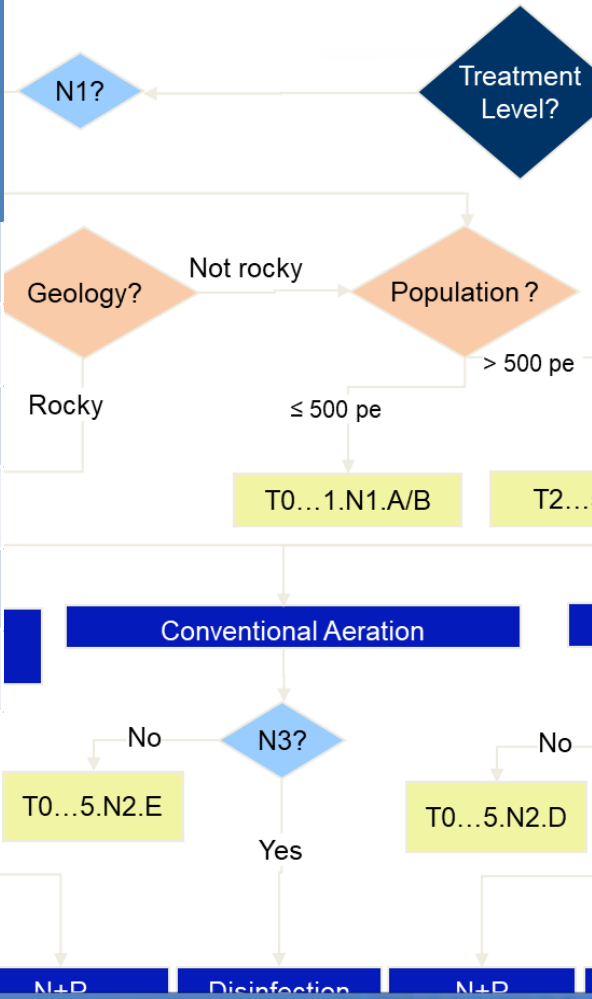
T1 – 500 PE

T2 – 750 PE

T3 – 1.000 PE

T4 – 1.500 PE

T5 – 2.000 PE



Treatment level	Parameter	Discharge limits (to be set by authorities)	
		% Removal	Concentration (mg/l)
N1 Primary Treatment	BOD ₅	20	
	TSS	50	
N2 Secondary Treatment	BOD ₅	70	40
	TSS	70	60
N3 Tertiary Treatment	BOD ₅	70	25
	TSS	70	60
	TN	70	15
	P	80	10
	Total Coliforms		10.000 (/100 ml)
	Faecal Coliforms		2.000 (/100 ml)

Size

Tx
(x = 0 à 5)

Treatment Level

N1

N2

N3n (N+P)

N3d (disinfection)

Sludge treatment

Technology

Septic tank

Anaerobic pond

Imhoff tank

Pond sequence

Constructed wetland

Activated sludge

Activated sludge (SBR)

Trickling filter

AS (continuous, anoxic + aeration)

Activated sludge (SBR)

Maturation pond

UV

Drying beds

Static thickening

Belt filter

Centrifuge

Code

Tx.N1.A

Tx.N1.B

Tx.N1.C

Tx.N2.A

Tx.N2.B

Tx.N2.C

Tx.N2.D

Tx.N2.E

Tx.N3n.C

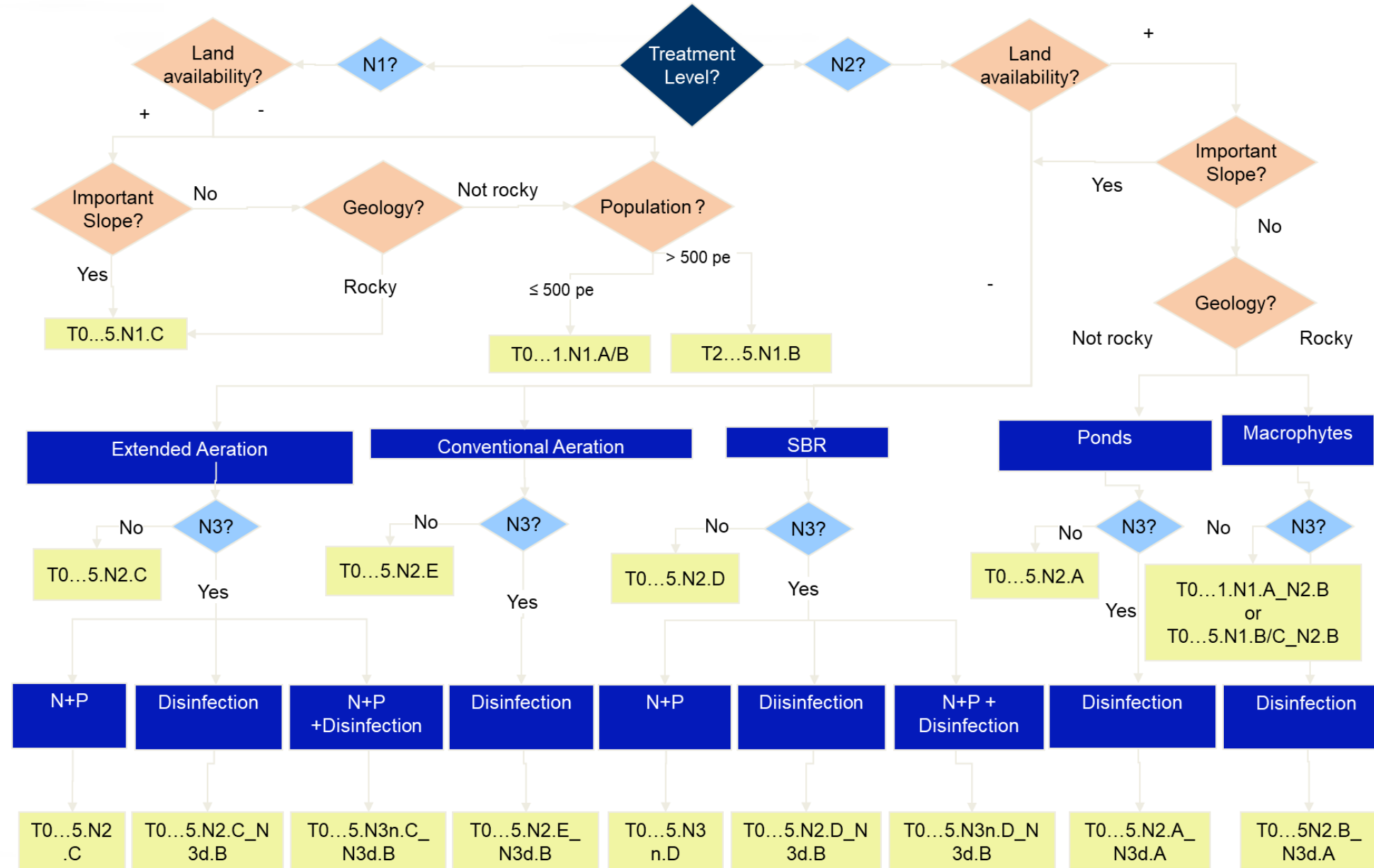
Tx.N3n.D

Tx.N3d.A

Tx.N3d.B

Tool

AdP standard solutions – decision support tool



- Treatment line(s) and their advantages and inconvenients
- CAPEX estimation
- Project specifications
- Price list
- Drawings for each treatment stage
- Building specifications

AdP standard solutions – decision support tool

standard solutions – CAPEX

Land costs (€/m²)	Tx.N2.D	Tx.N2.E	Tx.N2.A	Tx.N1.B-N2.B	Tx.N1.A-N2.B	Tx.N2.C
0	350	380	360	320	340	350
5	350	380	400	340	360	360
10	350	380	450	380	400	370
15	350	380	500	420	440	370
20	350	380	550	460	480	380

standard solutions – CAPEX vs land costs

Land costs (€/m²)	Tx.N2.D	Tx.N2.E	Tx.N2.A	Tx.N1.B-N2.B	Tx.N1.A-N2.B	Tx.N2.C
0	350	380	360	320	340	350
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10	350	380	450	380	400	370
15	350	380	500	420	440	370
20	350	380	550	460	480	380

OPEX (secondary treatment)

Standard capacity (PE)	Tx.N2.A	Tx.N1.B-N2.B	Tx.N2.C	Tx.N1.A-N2.B	Tx.N1.C-N2.B	Tx.N2.D
250	0.18	0.18	0.30	0.17	0.18	0.36
500	0.09	0.09	0.17	0.08	0.09	0.22
750	0.06	0.06	0.12	0.05	0.06	0.17
1000	0.05	0.05	0.09	0.04	0.05	0.14
1500	0.04	0.04	0.07	0.03	0.04	0.12
2000	0.03	0.03	0.06	0.02	0.03	0.11

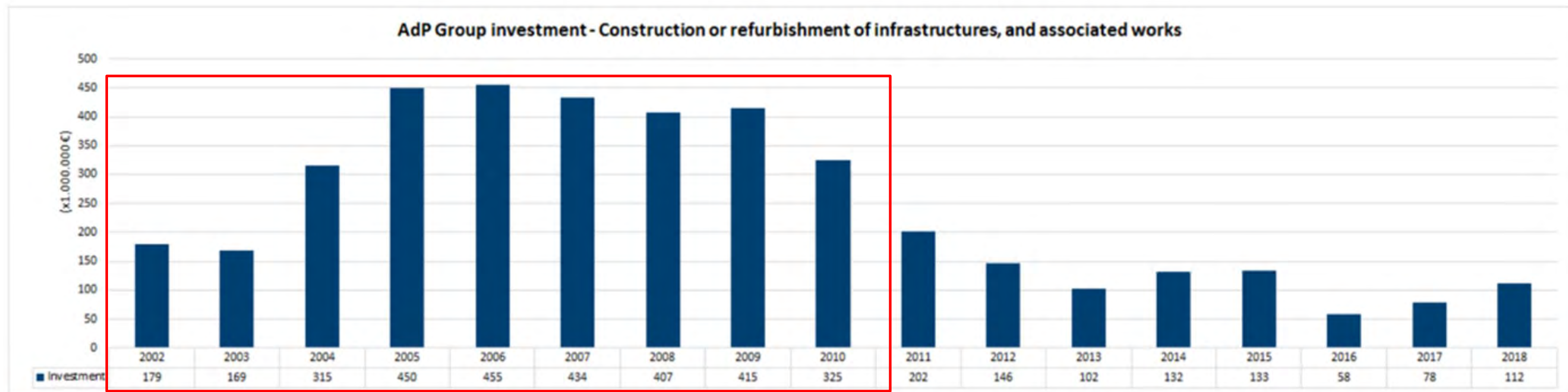
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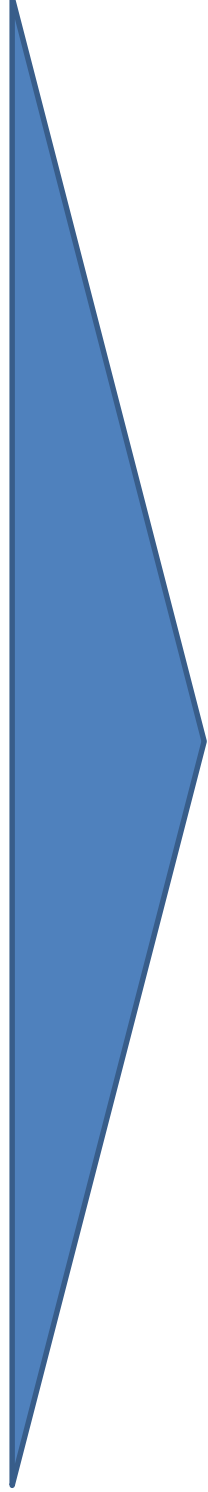
Achievements

- Rural wastewater GAP closed in about a decade 2000-2010
 - Pre-engineered solutions
 - More than 500 WWTP built with very short tendering process (according public law)
 - Standard solutions
 - Optimized costs CAPEX and OPEX
- Standardization allows OPEX optimization and internal benchmarking



Current and future Challenges (20 years after...)

- Rural population keeps decreasing
- New technologies available (renewable energy, treatment)
- Aged infrastructures
- New challenges (Energy neutrality, circular economy, digitalization)
- Return of experience of 15 years of operation
- Updated running costs for energy, sludge management, etc
- New discharge permits



**Reengineering
of our systems**

We build
Partnerships on Water

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Obrigado