Work Project presented as part of the requirements for the Award of a Masters Degree from NOVA – School

of Business and Economics

Consulting project for the Portuguese Water and Waste Services Regulation Authority

Optimization of the Organizational Model and Identification of the Benefits of an Aggregation of "Retail" Operators

Consulting lab carried out under the supervision of:

Professor Constança Monteiro Casquinho

22nd of May 2016

Diana Martins de Oliveira Tomás	#2274
Luís Maria Rodrigues Andrade e Sousa	#2141
Mafalda Folgado Verol Marques	#2317
Marta Duarte Soares	#2444
Simão Mouzinho Latino Tavares	#2021

The Portuguese regulator of water supply and wastewater management is facing a challenge: municipalities are having difficulties in managing their services in a sustainable way, while providing good quality of service. By analyzing some best practices, it was visible that aggregations could be the solution. To bring this solution to the municipalities, an implementation plan was drawn with a series of guidelines to use in meetings with municipalities. Inside it there was also a selling package which consisted of several arguments for the target municipalities. The selling package culminated in a model that simulated the positive effects of an aggregation.

Keywords: Regulation Authority, Water Supply, Retail Service, Aggregation

Acknowledgements

First of all we would like to thank our amazing advisor, Professor Constança Casquinho. Her passion about life and her strive through adversity were very motivating and inspiring. Secondly we want to thank all Nova School of Business and Economics professors specially Professor Fábio Santos for all the work, devotion and extra-hours spent guiding us.

We would also like to thank our demanding client in name of Dra. Ana Albuquerque and Dr. Orlando Borges for the amazing oportunity given and all the support; and all ERSAR's collaborators, specially Eng. Ana Rita Ramos, Dra. Rita Silva, Dra. Alexandra Cunha, Dra. Isabel Andrade, Dr. Luís Simas, Eng. João Rosa and Professor Poças Martins, who were a day-to-day essential help, for their patience answering our questions and supervision during the project.

Furthermore, a special thank you to the different operators directors and interveners we met. We would like to mention Dr. Miguel Carrinho, Eng. Moura de Campos, Eng. Fernando Vasconcelos, Dr. Carlos Paiva, Dr. Nuno Campilho and Dr. José Augusto Silva Santos for their indescribable generosity of sharing knowledge and time with us.

Finally we would like to mention our parents, families, friends and all who encouraged us through the whole project, for all the support and patience when times were not easy and specially for the unconditional love you give us every day.

"Success is no accident. It is hard work, perseverance, learning, studying, sacrifice and most of all, love of what you are doing or learning to do"

Pelé

This was a highly challenging problem proposed by ERSAR in order to foster the reorganization of the drinking water supply and wastewater sector

About ERSAR

Created in 1997, ERSAR (The Water and Waste Services Regulation Authority) is the Portuguese Regulator of water supply, wastewater management and urban waste services acting over all 500 operators of the sector.

These services are regional natural monopolies, which harm competition. Consumers can not choose the operator of their preference nor the entity with better price-quality relation. Since it constitutes a market failure (there is no competition) there is the need for economic regulation to reduce inefficiencies. Thus, ERSAR is responsible for protecting users by ensuring the quality of service and for guaranteeing fair tariffs. However, this should be conducted by assuring a long term sector's financial and environmental sustainability.

ERSAR
ENTIDADE REGULADORA
DOS SERVIÇOS DE ÁGUAS E RESÍDUOS

About the Project

This project is a multidisciplinary work done in collaboration with different departments and experts within ERSAR, targeting "retail" operators ("*baixas*") in Portugal.

The reorganization of multimunicipal concessions in wholesale ("*altas*"), created the opportunity to reorganize the "retail" operators, a fragmented, inefficient and indebted sector. Thus, together with UTA (*Unidade Técnica de Apoio*) – comprising managers, economists, jurists, engineers, auditors, specialized professors and ex-mayors – the team was able to study possible national aggregations between municipalities with existing good relations, specially created through CIM's (*Comunidades Intermunicipais*) in order to ensure a fair and sustainable access to this essential service with better quality.

Entidade Reguladora dos Serviços de Águas e Resíduos tem nova imagem com assinatura da MyBrand. (2016). Retrieved May 18, 2016, from http://www.meiosepublicidade.pt/2016/03/entidade-reguladora-dos-servicos-de-aguas-e-residuos-tem-nova-imagem-com-assinatura-da-mybrand/

"ABASTECIMENTO DE ÁGUA INTERROMPIDO NA ZONA DO PINHAL NOVO." SetubalTV STV. 2015. Accessed May 18, 2016. http://setubaltv.com/abastecimento-de-agua-interrompido-na-zona-do-pinhal-novo/.

"Quem Somos - Apresentação da ERSAR". ERSAR. 2016. Accessed May 18, 2016. http://www.ersar.pt/website/ViewContent.aspx?FolderPath=\Root\Contents\Sitio\MenuPrincipal\QuemSomos&Section=MenuPrincipal&SubFolderPath=

The main goal of the project was to give inputs for ERSAR's strategy to transform this sector (in "*baixas*") and make it sustainable in the long-term

Challenges

- What are the "retail" operators' current challenges and problems? How can they solve them?

- Is an aggregation the best way to achieve efficiency, environmental sustainability and water quality?

- How can ERSAR take advantage of Portuguese existing best practices to convince municipalities to aggregate?

- How can ERSAR use the existing relations between municipalities to speed up the processes?

- What is the best aggregation model for a certain region?

- Is it possible to develop one aggregation model and apply it to all municipalities?

- Is it possible to set an homogeneous tariff along the country?
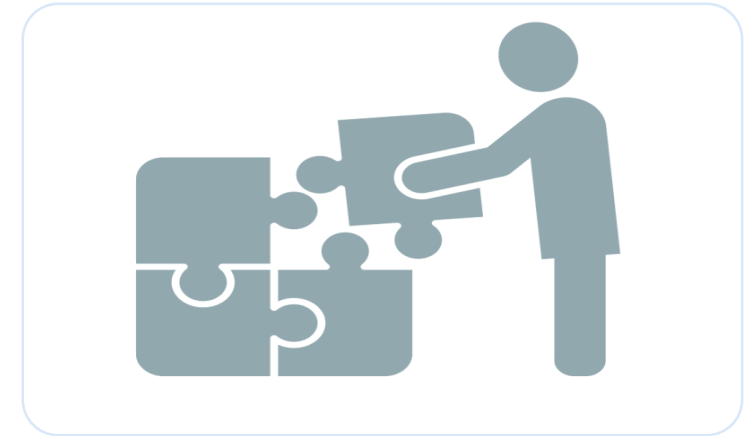
Aim and Activities

AIM: to create an approach and a plan to show municipalities that aggregation is the best solution for sector's sustainable development.
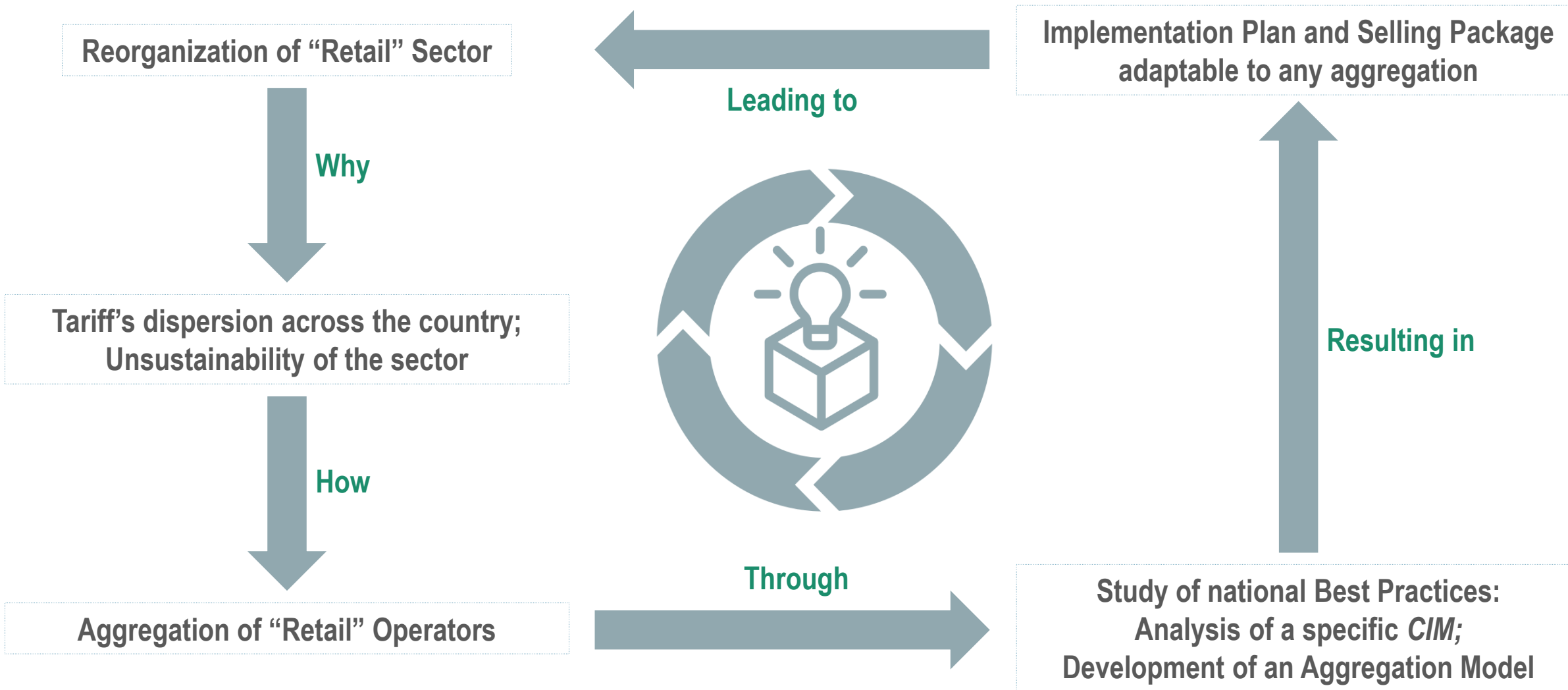
ACTIVITIES:

- Understand Portuguese water supply and wastewater sector;

- Analyze the different types of operators, major practices, constituents and main challenges and inefficiencies;

- Identify national best practices, study their aggregation processes, efficiency practices and gains and apply them to pilot areas;

- Assess strengths, weaknesses, opportunities and threats of a certain region and understand how to take advantage of them to create a sustainable aggregation;

- Estimate cost savings in aggregations through the analysis of individual Profit and Losses Statements and aggregated ones;

- Develop inputs for ERSAR's strategy ,propose recommendations and an implementation plan.

In order to solve the challenge we recommended an implementation plan to foster the sector's reorganization

Solution

Reorganization of "Retail" Sector

Why

Tariff's dispersion across the country; Unsustainability of the sector

How

Aggregation of "Retail" Operators

Leading to

Through

Resulting in

Implementation Plan and Selling Package adaptable to any aggregation

Study of national Best Practices: Analysis of a specific *CIM*; Development of an Aggregation Model

By implementing our recommendations, ERSAR will be able to help municipalities reorganize themselves by giving them tools to facilitate the aggregation processes

Recommendations

RECOMMENDATIONS FOR ERSAR:

- **Implementation Plan:** All the steps before and after the creation of a Municipal Company;

- **Specialized training to specific operators;**

- **Enhanced use of an online platform to share experiences and knowledge;**

- **Bi-annual reports deliveries**

RECOMMENDATIONS FOR MUNICIPALITIES:

- **Selling Package**: Structured plan to convice municipalities to aggregate

- **CIM Douro:** targeted recommendations regarding the type of aggregation, specific legal requirements and how to reach financial and quality goals

Total Added Value for the Client

- Three sharp case studies about best practices in Portugal – two of them of succeeded aggregations and one about two municipalities with successful practices;

- Detailed analysis of CIM Douro, analysis of their resources, current situation – quantitative and qualitative –, expected improvements from the aggregation and implementation plan;

- Selling package and aggregation model for future aggregations;

- Recommendations both for ERSAR and the regulated operators in order to increase efficiency and quality of the provided services;

ERSAR

NOVA School of Business & Economics

Shaping powerful minds

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS, ACRONYMS AND INITIALS

GLOSSARY

Table of Contents

List of Abbreviations, Acronyms and Initials

AdP – Águas de Portugal

AdR – Águas do Ribatejo

AdRA – Águas da Região de Aveiro

CAGR – Compound Annual Growth Rate

CIM – Comunidade Intermunicipal

EE – Pumping Stations

EPAL – Empresa Portuguesa das Águas Livres, SA

ERSAR – The Water and Waste Services Regulation Authority

ETA – Water Treating Plants

ETAR – Wastewater Treating Plants

MCZ – Measurement and Control Zone

P&L – Profit and Losses Statement

POSEUR – Programa Operacional Sustentabilidade e Eficiência no Uso de Recursos

POVT – Programa Operacional Temático Valorização do Território

QREN – Quadro de Referência Estratégico Nacional

SIMAS – Serviços Intermunicipalizados de Oeiras e Amadora

UWM – Urban Waste Management

WS or **AA –** Water Supply

WW or **AR –** Wastewater Management

Glossary

Abstractions: Location where the water is extracted from its natural source. There are superficial and subterranean abstractions.

Acoustic *Correlador*: Device that is inserted into two points of the network to calculate the position of the leak in the mains.

Acoustic Logger: The combination of a logger and a *correlador acústico*.

Adduction: The transportation of water from the abstractions to the treatment stations.

Adductors: Structures that transport the water from the abstractions to the treatment stations and to reservoirs for the "Retail" distribution.

Aquamatrix: Commercial management system. It handles clients, invoices, service management. Integrated approach to the technical and commercial sides of the business.

Association of municipalities: Several municipalities take part in a collaborative public management body – the association of municipalities is the operator of the service.

Collectors: Pipes and chambers that constitute the infrastructures that lead the wastewater to the treatment stations.

Company established in partnership with the state (municipal or State owned company): State and municipalities participate in the share capital of the public body in charge of managing the partnership.

Concession: The concession contract states that the concessionaire has obligations when providing services; the tariff has to be defined and actualized every year and the concessionary has the right to reset the economic and financial balance when there is shift in the exploitation of the service because of the shift in the legal norms. The maximum period of the contract is 30 years.

Delegation: The delegation of the services to companies predicts that these companies are in charge of the management of the services. The delegation can be a partnership with state, a company totally owned by municipalities or a parish association. This model requires a business contract where the objectives, the politics and the prices of the company are stated. Also, the investments and the tariff charge have to be stated in the business contract that is subject to revision every five years.

Direct Management: The direct management of the services can be done by the municipalities, municipalized, inter-municipalized services or association of municipalities; the difference between the municipalities services and the inter-municipalized services is the financial and administrative autonomy.

Domestic Connections of Wastewater Management: Portion of the pipes that makes the connection between the plumbing and the collectors.

Domestic Connections of Water Supply: Portion of the pipes that makes the connection between the plumbing and the mains.

Domestic Consumption: Consumption made by domestic clients.

Flowmeters: Devices capable of measure the flow of water passing through the mains. It is able to characterize the level of consumption.

Geofone: Device used to identification of leaks in the mains through the pavement on the streets. It captures the noise from the pipes leading to identification of leaks.

Glose: Platform used to manage operations and maintenance. Used to identify the assets of the organization.

"Gross" or "Wholesale": Gross activity of the water supply and wastewater management services. It covers the abstraction, treatment, elevation and water storage.

Glossary

Inter-Municipalized services: Cooperation between two or more municipalities, shared autonomous structure but without legal personality.

Logger: Device that is installed with any kind of flowmeter. The logger is used to store information captured by the flowmeters.

Mains: Pipes that transport the water from the reservoirs to the final user.

Measurement and Control Zone: It is a delimited zone surrounding the pipelines that controls and measures the flow of water passing through the mains, using flowmeters.

Municipal concessionaire: Public-private partnership (municipalities or other private utilities)

Municipal owned company in which there is no participation of the State (established under commercial law): Several municipalities may participate in the share capital of the concession. Private companies may have minority share.

Municipality service: One municipality, the operator of the service is the municipality.

Non-domestic Consumption: Consumption made by non-domestic clients.

Parish or user's association: Agreements or contract-programs between the municipality and parish or users association.

Pipeline Register: Mapping of all the kilometers of mains and collectors and other infrastructures.

Pumping Stations: Installation that allows for the pumping of water to regions with higher altitudes or which the network has not enough pressure to send the water.

Reservoirs: Infrastructure where water is stored.

"Retail": Retail activity of the water supply and wastewater management services. It covers all the distribution of water and collection of wastewater from the consumers.

SIG: Geographical Information Systems. Open source software with internal developments. It is used for a better data management.

Tariff charge: It is the value that the consumer pays for the water supply and wastewater management services.

Tariff: It is the unit value applied to a measurement unit: per contract, per cubic meter. This tariff value is defined by each operator. This value takes into account the costs of each activity per si, the investment costs and exploitation costs.

Telegestão: System that monitors and manages the equipment remotely. This allows for efficiency improvements, better water quality control and a reduction of costs, electricity and water losses.

Treatment Stations: Installation that treats and cleans the water. There are treatment stations for the water supply services and for the wastewater management services.

"Verticalization": When the Operator does the "Gross" and "Retail" part of the business.

Wastewater Management Services: Services related to the collection and treatment of wastewater from the general population.

Water meters: Instrument used to measure the volume of water consumed on that location.

Water Supply Services: Services related to the abstraction, treatment and distribution of drinking water to the general population.

1. METHODOLOGY

GENERAL METHODOLOGY

PHASE I: DIAGNOSIS

PHASE II: ANALYSIS

PHASE III: RECOMMENDATIONS

PHASE I: DIAGNOSIS

Water and Wastewater Sector's Overview

WS and WW gross operators

WS and WW retail operators

Financial Analysis

Management Models' Study

National Best Practices Analysis

Águas do Ribatejo

Águas da Região de Aveiro

Sistemas Intermunicipais de Água e Saneamento – Oeiras e Amadora

February, 2nd – March, 18th

PHASE II: ANALYSIS

Development of a "Light" Management Model

Advantages

Variables

Applicability

Determination and Analysis of a Pilot

CIM Douro

    Qualitative analysis
    Aggregation model
    Scenarios

March, 21st – April, 26th

PHASE III: RECOMMENDATIONS

Recommendations for ERSAR

Implementation Plan

Recommendations for Municipalities

Selling Package

April, 26th - May, 11nd

1. METHODOLOGY

GENERAL METHODOLOGY

PHASE I: DIAGNOSIS

PHASE II: ANALYSIS

PHASE III: RECOMMENDATIONS

WATER AND WASTEWATER SECTOR'S OVERVIEW

PURPOSE (why?): Study the sector to determine strengths and weakness of main activities. Analyze different types of operators regulated by ERSAR

METHOD (how?): The main goal was to study the sector and to understand its main activities, players and modus operandi. It was also relevant to understand the distribution across the country and the evolution of the sector over the years. The team used primary and secondary research for these purposes.

AGENDA (what?):

INTRODUCTION

- Characterize the different services regulated by ERSAR;
- Understand the difference between "Gross" and "Retail" Activities;
- Map out the different steps of supply chain;

WS AND WW GROSS OPERATORS

- Understand the "Wholesale' " aggregation process;
- Identify different types of players, relevance and distribution across the country;

WS AND WW RETAIL OPERATORS

- Identifiy different types of players, relevance and distribution across the country;

FINANCIAL ANALYSIS

- Understand the current financial situation of operators by type of operator.

MANAGEMENT MODELS' STUDY

MANAGEMENT MODELS' STUDY

PURPOSE (why?): Analyze different types of management models that a municipality may decide to adopt, in order to characterize the sector in Portugal.

METHOD (how?): This framework was a essential tool to understand how the country is distributed accordind to the management models, which of them municipalities tend to adopt and their main particularities.

AGENDA (what?):

INTRODUCTION

- Introduce theoretically the different management models (characteristics and definitions);

QUALITATIVE AND QUANTITATIVE ANALYSIS

- Develop a framework according to the type of management model, having as variables the management sub-model adopted, type of operator, ownership entity and type of service.

- Assess the number of operators, municipalities and population covered by each type of service. It also included other particularities, such as the average coverage of total costs, financial autonomy, assets ownership and type of management (private or public).

NATIONAL BEST PRACTICES ANALYSIS

PURPOSE (why?): Study the successful cases in Portugal allowed us to know deeply what are the motivations, vantages, limitations and resistance of an aggregation. Study the different management models and understand what are the characteristics and the outcomes of each model. This analysis allowed us to develop an aggregation Model to CIM Douro that can be adapted to other entities.

METHOD (how?): Visit the national best practices headquarters and meet with the different division chiefs.

AGENDA (what?):

MOTIVATIONS FOR THE AGGREGATION/MAINTENANCE	▪ Understand the major reasons of an aggregation;
HISTORICAL FRAMEWORK	▪ Explain the different steps of the aggregation process; ▪ Identify requirements established;
GEOGRAPHICAL FRAMEWORK	▪ Understand the reasons of the municipalities that did not integrated the aggregation; ▪ Identify different municipalities that integrated the aggregation;
MANAGEMENT MODEL	▪ Characterize the model used by the operator;
ORGANIZATION CHART	▪ Identify the distribution of the collaborators through the divisions of the services;
ECONOMIC SUSTAINABILITY	▪ Analyze the evolution of revenues, costs, tariffs, efficiency improvements, coverage of total costs;
EFFICIENCY MEASURES IMPLEMENTED	▪ Identify the major efficiency measures implemented after the aggregation;
FUNDING AND INVESTMENT	▪ Identify the major investments after the aggregation; ▪ Analyze the funds received by the operators;

1. METHODOLOGY

GENERAL METHODOLOGY

PHASE I: DIAGNOSIS

PHASE II: ANALYSIS

PHASE III: RECOMMENDATIONS

DEVELOPMENT OF A LIGHT MANAGEMENT MODEL

PURPOSE (why?): Analyze this type of management model, to determine and understand its applicability and variables required to implement it.

METHOD (how?): The main goal was to define the characteristics, advantages and requirements of this model, in order to provide a step-by-step solution to municipalities. It was also relevant to understand how the relations between the municipalities are made, as well as the services shared.

AGENDA (what?):

INTRODUCTION

- Characterize the model and legal requirements;

MODEL ANALYSIS

- Determine the variables that may change, contract parameters and penalizations to apply.
- Define its applicability and advantages,
- Analyze the type of service shared, by nature and area of operation.

ERSAR   NOVA School of Business & Economics   Shaping powerful minds

DETERMINATION AND ANALYSIS OF A PILOT

PURPOSE (why?): Analyze the Douro region in order to understand its economic demographic characteristics and also to determine strengths, weakness, opportunities and threats of the region. Study the region water services management. This analysis will allow us to determine the best aggregation model for the region.

METHOD (how?): The main goal was to know the characteristics of the region, in order to provide the most appropriate aggregation model. The team interviewed over the phone all 19 municipalities in order to understand their resources and activities. The team also consulted industry and region experts.

AGENDA (what?):

QUALITATIVE ANALYSIS

- Understands the characteristics of the region – area, population, population density and purchasing power per capita;
- Analyzes the water supply and wastewater management services;
- SWOT Analysis
- Analyzes the water and service indicators

AGGREGATION MODEL

- Simulates the effects of an aggregation;

SCENARIOS

- Studies several scenarios of the aggregation model;
- Explains the improvements in the region that each scenario provide;

AGGREGATION MODEL

PURPOSE (why?): Simulate the impact of an aggregation in CIM Douro, more specifically on the P&L of the Operator and its Quality of Service.

METHOD (how?): To create this model it was necessary to gather all the data, treat properly, and make the right calculations and assumptions to build the most accurate results. To gather the data, the visits to the best practices were very useful as to know how a well managed and efficient operator operates. The Municipalities data was gathered on ERSAR's portal and with direct contact with the Municipalities. The assumptions made were based upon the opinions of the technicians in ERSAR and based on our gathered expertise in the field. Finally the results were created in order to the user to see clearly the advantages and potential of an aggregation.

AGENDA (what?):

FINANCIAL DATA	▪ Gather all the P&Ls from the 19 municipalities of CIM Douro and from the three best practices studied, Águas do Ribatejo, Águas da Região de Aveiro and SIMAS Oeiras e Amadora.
GENERAL DATA	▪ Gather all information regarding demographics, area, quality of service, tariff charges and others.
TREAT DATA	▪ Estimate missing data and unreliable data; ▪ Eliminate unnecessary data.
OPERATIONAL REVENUES & EXPENSES	▪ Calculate possible efficiencies and economies of scale in following items: Sales, Cost of Goods Sold, Personnel Expenses, Supplies and External Services.
FINANCIAL EXPENSES	▪ Calculate amount of amortization needed to pay the investments that the aggregation brings to operators.
ANALYZE RESULTS	▪ Display all the information in a clear manner; ▪ Ellaborate different scenarios for ERSAR and Municipalities to choose from.

1. METHODOLOGY

GENERAL METHODOLOGY

PHASE I: DIAGNOSIS

PHASE II: ANALYSIS

PHASE III: RECOMMENDATIONS

NOVA School of Business & Economics — Shaping powerful minds

ERSAR

RECOMMENDATIONS

PURPOSE (why?): Deliver final recommendations to ERSAR and the municipalities to motivate and promote the re-orgnization of the "retail" sector.

METHOD (how?): After studying the best practices in Portugal, and gathering the necessary information and knowledge from ERSAR and the operators that were visited, the team was now ready to draw some conclusions in the form of recommendations for ERSAR and the municipalities. These recommendations are in line with the problem identiied by the team and the client, which can be fixed by a re-orgnization of the sector.

AGENDA (what?):

GATHER THE INFORMATION AND KNOWLEDGE FROM BEST PRACTICES AND OTHER OPERATORS

- Gather information on the changes that the aggregation brought to the best practices;
- Gather information on the modus operandi of other municipalities;

ANALYZE ALL THE INFORMATION RETRIEVED

- Analyze and discuss about the information collected;
- Discern on what changes can be replicated to other future aggregations;

PREPARE RECOMMENDATIONS FOR ERSAR

- Draw recommendations for ERSAR, in the form of an Implementation plan, to approach municipalities that can be future participants in an aggregation;
- Draw additional recommendations for ERSAR to improve its results as the regulator of the sector;

PREPARE RECOMMENDATIONS FOR THE MUNICIPALITIES

- Draw recommendations for the municipalities that will intake in future aggregations, including a selling package;

2. PHASE I: DIAGNOSIS

SECTOR'S OVERVIEW

BEST PRACTICE: ÁGUAS DO RIBATEJO

BEST PRACTICE: ÁGUAS DA REGIÃO DE AVEIRO

BEST PRACTICE: SIMAS OEIRAS E AMADORA

PHASE I: DIAGNOSIS	PHASE II: ANALYSIS	PHASE III: RECOMMENDATIONS
Water and Wastewater Sector's Overview WS and WW gross operators WS and WW retail operators Financial Analysis Management Models'	Development of a "Light" Management Model Advantages Variables Applicability	Recommendations for ERSAR Implementation Plan
National Best Practices Analysis *Águas do Ribatejo* *Águas da Região de Aveiro* *Sistemas Intermunicipais de Água e Saneamento – Oeiras e Amadora*	Determination and Analysis of a Pilot CIM Douro Qualitative analysis Aggregation model Scenarios	Recommendations for Municipalities Selling Package
February, 2nd – March, 18th	March, 21st – April, 26th	April, 26th – May, 11th

NOVA School of Business & Economics

Shaping powerful minds

ERSAR

The water and wastewater sector is of crucial importance in the Portuguese society. A true development of the country has to address the need to make these services widely available across the country with acceptable standards concerning the quality of service provided

The sector includes three different services: Water Supply (WS), Wastewater (WW) and Urban Waste Management (UWM). This work project will focus only on the first two. Those services are essential to the quality of life of citizens, public wealth, economical activities and environment protection. Therefore, WS and WW should follow the principles of universal access, continuity and quality of service, efficiency and fair prices. The Water and wastewater sector is a natural monopoly in each region, which means that each municipality can only have one operator responsible for the services.

The services WS and WW comprise "Gross" and "Retail" services depending on the type of activity they perform (Figure 1). The "Gross" service for water supply includes all the processes before the distribution – abstraction, treatment, elevation and adduction - connecting the water environment to the "Retail" system. The latter connects the water to the end-users' through storage and distribution. In the case of Wastewater, the "Gross" activity comprises discharges, drainage, retention and elevation while the "Retail" covers transportation, urban wastewater treatment and devolution to the environment.

Nowadays the regulator believes that a reorganization of the Retail system will have a positive impact on the sector due to operator's scale gains. A higher integration level in the water and wastewater sector allows, possibly, economies of scale and scope. This will be possible in the water sector with the promotion of regional cooperation and aggregation that will allow to save costs both to operators (that are inefficient in most of the country) and possibly to the end-users (by charging fair but sustainable tariffs), to provide a better service (in terms of water quality and safety), gain scale to invest in infrastructures (mains and collectors rehabilitation and physical accessibility of the service) and protect the environment (proper treatment of collected wastewater).

Figure 1 – Water Supply and Wastewater supply chain

There are several diversified types of players in this sector. At Government level, there is in general the Public Administration and the regulation authority. The systems are managed by municipalities, associations of municipalities, municipal and *intermunicipal* companies, public companies and private concessions or companies

WATER SUPPLY (WS)   **WASTEWATER (WW)**
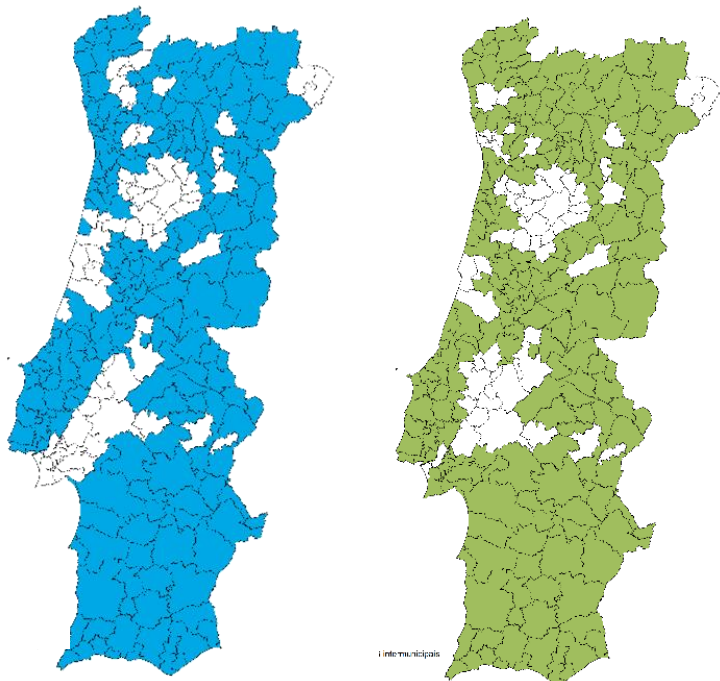
Figure 2 – "Gross" Aggregated operators in 2014

WATER SUPPLY AND WASTEWATER GROSS OPERATORS

The Portuguese "gross" system has suffered a major reorganization and nowadays, after the aggregation process all "gross" operators are companies (15 in WS and 19 in WW - Figure 2) with the *multimunicipal* concessions dominating the sector. The business community started the development in the middle 90's. The first generation of aggregations occurred in the littoral and dense regions while the second generation happened in the rural areas.

The concessions embrace about 71% of total population and 79% of municipalities in WS; and about 97% of total population and 91% of municipalities in WW.

The WS state-owned companies have, as well, some power: even with only one operator (EPAL), the high density of the area transform this sub-management model the second more important with 25 municipalities and 1,8 million habitants.

There are also some municipalities without bulk services both in WS and WW. The water service includes 97 municipalities and 3,33 million people in this model and the wastewater has 94 municipalities and 2,9 million habitants, most of them located in the north and center of Portugal.

Finally, it is also relevant to enhance the State-municipality partnership (with *Águas de Portugal*) that provides the service to approximate 250 thousand people covering 23% of Portugal's area, mainly in rural zones such as *Alentejo*.

All operators involved in this sector need, reliable information about the water and wastewater sector and its evolution in Portugal to support policymaking and strategic planning by the operators and to effectively assess the services offered to end-users

WATER SUPPLY (WS)   **WASTEWATER (WW)**
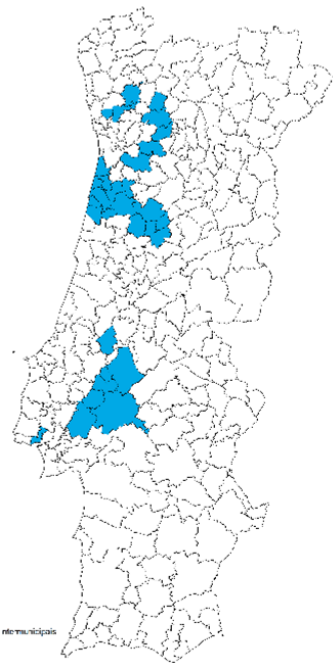
Figure 3 – "Retail" Aggregated operators in 2014

WATER SUPPLY AND WASTEWATER RETAIL OPERATORS

Retail system is characterized by a huge number of operators, 262 for WS and 264 for WW. These entities are small and usually operate only in one municipality. Usually these companies (specially in the rural areas) are not efficient economically and most of them are not able to invest the proper amount of money to rehabilitate mains and other infrastructures. This event highly affect quality of water and service provided to end-users.

The Direct management model has the biggest coverage percentage: 70% of total municipalities for WS (53% of population) and 78% for WW (61% of population).Since the biggest amount of population for this type of model prevails in rural areas with smaller population density, the remain management models prevail in littoral area or urban centers. Thus, both delegation and concession contain an elevated percentage of the population, but are present in a lower number of municipalities.

Finally, it is also relevant to overview economic performance, which in fact varies a lot across the country. The Portuguese average tariff charges for an average consumption of 10m³ for in WS is 9,2€ (16,05€ is the maximum and 0,75€ the minimum). For WW the average is 6,44€, way below WS, and we can find some operators that do not charge sanitation tariff - the maximum amount is 19,54€.

All operators involved in this sector need reliable information about the water and wastewater sector and its evolution in Portugal to support policymaking and strategic planning by the operators and to effectively assess the services offered to end-users

Average of Coverage of Total Costs per Management Model

Management Model	AR	AA
Intermunicipalized Service	1,15	1,10
Municipalized Service	0,91	1,08
Delegation	0,98	1,22
Concession	0,85	1,13
Municipality Service	0,66	0,77

Legend: ■ AR ■ AA
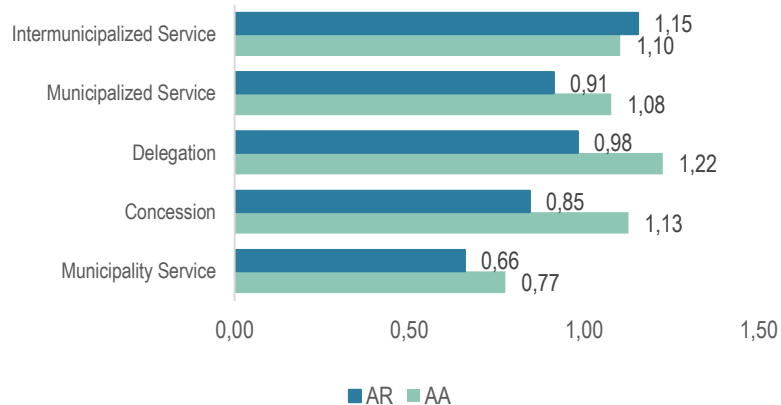
Personnel Costs per Covered Population

Management Model	Value
Intermunicipalized Service	2,00
Municipalized Service	17,00
Delegation	24,00
Concession	24,00
Municipality Service	191,00

FINANCIAL ANALYSIS

When analyzing the financial performance of retail operators it is important to take into account how it depends a lot on the verticalization and level of outsourcing. In fact an operator that explores both gross and retail will entail lower COGS but probably higher electricity expenses when compared with a non-verticalized operator. The level of outsourcing is also relevant, because companies with lower levels of personnel expenses usually spend more money in supplies and external services (e.g.: specialized jobs or conservation and reparation). One important note is that reliability of data is one of the biggest challenges for ERSAR because most of operators do not account correctly financial information.
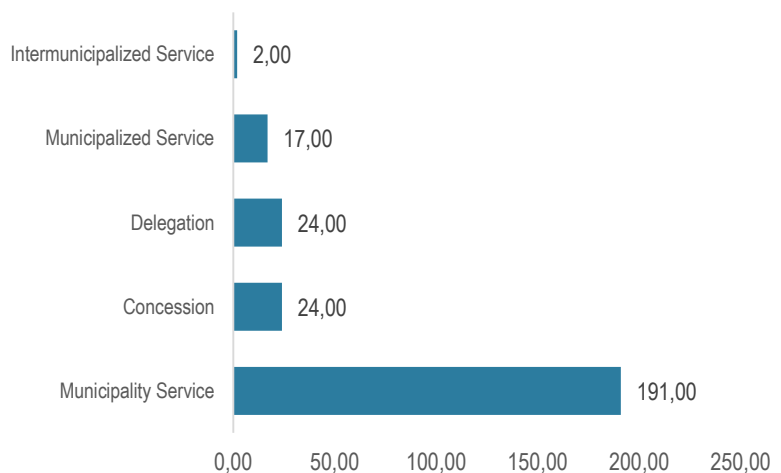
Coverage of Total Costs:

The coverage of total costs is one of the most relevant indicators and yet very deficient: only 11% of WS's operators and 7% of WW's present efficient results (good evaluation under ERSAR criteria – 1,0;1,1). Around 60% of the WS's operators are in deficit and this deficit increases to 80% when wastewater is the sector analysed. The remaining ones present coverage of total costs' values above the maximum accepted by the regulator and therefore should re-evaluate their tariffs;

In Water Supply this economic indicator is evaluated as "Good" in almost all municipalities for every management model except from municipalities services where most operators are not able to cover their costs with revenues. The Wastewater service presents lower levels of coverage, due to lower tariffs on average and this is reflected in high needs of investment that are not bridged.

Personnel Expenses:

On average Municipality Service is the management model with higher expenses with personnel far distant from the others. This is one of the results that highlights the inefficiency of this type of management model. The most efficient one is Intermunicipalized service. However, this result is biased since there are only two operators governed by this management model.

In Portugal, Municipalities are responsible for municipal systems, its management and operation can be done under three different management models. The direct management by the municipal services is the most common

MANAGEMENT MODELS' STUDY

In Portugal, the ownership of the water supply, wastewater management and waste management services belong to the State or the Municipaliities. The State is responsible for the multimunicipal systems and the Municipalities are in charge of the municipal systems. The operators are the responsible entities for the management and operation of the municipal systems, and may decide between **three different management models**: direct management, delegation and concession, and are able to promote public-public partnerships, or public-private partenerships. For the "retail" part of the business, the system are generally all municipal.

In the case of municipal ownership, the direct management model can be done through municipalized or inter-municipalized services, municipality services and association of municipalities. The delegation can be attributed to a company established in partnership with the state, to a municipal owned company, and to a parish or users association. Finally, the concession is always attributed to a municipal concessionaire.

According to the appendix 1 that shows all the management models over the country, it is patent that most of the municipalities adopted a direct management model through municipal services. However, these services are the only operator in Portugal that show a negative (lower than 1) average coverage of total costs. In most of the cases of delegation and concession, the assets still remain in the ownership of the municipalities after the contract expires, but its management is made by the operators.

Furthermore, the best practices in Portugal decided to adopt an intermunicipal model solution, and this might be the solution for efficient municipalities. Águas da Região de Aveiro, SIMAS and Águas do Ribatejo adopted a delegation model to a company established in partnership between the State and Municipalities, a direct management model through a inter-municipalized services, and a delegation model to a inter-municipal company, respectively.

2. PHASE I: DIAGNOSIS

SECTOR'S OVERVIEW

BEST PRACTICE: ÁGUAS DO RIBATEJO

BEST PRACTICE: ÁGUAS DA REGIÃO DE AVEIRO

BEST PRACTICE: SIMAS OEIRAS E AMADORA

PHASE I: DIAGNOSIS	PHASE II: ANALYSIS	PHASE III: RECOMMENDATIONS
Water and Wastewater Sector's Overview WS and WW gross operators WS and WW retail operators Financial Analysis Management Models'	Development of a "Light" Management Model Advantages Variables Applicability	Recommendations for ERSAR Implementation Plan
National Best Practices Analysis *Águas do Ribatejo* *Águas da Região de Aveiro* *Sistemas Intermunicipais de Água e Saneamento – Oeiras e Amadora*	Determination and Analysis of a Pilot CIM Douro Qualitative analysis Aggregation model Scenarios	Recommendations for Municipalities Selling Package
February, 2nd – March, 18th	March, 21st – April, 26th	April, 26th – May, 11th

In 2003 Municipalities found themselves in concerning situation, in need of funding to pay for the investments that were needed to provide the service with sustainability and quality that the consumers require

SERVICE MANAGEMENT SUSTAINABILITY

- Economic sustainability through the balance of intra and intermunicipal accounts;
- Drinking water supply and Wastewater management services' coverage;
- Compliance with legal requirements on drinking water quality.

INVESTMENT

- Infrastructure (construction and restructuring);
- Technical Experts (engineers, operating technicians);
- Information Systems (Infrastructure management systems)

FUNDING

- Funding to cover existing investment needs;
- At the time, the aggregation was the only option for municipalities to get EU funds.

MOTIVATIONS FOR THE AGGREGATION

There were three major reasons for the aggregation of *Lezíria do Tejo*: a huge concern regarding the economical and financial sustainability of the service, which required a large investment that, in turn, required funding.

HISTORICAL FRAMEWORK

A longstanding process started in 2003 led the "Drinking water supply and Wastewater management Intermunicipal System of *Lezíria do Tejo*" to the creation of the intermunicipal company *Águas do Ribatejo - 2007*.

By the time of aggregation, all the region's municipalities were welcome. However, a few requirements were still established:

- Control of their systems in "Gross" and "Retail";
- Economic viability for the system ;
- Geographical proximity;
- Interest shown by municipalities.

Nowadays, the aggregation comprises municipalities of Almeirim, Alpiarça, Benavente, Chamusca, Coruche, Salvaterra de Magos and Torres Novas, with good relations with each other, and which are governed by a principle of municipal solidarity.

"Quem somos - Mensagem do Presidente" Águas do Ribatejo. Accessed May 18, 2016 from http://www.aguasdoribatejo.com/artigo.aspx?lang=pt&id_object=392&name=Mensagem-do-Presidente
"Quem somos - Síntese Histórica." Águas do Ribatejo. Accessed May 18, 2016 http://www.aguasdoribatejo.com/artigo.aspx?lang=pt&id_object=397&name=Sintese-Historica

The aggregation occurred in 2007 with the majority of the municipalities of Ribatejo being part of it, and welcoming Torres Novas in 2011. Rio Maior, Azambuja, Cartaxo and Santarém did not join for different reasons. Golegã abandoned the process

Geographical Area
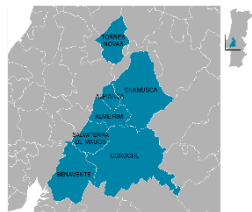
3 200 km^2

Population

150 000

Population Density

46,9

Shareholder Composition

- Alpiarça 5%
- Chamusca 7%
- Torres Novas 25%
- Benavente 19%
- Almeirim 16%
- Salvaterra de Magos 15%
- Coruche 13%

Figure 4 – AdR Geographical and demographical Information

GEOGRAPHICAL FRAMEWORK

Almost all municipalities belonging to *CIM Lezíria do Tejo* integrated the aggregation, excluding *Santarém* and *Cartaxo* due to political and administrative motives – the first have created its own Municipal Company and the second has concessioned its services to a private operator - and *Rio Maior* and *Azambuja* as they were already aggregated in "gross" activities. *Golegã* abandoned the process few months later of its beginning and decided to maintain a direct management model, managed directly by the City Council. Torres Novas was the last municipality to join the aggregation, only in 2011.

SHARE CAPITAL AND ASSETS OWNERSHIP

AdR – Águas do Ribatejo E.M. SA, is an Intermunicipal Company, established in December 2007 as a public liability company. Its share capital – 6 871 681,00€ - is 100 % public and owned by seven municipalities of Santarém (district), being the shareholder composition based on each municipality's population. The share capital was totally composed with assets: each municipality gave the company several infrastructure (reservoirs, treatment plants, pumping stations) to make up their participation value, receiving in exchange a certain number of shares.
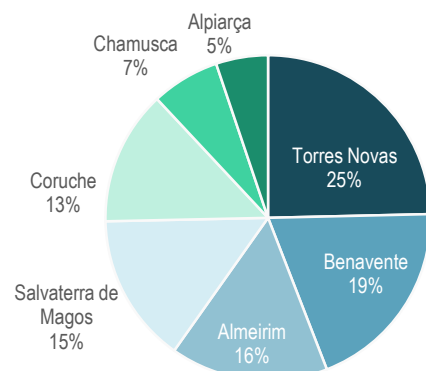
The assets acquired during the 40 years of partnership belong to the company and at the end of the partnership revert to municipalities. Assets that already existed before the company's creation are managed by AdR during the partnership period but are turned back to municipalities at its end.

The municipalities of Ribatejo opted for a delegation model to an Intermunicipal Company. Águas do Ribatejo is a without bulk service company, covering the water supply and wastewater management services

Delegated Management Model to an Intermunicipal Company

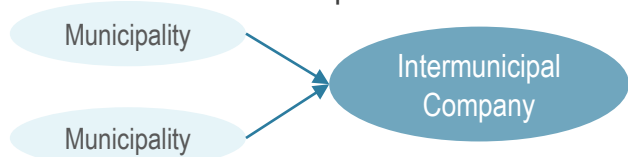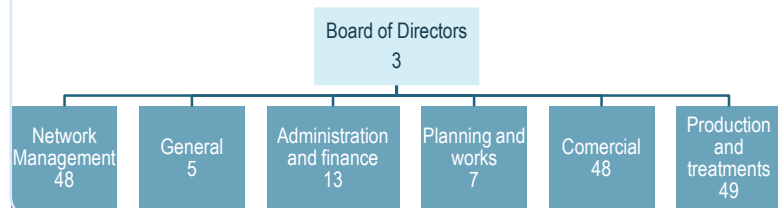|	
Holder	Municipalities or Association of Municipalities
	Municipalities' partnership + State
Operator	Company with State and municipalities' owned capital

Intermunicipal Solution

Municipality → Intermunicipal Company

Municipality → Intermunicipal Company

Águas do Ribatejo Organization Chart

Board of Directors
3

- Network Management 48
- General 5
- Administration and finance 13
- Planning and works 7
- Comercial 48
- Production and treatments 49

Function's Distribution

Employees
170

- Managers 6
- Responsible for Work 12
- Senior Technicians and Doctors 29
- Workers and Operators 78
- Administration and Comercial 45

Figure 5 – AdR Management Model and Organization
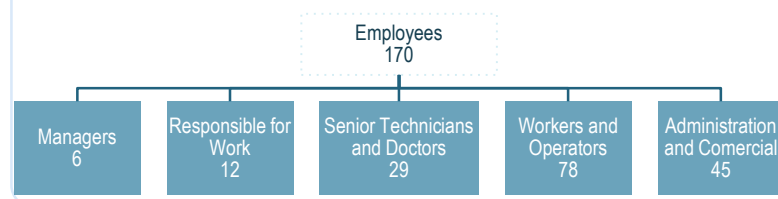
MANAGEMENT MODEL

Initially, the operator signed individual delegation agreements with all municipalities - 2008-, later on, those were replaced by a single delegated management contract settled between the seven municipalities and the Intermunicipal Company. This business formula enables the integrated management of drinking water supply and Wastewater management in the aggregated Municipalities. This allows them to achieve economies and efficiency scales and investment capacity which would be more expensive or even impossible if taken individually by each municipality.

Águas do Ribatejo is a without bulk service company which means that it provides both gross and retail services.

ORGANIZATION

AdR BackOffice is centred in *Salvaterra de Magos*, which is, geographically a central municipality of the region, but the operation - maintenance and customer support - remains dispersed. The Board of Directors includes three mayors and the company has 170 employees spread over six directions

Best Practice Analysis – ÁGUAS DO RIBATEJO

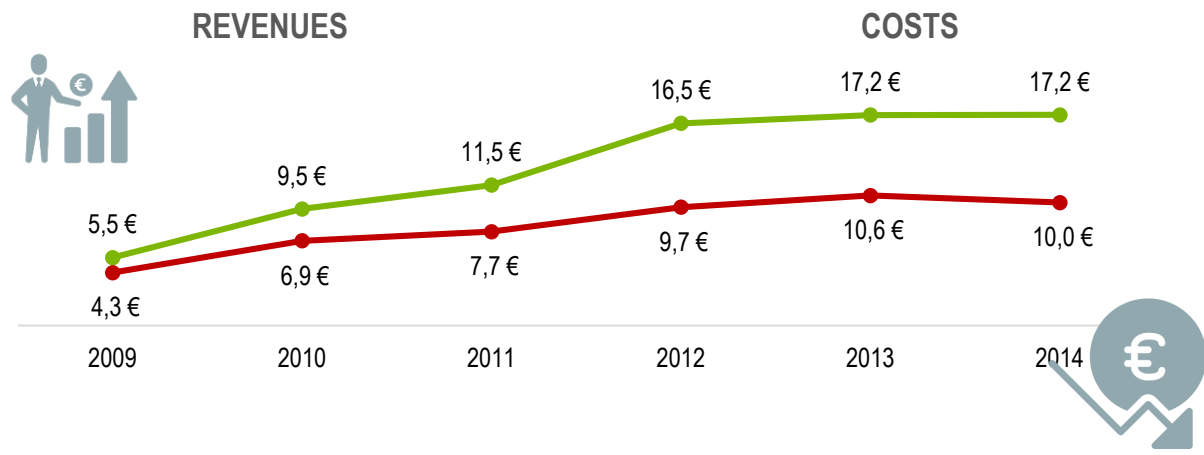**Costs have been growing fastly in AdR, but they are more than compensanted with the increase in Revenues. The huge decrease in losses is the result of an high invesment in infrastructures and their quality**

REVENUES / COSTS

Revenues: 5,5 € (2009), 9,5 € (2010), 11,5 € (2011), 16,5 € (2012), 17,2 € (2013), 17,2 € (2014)

Costs: 4,3 € (2009), 6,9 € (2010), 7,7 € (2011), 9,7 € (2012), 10,6 € (2013), 10,0 € (2014)

Values in million €

EFFICIENCY IMPROVEMENTS

Fixed Tariff (10m^3): €3,69 (2009), €4,67, €4,84, €5,06 (2014)

Losses: 52% (2009), 43%, 35%, 39%, 38%, 34% (2014)

Personnel Expenses per Population covered in 2014 (Thousands)

- Setor: 28,6 €
- Serviços Municipais: 26,4 €
- Águas do Ribatejo: 22,0 €

Positive financial results can be explained through a sustainable tariff over the years, the consistent reduction of losses and efficiency in personnel expenses;

COVERAGE OF TOTAL COSTS

1,04 (2011), 1,10, 1,12, 1,05 (2014); baseline 1,00

Since 2011 AdR presents consistently a solid coverage of total costs, having in 2014 values above national average and specially above municipality services.

Coberage of Total Costs (2014)
- Setor: 0,95
- Serviços Municipais: 0,72
- Águas do Ribatejo: 1,05

Revenues' evolution explanation:
AdR started the operation in the middle of 2009 originating a higher increase in 2010's revenues;
Torres Novas joined AdR in 2011, resulting in a scale increase both in 2011 and 2012;
One of the main concerns of AdR is keeping a sustainable tariff;
Losses decrease since 2009 except in 2012;

Revenues main items (2014):
Tariff WS: 6.712.499€
Tariff WW: 7.557.018€
Subsidies: 2.808.829€

Costs' evolution explanation:
AdR started the operation in the middle of 2009 originating a higher increase in 2010's costs;
Torres Novas joined AdR in 2011, resulting in a scale increase both in 2011 and 2012;
Since 2009 AdR replaced and built new infrastructures which increase the maintenance costs and investments.

Costs main items (2014):
Personnel: 3.273.960€
Electricity: 1.704.829€
Maintenance and Repair Services: 1.075.747€
COGS: 890.172€

"Entidade Reguladora dos Serviços de Águas e Resíduos." ERSAR's Portal. Accessed May 18, 2016. https://portal.ersar.pt/

The predicted investments of Água do Ribetejo until 2047 represent around 400 million euros, 113 of those already accomplished. These investments allowed the operator to increase the efficiency in the management and the quality of the service

Investments plan
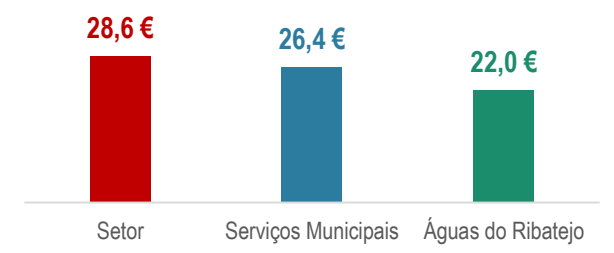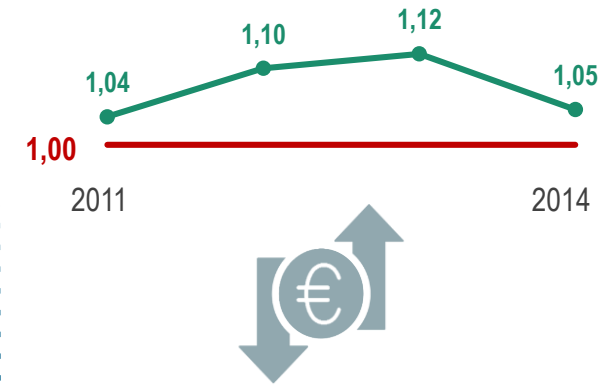
- 2015: Accomplished – 113 Million euros

- 2017: Foreseen– 131 Million euros

- 2047: 400 Million euros

Investments until 2013	WS	WW
Almeirim	3,40 M€	5,37 M€
Alpiarça	2,36 M€	4,09 M€
Benavente	5,88 M€	4,27 M€
Chamusca	5,50 M€	8,79 M€
Coruche/Benavente	-	1,70 M€
Coruche	7,59 M€	20,60 M€
Salvaterra de Magos	5,22 M€	9,31 M€
Torres Novas	7,50 M€	26,20 M€
Total	**37,45 M€**	**80,33 M€**
Total WS+ WW		**117,78 M€**

Figure 6 – AdR Investments plan

INVESTMENTS

A great investment allowed Águas do Ribatejo to improve not only its management efficiency but also its drinking water and service's quality. For a 40 years horizon, the Economic and Financial Model estimates overall investment requirements around 437 million euros.

Initially it was defined a set of goals and targets for the Intermunicipal System to achieve in terms of service indicators' quality (coverage, reliability, efficiency, among others). To accomplish these objectives, and because the municipalities revealed different developmental stages, investments needed were set differently for each municipality.

In a first phase of AdR's life, investments were mainly channelled to the municipalities with lower indicators ratings, and thus stood further away from the objectives and outlined goals, regardless its share capital weight. Therefore, municipalities with larger shares in the capital were likely to receive fewer investments in their areas, and vice versa. This criteria goes along with the principle of solidarity between municipalities – mentioned at the beginning of the analysis – since the investments were conducted on the bottom municipalities performers, regardless other criteria such as economic and financial matters.

In a second phase the situation will be reversed. The least needy municipalities will receive more investment once the new infrastructure already built by the AdR – on other municipalities - will require much less investment to refurbishment and maintenance than the infrastructure that already existed when the AR started its activity.

Best Practice Analysis – ÁGUAS DO RIBATEJO

The investments were used to acquire information systems to support several areas of Águas do Ribatejo, install new water meters, and invest in infrastructures, whether by building new ones or rehabilitating the already existing

Acquired Management System

System	Functionality	Investment
Telegestão	Monitor, control and remotely manage equipment	600 mil euros[1]
Glose	Operation and Maintenance management	30 mil euros
Software Gestão do Controlo Analítico	Analytical Control	5 mil euros
Primavera	Procurement, accounting, treasury, human resources	20 mil euros
Aquamatrix	Commercial management – billing, CRM	80 mil euros[2]
SIG	Software open source with internal development	

Number of water meters

Ano	2009	2010	2011	2012	2013	2014	2015
Inst.	1 585	489[1]	596[1]	-	-	-	-
Subst.	1 296	3 377	6 551	7 660	6 177	6 068	5 157

So, those who initially received less attention will get more investment in the future, specifically the refurbishment and modernization of infrastructure.

EFFICIENCY MEASURES IMPLEMENTED

- **Pipeline Register**

The drinking water supply network (around 2,000 km) is already totally represented with also other infrastructures (reservoirs , EE, ETA , among others) in SIG, with network distribution, materials, diameters, ages, location, accessories.

In the case of wastewater management (around 1,000 km), there is no information in SIG yet. However, the entire network is represented in plants with information on materials, diameters, ages and accessories (partial) and other infrastructure (ETARs, EE, etc).

- **Measurement and Control Zone**

2015 was an important year for MCZ's implementation. currently there are 23 MCZ 's already implemented and 14 under implementation and this is a process to extend over this and the next few years

Figure 7 – AdR Efficiency measures

In addition to the financial improvements, and although it is not possible to compare to the situation before the aggregation, Águas do Ribatejo shows some very positive results in the quality of the service, having only a small number of negative indicators according to ERSAR

Operator Sustainability

AA01 - Physical accessibility of the service ● =
AA02 - Affordability of the service ● −
AA03 - Service interruptions ● −
AA05- Reply to written suggestions and complaints ● +
AA07- Connection to the service ● +
AA10 - Mains rehabilitation ● −
AA11 - Mains failures ● +
AA12 - Adequacy of human resources ● −

AR01 - Physical accessibility of the service ● −
AR02 - Affordability of the service ● −
AR03 - Flooding occurrences ● −
AR04 - Reply to written suggestions and complaints ● +
AR06- Connection to the service ● +
AR08 - Sewer rehabilitation ● −
AR09 - Sewer collapses ● −
AR10 - Adequacy of human resources ● +

Environmental Sustainability

AA13 – Real water losses ● +
AA14 – Fulfilment of the water intake licensing ● +
AA15 - Standardized energy consumption ● +
AA16 - Sludge disposal ● =

AR11 – Standardized energy consumption ● +
AR12 - Proper treatment of collected wastewater ● +
AR13 - Emergency control discharges ● −
AR14 -Wastewater analysis ● +
AR15 - Compliance with discharge parameters ● +
AR16 – Sludge disposal % ● +

Figure 8 – AdR Indicators and evolution

● Good service Quality   + Values above the national average
● Acceptable service Quality   = Values equal to the national average
● Unsatisfactory service Quality   − Values below the national average

"Entidade Reguladora dos Serviços de Águas e Resíduos." ERSAR's Portal. Accessed May 18, 2016. https://portal.ersar.pt/

RESULTS

The Delegated Management Agreement between the municipalities and the Company signed in 2009 defined strategic objectives, materialized in coverage quality of service indicators, environmental performance, productivity and management efficiency. The selection of indicators was based on the 2nd generation service quality indicators used by ERSAR, as well as, their reference levels. These were Coverage of Total Costs, Physical Accessibility to Service (AA01 and AR01) Safe Water (AA04), Non-revenue Water (AA08) and Compliance with Discharge parameters (AR15). From these, only Non-revenue Water (with a 16% decrease) and Compliance with Discharge parameters (with an 85% increase) indicators shown significant developments and convergence with the objectives.

The same indicators were used to conduct a deeper study about the company and its evolution since its beginning. However, unfortunately the data relative of the AdR's first year of operation is not available, being impossible to calculate the evolution held for those who were stated in the Delegated Management Agreement. Being said that, we focused our analysis to a comparison between the evaluations of AdR and the national average.

At the left we can find a chart were we have several drinking water and service quality indicators with their respective evaluations – according to ERSAR – and also if their results are above, equal or below the national average.

The aggregation played a crucial role in the raising of external funds as it was not possible for a municipality to apply individually to the Cohesion Fund. Until now, Águas do Ribatejo have already gathered more than 75 million euros from funding

FUNDING

Funding needs represented one of the major drivers of aggregation. Obtaining funding was the only possibility to cover existing investment needs. And at the time of AdR's creation, an aggregation was the only way to obtain funds.

Before **QREN 2007-2013**, it was not possible for a municipality singly to apply to the Cohesion Fund - financial instrument of the European Union that guaranteed the largest share of support to investments in drinking water supply and wastewater management, and financed all AdR's investments. Despite AdR's formal constitution took place only in December 2007, the process began long before that, and the aggregation of the *Lezíria do Tejo* allowed the municipalities to apply to this fund, resulting - in 2004 – in a substantial amount around **28 million euros**. Following the exit of Santarém and Cartaxo this application was subject of reprogramming - in 2007/2008 - and the execution of investments (WS and WW) began in 2008 and have been completed in 2011.

The second, third and fourth applications were approved by **POVT** in 2009, 2010 and 2011. Águas do Ribatejo benefited from amounts around **22 million euros** (wastewater management investments), **14.5 million euros** (Drinking water supply investments) and **2.2 million euros** (Drinking water supply investments, only in Torres Novas which integrated AdR later) respectively. The implementation of all investments completed in 2015.

At the end of 2015 / early 2016, there were approved by **POSEUR under the Portugal 2020** program, four applications for wastewater management investments, with funding around **9.6 million euros**.

"POVT – Candidaturas." POVT. Accessed May 18, 2016. http://www.povt.qren.pt/
"QREN - Quadro de Referência Estratégico Nacional." Accessed May 18. http://www.qren.pt/
"POSEUR – Documentação" POSEUR. Accessed May 18, 2016. https://poseur.portugal2020.pt/
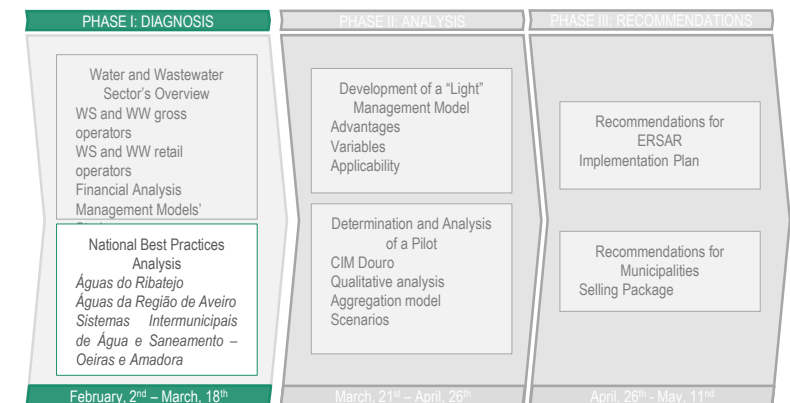
2. PHASE I: DIAGNOSIS

SECTOR'S OVERVIEW

BEST PRACTICE: ÁGUAS DO RIBATEJO

BEST PRACTICE: ÁGUAS DA REGIÃO DE AVEIRO

BEST PRACTICE: SIMAS OEIRAS E AMADORA

The main motivations for the aggregation in the region of Aveiro were the environmental issues around the Ria and the need for a financially sustainable business. The good relations between the municipalities was a great contribution for the success of the aggregation

ECONOMIC AND ENVIRONMENTAL SUSTAINABILITY

- In *Aveiro* county, environmental issue is very important;

- Municipalities realized that drinking water sector could benefit from operators with larger scale and aggregation would allow a more efficient management of the service.

INVESTMENT

- Before the aggregation, the level of infrastructure in Wastewater Management was very underdeveloped;

- It was necessary to improve the service quality, reduce water losses and infiltration in network at a regional scale and not just in certain municipalities.

FUNDING

- Aggregation allowed municipalities to fulfil the necessary requirements for access to funds that, in turn, still allow the achievement of various investments.

MOTIVATIONS FOR THE AGGREGATION

As well as it happened for Águas do Ribatejo, there were three major reasons for the aggregation of the municipalities of Aveiro region: a concern with economic and financial sustainability of the service and environment, being Aveiro a region with a lot of focusing around the *Ria*. This sustainability required a large investment which, in turn, required funding.

HISTORICAL FRAMEWORK

The need for the development of drinking water supply and wastewater management services was quite remarkable which was revealed on the municipalities' initiative for the aggregation. Its success can be explained by the good relations existent between municipalities which had to have gathered together in the past to solve problems for regional development and planning matters. The environmental issue around the *Ria de Aveiro* united the region municipalities on several occasions: at the end of the 80s, the municipalities faced a big pollution problem on *Ria de Aveiro*, which led to the creation of the Ria's Association of Municipalities. Later on, in 1997, municipalities created SIMRIA[1] – and Integrated Sanitation System of Ria Municipalities[1]. It was also created a Regional Sanitation System and Municipal System in "gross" services[2] - *Carvoeiro Vouga* and the concession still exists and has been assigned to a private. This Municipal System explores the water source in the *Vouga* river, and aims the protection of the aquifer in the area - non-renewable aquifer.

Thus, the aggregation in the "retail" occurred in 2009, through a Public Partnership Agreement. In that same year nine municipalities joined the aggregation, and the tenth joined only in 2010.

Águas da Região de Aveiro was created in 2009 with the aggregation of nine municipalities, with Ovar joining afterwards. The share capital belongs to the municipalities and Águas de Portugal, being the latest the majority holder.

Geographical Area

1 500 km^2

Population

350 000

Population Density

233,3

- Águeda
- Albergaria-a-Velha
- Aveiro
- Estarreja
- Ílhavo
- Murtosa
- Oliveira do Bairro
- Ovar
- Sever do Vouga
- Vagos
- Águas de Portugal
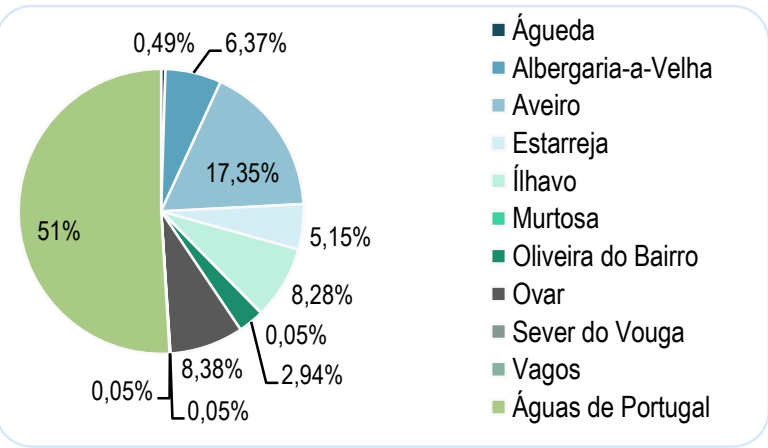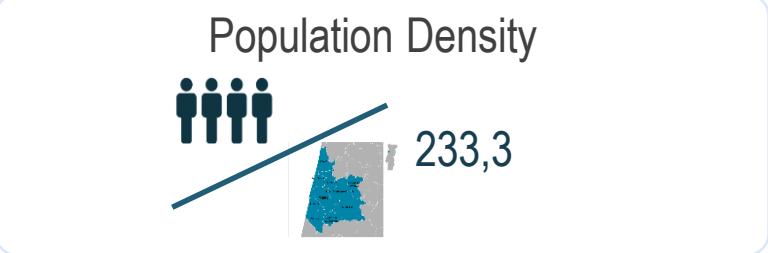
GEOGRAPHICAL FRAMEWORK

Nowadays, *AdRA*[1] includes ten municipalities: *Águeda*, *Albergaria-a-Velha*, *Aveiro*, *Estarreja*, *Ílhavo*, *Murtosa*, *Oliveira do Bairro*, *Ovar*, *Sever do Vouga* e *Vagos*.

Ovar was the last one to join the aggregation, in 2010, for political issues: At that time there were elections going on and the different parties supported different points of view regarding aggregation. After the elections, the party who supported the aggregation was elected leading *Ovar* to join *AdRA*.

Anadia (that also belongs to *CIM Região de Aveiro e Baixo Vouga*) did not join the aggregation also for political matters but contrarily to what happened with *Ovar*, mayor decided to remain independent and against all the odds it got access to EU funds earlier than *AdRA*.

AdRA is receptive to the integration of new municipalities. However, any entrance would have to be accepted by the 11 partners (the ten municipalities plus *Águas de Portugal*). It is estimated that to make a possible entrance more attractive, one operator's situation should be at least neutral or advantageous for the 10 existing municipalities in *AdRA*.

SHARE CAPITAL AND ASSETS OWNERSHIP

AdRA - Águas da Região de Aveiro, S.A. – was created as a public limited company, incorporated in state-owned enterprises[2], and is accountable for the drinking water supply and wastewater management services for the Drinking Water System of Aveiro Region – SARA[3]. Its share capital - € 15 million - is 100 % public and its shareholders are *Águas de Portugal, S.A.* (representing the state) with 51% and ten municipalities with the other 49%.

Figure 9 – AdRA Geographical and demographical Information

The participation in the share capital was defined taking into account the size and investments needs of each municipality, in this model that establishes a partnerhsip between the municipalities and the state to delegate the services to a state-owned company

Delegated Management Model of a Public Partnership[1]
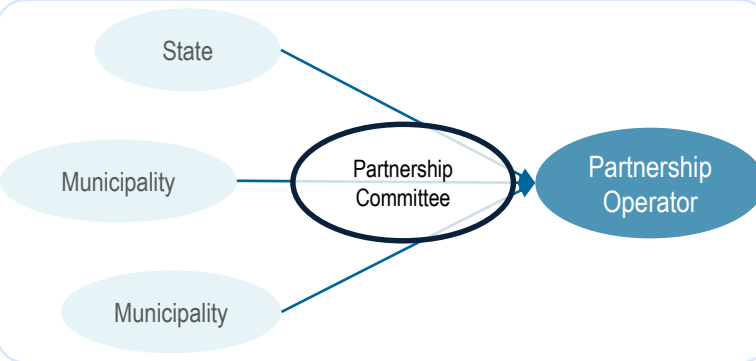
Each municipality's participation was defined taking into account its size (business turnover) and the respective investment needs. This has been agreed and decided by municipalities. The existing infrastructure in each municipality still belong to them but is now managed by AdRA. The new infrastructure belong to AdRA, and at the end of 50 years of partnership, revert to one or more representative bodies of the municipalities.

MANAGEMENT MODEL

In this management model the state cooperates with municipalities for the conduct of municipal competencies, establishing a partnership to delegate service in a state-owned company.

AdRA's partnership committee[2] consists of three members: one representative of the municipalities, one state representative and one member appointed by the other two - an industry expert. For structural issues, concerning matters such as business plans, investment, financial, accounting reports and tariffs, this commission's approval is necessary. The commission meets at least once a year.

AdRA's Board of Directors consists of five members: three representatives of *AdP* and 2 representatives of the municipalities. There are monthly meetings that address important issues with present-day status.

Figure 10 – AdRA Management Model and Organization

Best practice analysis – ÁGUAS DA REGIÃO DE AVEIRO

AdRA shows positive financial results coming mainly from its sustainable and responsible management policy, with anual revenues increasing more than anual costs and with efficiency indicators above national average

REVENUES

44 242 804 €
41 558 561 €
44 095 169 €

32 323 725 €
34 783 080 €
34 261 750 €

2012   2013   2014
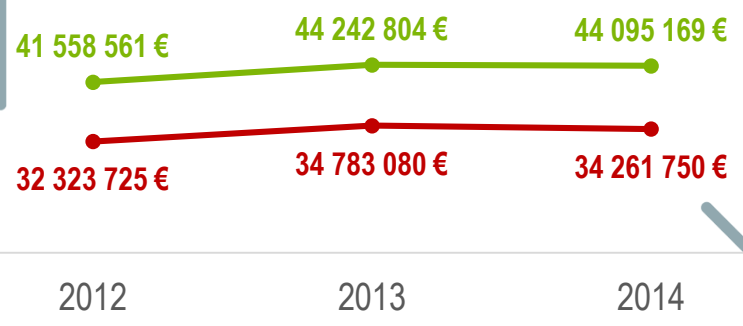
CAGR = 3,01%

Revenues main items (2014):
WS Tariff: 23.845.099€
WW Tariff: 18.283.458€
Subsidies: 336.501€

COSTS

CAGR = 2,95%

Costs main items (2014):
WW Treatment: 11.863.349€
COGS: 5.658.660€
Personnel: 5.164.040€
Rents: 2.455.001€
Electricity: 1.784.702€

EFFICIENCY IMPROVEMENTS

Fixed Tariff (10m³)

€10,53 €10,91 €11,09 €11,13 €11,36 €11,48
2009   2014

Losses

34% 35% 39% 35% 32%
2009   2014

Personnel Expenses per Population covered in 2014 (Thousands)

€28,56 Setor
€26,39 Serviços Municipais
€17,46 Águas da Região de Aveiro
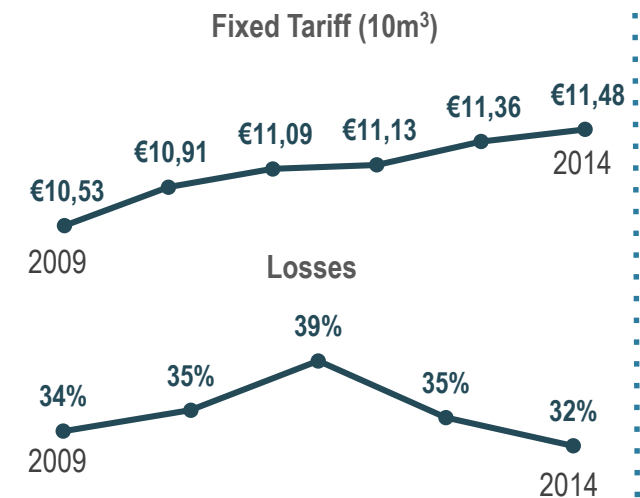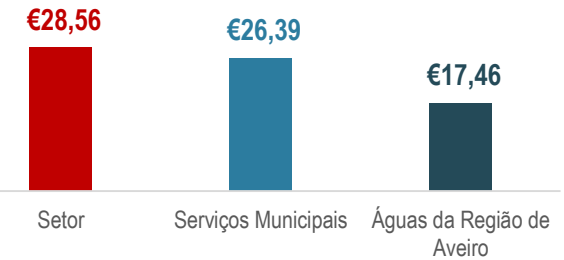
AdRA can keep positive results during the years through a reduction in losses and an increase in tariffs. Adittionally personnel expenses are efficient and bellow the national average.

COVERAGE OF TOTAL COSTS

1,07 1,04 1,03 1,02
1,00
2011   2014

AdRA presents a positive coverage of total costs within ERSAR's range since 2011, better than national average and a lot above municipality services.

Coverage of Total Costs (2014)
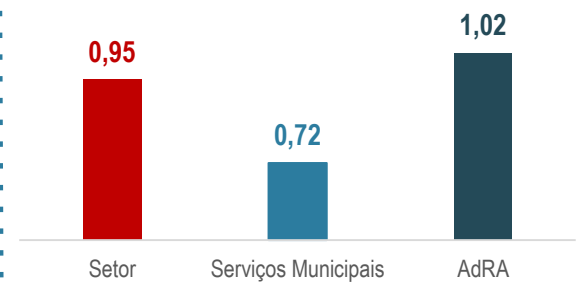
0,95 Setor
0,72 Serviços Municipais
1,02 AdRA

One of the main motivations for the constitution of AdRA were the poor conditions of water supply and wastewater management systems. So, the Investment Plan was one of the key points when developing the Strategic Framework Document

Investments Plan

- 2015: Accomplished – 45 Million Euros

- 2059: 500 Million Euros

Investment until 2015	
Águeda	9,6 M€
Albergaria	0,3 M€
Aveiro	1,3 M€
Estarreja	0,5 M€
Ílhavo	7,3 M€
Murtosa	4,6 M€
Oliveira do Bairro	1,9 M€
Ovar	9,8 M€
Sever do Vouda	5,4 M€
Vagos	3,9 M€
Total	**45 M€**

INVESTMENTS

Having been one of the major objectives of the establishment of AdRA to ensure the quality, continuity and efficiency of public services of water supply and wastewater management, there was a huge need to reshape and enhance the network and infrastructures. To improve the service quality would lead to an increase in the population welfare, environmental protection and economic and financial sustainability of the sector. AdRA's initial investments plan - provided for the duration of the partnership contract – revealed a need for 500 million euros to invest in construction, expansion, remodelling and maintenance of water supply and wastewater infrastructure. Upon AdRA's constitution, wastewater service's infrastructures found to be much more deprived than the water supply's. As such, for the first years of activity was estimated an initial investment of approximately 100 million euros for wastewater and only 20 million euros to water supply.

EFFICIENCY MEASURES IMPLEMENTED

- **Pipeline Register**

Both drinking water supply network (around 3,961 km) and wastewater network (around 2,401) are represented.

- **Measurement and Control Zone**

AdRA has already 78 MCZs implemented, being these one of the most prevalent equipment to control water loss.

- **Management System**

AdRA has also invested a lot on management system, which guarantees an efficient, fast and accurate management.

Figure 11 – AdRA Investments plan

Best practice analysis – ÁGUAS DA REGIÃO DE AVEIRO

Once again, it is impossible to compare the situations before and after the aggregation. However, it is easy to conclude that AdRA has now very good evaluations in most of indicators and, in general presents better values than AdR

Operator Sustainability

Indicator		
AA01 - Physical accessibility of the service	🟢	+
AA02 - Affordability of the service	🟢	−
AA03 - Service interruptions	🟢	+
AA05- Reply to written suggestions and complaints	🟢	+
AA07- Connection to the service	🔴	−
AA10 - Mains rehabilitation	🔴	−
AA11 - Mains failures	🟢	+
AA12 - Adequacy of human resources	🔴	−
AR01 - Physical accessibility of the service	🟢	−
AR02 - Affordability of the service	🟢	+
AR03 - Flooding occurrences	🟡	+
AR04 - Reply to written suggestions and complaints	🟢	+
AR06- Connection to the service	🔴	−
AR08 - Sewer rehabilitation	🔴	−
AR09 - Sewer collapses	🔴	+
AR10 - Adequacy of human resources	🔴	−

Environmental Sustainability

Indicator		
AA13 – Real water losses	🟡	+
AA14 – Fulfilment of the water intake licensing	🔴	−
AA15 - Standardized energy consumption	🟡	+
AA16 - Sludge disposal	NA	NA
AR11 – Standardized energy consumption	🟢	+
AR12 - Proper treatment of collected wastewater	🟢	+
AR13 - Emergency control discharges	🟢	+
AR14 -Wastewater analysis	🟢	+
AR15 - Compliance with discharge parameters	🟢	+
AR16 – Sludge disposal %	🟢	+

Figure 12 – AdRA Indicators and evolution

🟢 Good service Quality
🟡 Acceptable service Quality
🔴 Unsatisfactory service Quality

+ Values above the national average
= Values equal to the national average
− Values below the national average

For the customer, AdRA invested on Customer Relationship Management – CRM – (*Aquamatrix*), on a Call center (*IPBrick*), on waiting line and procedures and shopping management (*Vortal*).

For the service, AdRA invested on management systems for the fleet (*Inosat*), maintenance (*Aquaman*), SIG (*Geosig and Geomedia*), network and SI systems (*Nagios*), laboratory (*Labways*) and MCZ (*Waterpi*).

For an efficiency improvement, AdRA invested on document management (*Fortis*), printer, fax scans, remote management software and SCADA, attendance systems management (*millenium*), video surveillance, security and protection of fires management.

RESULTS

For a more accurate comparison between cases, the same indicators were used to analyze operator and environmental sustainability.

Once again, the data relative of the AdRA's first year of operation is not available, and so it is impossible to study the evolution of the indicators so far. Looking for the chart on the left it is possible that there are several indicators presenting a good service quality and values above the national average.

Knowing that at the first year of AdRA's operation wastewater service found to be very under-performing, and looking to the environmental sustainability indicators that have all good evaluations, it is possible to say that there were positive results from the investment made, even without 2009's indicators' values.

Funding was one of the most important matters for AdRA, since it would be – and still is – the main support for investments. AdRA was expecting to get almost 200 million euros from external financing

FUNDING

In addition to self-financing, financial structuring of the Partnership Company was carried out taking into account the use of five possible sources of funding:

- *"**Share Capital**: is expected to be around **15 million**, in 2009 (**12,5 million euros**) and 2012 (**2,5 million euros**);*

- **Non repayable Grants**: *QREN's pooling in the amount of **42,1 million euros** relating to eligible investment. (...);*

- **Commercial Banking medium and long term Loans**: *It is expected to get a medium and long term financing of **44,5 million euros** from the Commercial Banking with uses in 2010 (**31 million euros**) and in 2012 (**13,5 million euros**) . (...) This amount is intended to finance the compensation to municipalities.*

- **Investment European Bank medium and long term loans**: *It is expected to get a medium and long term loans totalling **67 million euros**, to be used between 2010 and 2014 (1st tranche) and 2015 and 2017 (2nd tranche). (...) This amount is intended to finance the initial investment plan.*

- **Pledged Current Account**: *assumed to get a short-term line in the maximum amount of EUR **42 million** "[1]*

2. PHASE I: DIAGNOSIS

SECTOR'S OVERVIEW

BEST PRACTICE: ÁGUAS DO RIBATEJO

BEST PRACTICE: ÁGUAS DA REGIÃO DE AVEIRO

BEST PRACTICE: SIMAS OEIRAS E AMADORA

Best Practice Analysis – SIMAS Oeiras e Amadora
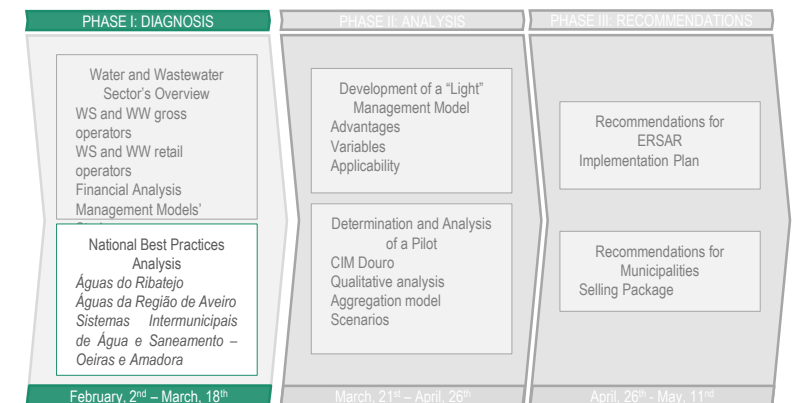
Instead of case of a case of aggregation as AdR and AdRA, SIMAS of Oeiras e Amadora is a case of 'non separation'. The financial stability and political relationship between municipalities are the main reasons of the decision of 'non separation'

Area

70 km^2

Population

347 805

Population Density

4 968,64

Clients

Oeiras
93.036

Amadora
89.984

183 020
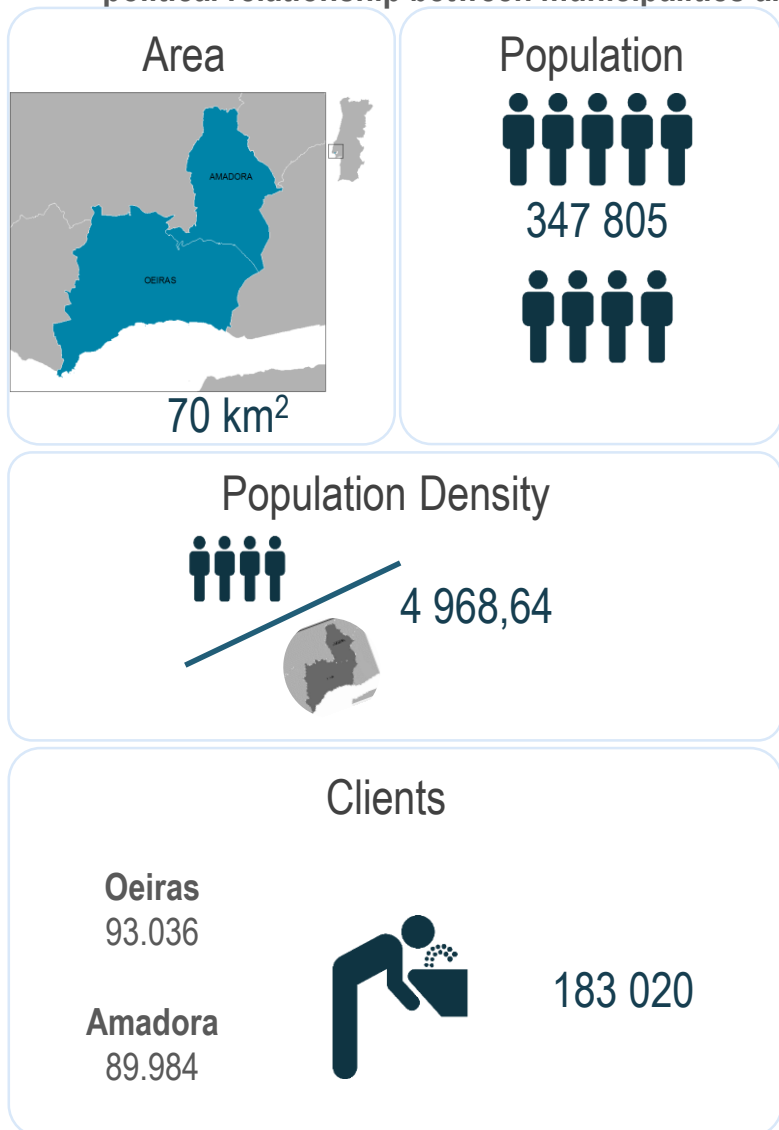
REASONS FOR MAINTENANCE

Instead of a case of aggregation such as *Águas do Ribatejo* and *AdRA* which were an aggregation, *SIMAS* best practice is a case of 'non separation'.

Until 1979, *Amadora* was not consider a municipality and belonged to *Oeiras*. When *Amadora* became a municipality the decision of 'no separation' had several reasons. For instance:

- The economic and financial sustainability of the service

- The political relationship and the proximity between municipalities

- The assets division was not realized when *Amadora* became a municipality, which in case of separation becomes more difficult to differentiate which infrastructure belong to *Amadora* or to *Oeiras*. The investment made in both municipalities belongs only to Oeiras.

HISTORICAL AND GEOGRAPHICAL FRAMEWORK

The Municipalized Services of *Oeiras* were created in 1929 by *Oeiras* City Council. In 1956 the wastewater management services of *Oeiras* were formed, in order to solve a pollution problem created by the increase of population and industrial activities. In 1979 the Municipalized Services of Oeiras – *SMAS* –, changed their legal form to Inter-Municipalized Services of *Oeiras* and *Amadora*. The creation and maintenance of *SIMAS* was due to the need of empowerment of the water supply and wastewater management. In this sense the services would have a business management, and it would not lose their social characteristics nor their public service nature.

Figure 12 – SIMAS Geographical and demographical Information

SIMAS operate as an Inter-municipalized Services that do not share capital. SIMAS have a shared autonomous structure without legal personality, and its management relies on the decision made by the municipalities

Model of Inter-Municipalized Services

Holder	Municipalities or Association of Municipalities
Operator	Municipalities or Association of Municipalities

Inter-municipal Solution

Municipality → Inter-Municipalized Services

Municipality →

SIMAS Chart

- Studies, Planning and Management Control Division
- Administrative Council
- President of the Administrative Council
- Auditing and Juridical Support Division 5
- Director of SIMAS

Communication and Client Support Division 23	Infrastructures Supervision and Maintenance Division 17	Laboratory and Analysis Division 18	Computing and Information Systemas Division 12	Human Resources Management Division 12
Equipment and Telemanagement Division 59	Oeiras Water Division 30	Amadora Water Division 30	Accounting Division 13	Comercial Division 64
Water Losses and Pipeline Registre Division	Wastewater Management of Oeiras Dvisiion 21	Wastewater Management of Amadora Division 17	Div. de Aprovisionamento 16	Management of Clientes Division

Figure 13 – SIMAS Management Model and Organization

SHARE CAPITAL AND ASSETS OWNERSHIP

Since *SIMAS* are an Inter-Municipalized Services that do not share capital, because it is not a company. The assets that these services own are only the ones that are in the P&L accounts. The SIMAS do not possess in their accounts municipalities assets.

MANAGEMENT MODEL

Amadora and *Oeiras* municipalities have a direct management model. In 1927, when the service was created, *Amadora* belonged to *Oeiras*, the management was only done by the Municipalized Services of Water Supply and Wastewater Management (SMAS). However, in 1979, SMAS changed to SIMAS the Inter-Municipalized Services which have shared autonomous structure without legal personality. Since SIMAS are an Inter-Municipalized Services, the management of the services depends on the decisions made by the municipalities. The strategic decisions are taken by the Administrative Council. These Services have a budget of €149.000, though when this value is exceeded it need to be approved by the City Council. When SIMAS want to hire new workers it also need to be accepted by both City Halls, once the services do not have autonomy to do it. The Administrative Council is constituted by three elements – the Mayor of the City Hall and two city councilors. Nowadays, those three elements are the Mayor of Oeiras City Hall, one city councilor of Oeiras and one city councilor of Amadora. This changes every two years.

ORGANIZATION

SIMAS Oeiras e Amadora back office is in Oeiras. The organizational structure of the Inter-Municipalized Services is divided into 17 divisions which directly report to the Director of SIMAS.

Best Practice Analysis – SIMAS Oeiras e Amadora

SIMAS present a decrease in revenues compensated with an higher decrease in costs. This situation contributed to coverage total costs' maintenance above optimal value. This values can also be justified with the increase of tariffs in the last five years

REVENUES

53 729 446 €
48 450 828 €
48 642 666 €

39 549 875 €
36 749 016 €
35 420 662 €

2012   2013   2014
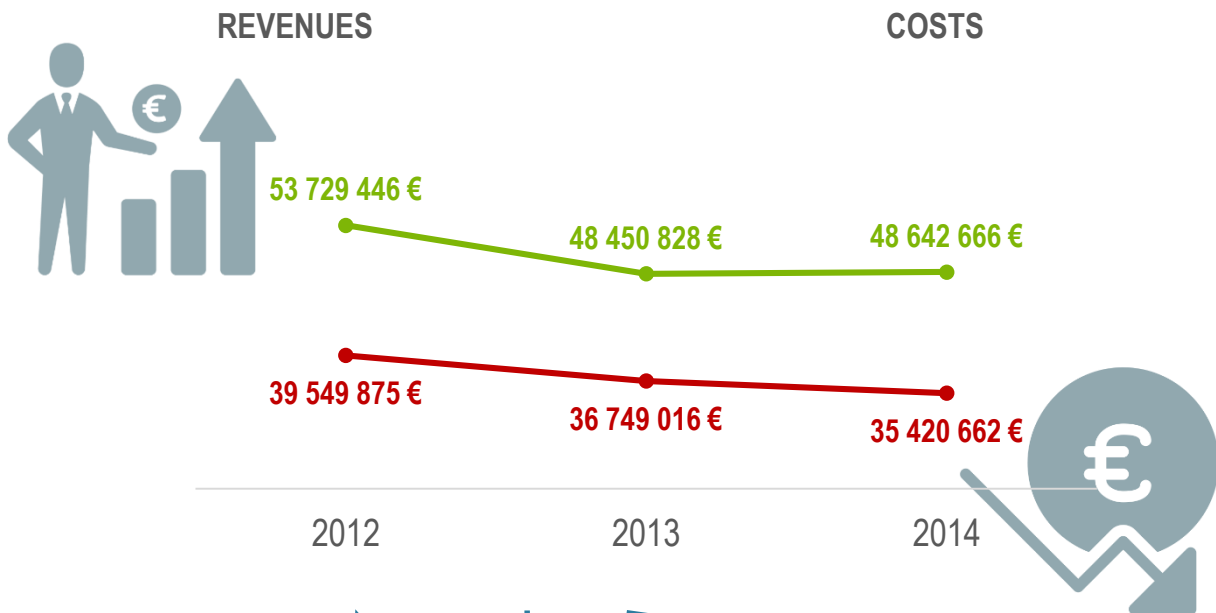
CAGR = -3,26%

Revenues main items (2014):
WS Tariff: 20.610.769€
WW Tariff: 27.579.723€

COSTS

CAGR = -3,61%

Costs main items (2014):
COGS: 12.871.340€
Personnel: 8.217.440€
Electricity: 1.704.829€
Maintenance and Repair Services: 11.075.747€
Specialized Jobs: 804.828.001€

EFFICIENCY IMPROVEMENTS

Fixed Tariff (10m^3)

10,78 €
8,66 €
9,14 €   9,15 €
6,00 €
4,42 €

2009   2014

Losses

20,3%   20,8%   20,9%   21,3%

2009   2014

Personnel Expenses per Population covered in 2014 (Thousands)

€28,56   €26,39   €23,66

Setor   Serviços Municipais   SIMAS de Oeiras e Amadora
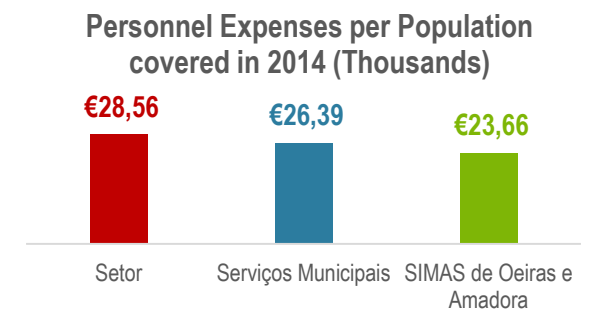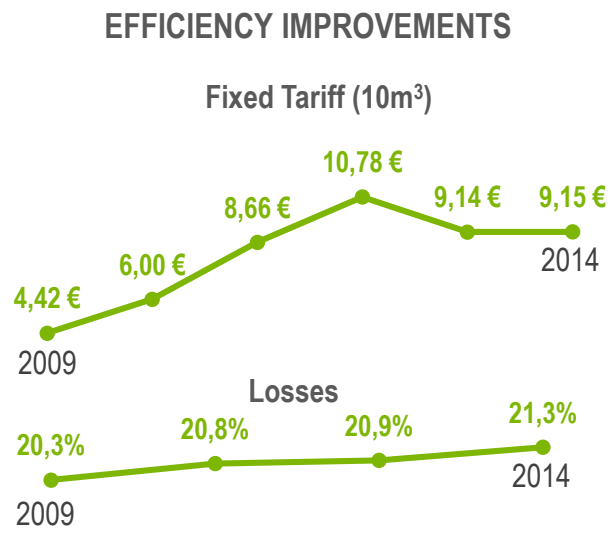
SIMAS can keep a personnel expenses sustainable, below sector's average. Moreover SIMAS is able to hold a coverage of total costs above the recommendations by tariffs and low losses.

COVERAGE OF TOTAL COSTS

1,19   1,28

1,00

2011   2014
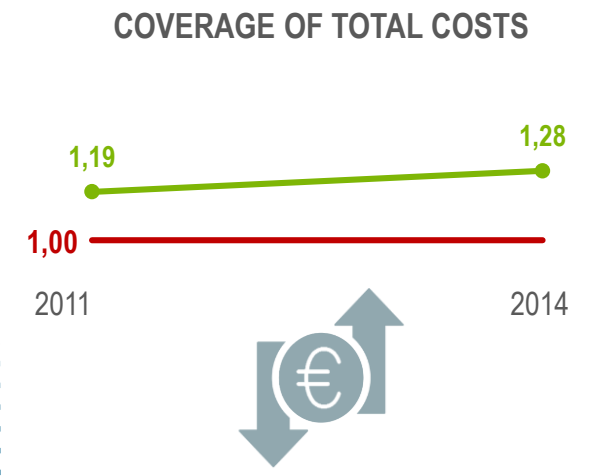
SIMAS presents a positive coverage of total costs since 2011 (1,19 in 2011 and 1,28 in 2014), a slightly above ERSAR's recommended values (1,0;1,1).
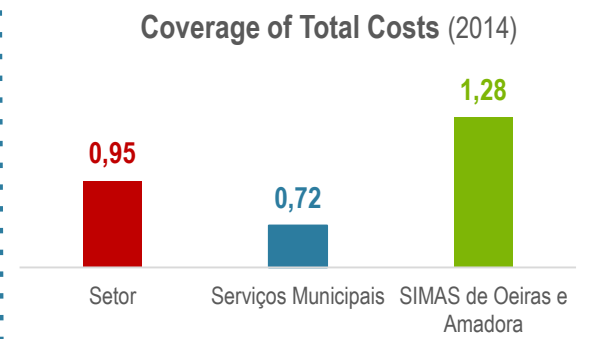
Coverage of Total Costs (2014)

0,95   0,72   1,28

Setor   Serviços Municipais   SIMAS de Oeiras e Amadora

simas OEIRAS E AMADORA   ERSAR   NOVA School of Business & Economics   Shaping powerful minds

SIMAS are currently investing in several projects in order to improve the service. One of the main concerns of the services is the water losses, because they are wasting thousand of euros in unaccounted-water. In order to solve this problem, they are investing in the substitution of water meters

Investments Plan*

Objectives	Year		
	2013	**2014**	**2015**
Water Supply	3 397 515,43	2 106 809,76	991 093,74
Wastewater Management	2 627 765,87	1 504 966,82	1 915 801,87
property in common course	2 207 796,65	109 484,71	263 104,87
Land and Natural Resources	20 000,00	0,00	0,00
Buildings	145 354,53	208 270,78	92 036,37
Constructions	1 422 931,07	1 109 427,24	191 369,07
Basic Equipment	136 196,17	179 975,43	185 049,94
Transport Equipment	266 224,62	377 390,43	86 036,89
General Tools	8 780,36	2 281,59	11 047,90
Administrative Equipment	396 324,78	270 780,91	411 098,05
TOTAL	**€10 628 889,48**	**€5 869 387,67**	**€4 146 638,70**

* These investments are 100% self-financed

INVESTMENT

Over the last three years SIMAS investment was mainly used to Water Supply and Wastewater Management. From 2013 to 2014, the investment decreased 44%. The main reason of this decrease was clearly the fact that processes and procurement takes time to be implemented, even if SIMAS have financial liquidity to invest. Furthermore, in order to invest, they need the approval of both city halls, which also takes time.

These investments have been increasing SIMAS's water and service quality and their management efficiency.

Currently, SIMAS are investing in several projects:

- **Document management:** which is an information system that will allow SIMAS to understand what is going wrong and the reason behind this failure. They will start with claims and service suppliers processes.

- **Telemetry in big clients:** will prevent ruptures, thus controlling the consumption of water. The reading will be digital and the information about the consumption of water will be send by message or email. The cost of this investment is €90/100 per telemetry water meter. The cost of normal water meter is €20/25.

- **Substitution of water meters:** is essential because SIMAS were losing 600 thousand euros in unaccounted-for water. The water meters every 6 years should be replaced because they wear out.

Figure 13 – SIMAS Investments Plan

Between 2012 and 2013, the Inter-Municipalized Services have received approximately 467 thousand euros from European Funding. This funding was used to invest in the Project Bacia Algés

Funding Oeiras and Amadora

- 2012 e 2013:

  - Received: €466 436,70

  - To Receive: €288 501,73

  - **Total: €754 938,44**

European Union
European Social Fund
Investing in jobs and skills

- **Sealing equipment:** will prevent robbery and theft and also it will reduce water losses. The cost of this investment is low.

- **Direct debit and electronic invoice campaign:** will allow *SIMAS* to reduce costs since they would stop sending water bills by mail.

- **Substitution and management of pipeline replacement** will is also related with the water losses. It will control and reduce water losses.

FUNDING

Between 2012 and 2013 SIMAS received approximately 467 thousand euros from the European Funding. The value received was invested in several projects, such as: the Project *Bacia de Algés*, the construction of pumping stations, the substitution and improvement of domestic and rain collectors in *Damião Góis, Brandoa, Alfornelos* and *Bacia de Algés*. Currently, SIMAS still have to receive 289 thousand euros from the European Funding.

Best Practice Analysis – SIMAS Oeiras e Amadora

The Inter-municipalized Services represent a good service quality in both operator and environmental sustainability indicators, though there are some indicators with unsatisfatory quality and others below the national average

Operator Sustainability

AA01 - Physical accessibility of the service
AA02 - Affordability of the service
AA03 - Service interruptions
AA05- Reply to written suggestions and complaints
AA07- Connection to the service
AA10 - Mains rehabilitation
AA11 - Mains failures
AA12 - Adequacy of human resources

AR01 - Physical accessibility of the service
AR02 - Affordability of the service
AR03 - Flooding ocurrences
AR04 - Reply to written suggestions and complaints
AR06- Connection to the service
AR08 - Sewer rehabilitation
AR09 - Sewer collapses
AR10 - Adequacy of human resources

Environmental Sustainability

AA13 – Real water losses
AA15 - Standardized energy consumption

AR11 – Standardized energy consumption
AR12 - Proper treatment of collected wastewater
AR15 - Compliance with discharge parameters
AR16 – Sludge disposal %

Figure 13 – SIMAS Indicators and evolution

● Good service Quality   + Values above the national average
● Acceptable service Quality   = Values equal to the national average
● Unsatisfactory service Quality   – Values below the national average

RESULTS

We studied the operator sustainability indicators and the environmental sustainability indicators, in order to evaluate the water and service quality of SIMAS. The selection of indicators was based on the 2nd generation service quality indicators used by ERSAR as well as their reference levels.

SIMAS show in both operator and environmental sustainability indicators a good quality of the service. Most of the indicators are above the national average. Although there still some indicators that are below the average. The Affordability of the service indicator (AA02) has good quality however it is below the national average. Additionally, the Adequacy of human resources (AA12) has a bad service quality and it is below the national average that means that regarding the volume of the activity the adequacy of the human resources is unsatisfactory. The Real water losses indicator (AA13) has a unsatisfactory service quality, however is above the national mean. As we said before this indicator is one the biggest concerns of SIMAS and also one of the biggest investments of the Inter-Municipalized Services.

3. PHASE II: ANALYSIS

LIGHT MANAGEMENT MODEL

PILOT ANALYSIS

- QUALITATIVE ANALYSIS

- AGGREGATION MODEL

- SCENARIOS

PHASE III: RECOMMENDATIONS	PHASE II: ANALYSIS	PHASE III: RECOMMENDATIONS
Water and Wastewater Sector's Overview WS and WW gross operators WS and WW retail operators Financial Analysis Management Models'	Development of a "Light" Management Model Advantages Variables Applicability	Recommendations for ERSAR Implementation Plan
National Best Practices Analysis *Águas do Ribatejo Águas da Região de Aveiro Sistemas Intermunicipais de Água e Saneamento – Oeiras e Amadora*	Determination and Analysis of a Pilot CIM Douro Qualitative analysis Aggregation model Scenarios	Recommendations for Municipalities Selling Package
April, 26th - May, 11nd	March, 21st – April, 26th	April, 26th - May, 11st

Light Management Model

Instead of a traditional aggregation model, Municipalities may decide to adopt the Light Management Model. With less commitment and without any loss of autonomy, municipalities can cooperate and share services, using the CIM as intermediate

Light management model

Shared services
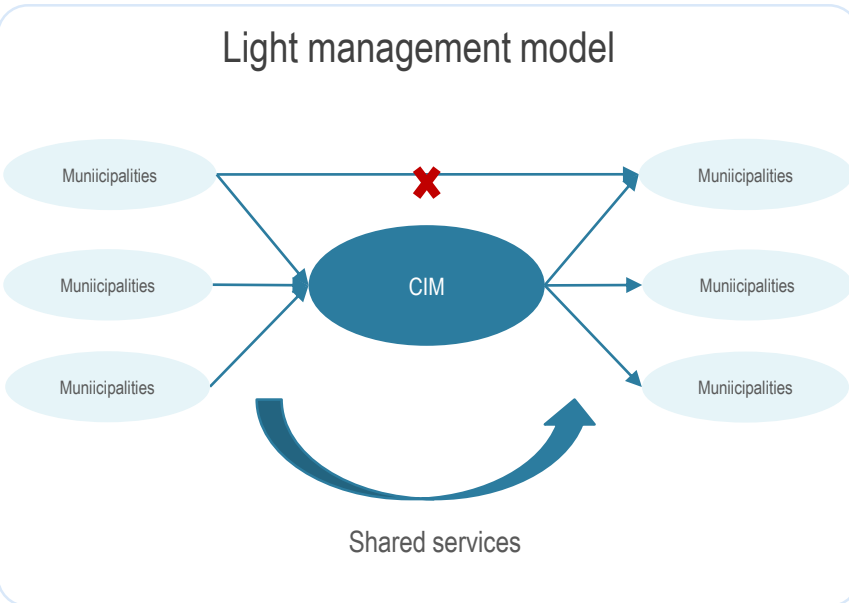
FRAMEWORK

Nowadays, there are several traditional aggregation models that Municipalities may decide to adopt. However, these models require a high degree of commitment and a loss of independence. In order to maintain management autonomy and take advantage of the strong points and best practices of others municipalities, they can decide to undertake a cooperation model designated by Light Management Model. This model is a soft version of an agregation model and can be described as a partnership between Municipalities.

In this cooperation model, Municipalities will provide the services they are able and willing to and that still have capacity to be used. On the other hand, they are going to receive those in which they lack operational competences and need to sub-contract or are not efficient enough. Those services are then attributed to the respective CIM that acts as an intermediate, and is in charge of the management of those services.

These services that can be shared or "borrowed" by the Municipalities can be categorized by its nature and area of operation. Regarding the nature of the services, they can be information systems, assets or infra-structures, human resources, management systems or external supplies and services. Regarding the operation area of those services, they might belong to the commercial, human resources, financial and administrative, planning and management control, network mapping and control of losses, accounting, customer relationship management, equipment and laboratories of analysis, auditing and legal support, information systems or water supply and wastewater operational services.

Figure 14a) – Light Management Model Demonstration

Light Management Model

The advantages of this model are similar to the ones in an aggregation model, both aiming to reach higher consumer satisfaction and efficiency. The main differences are the maintenance of the municipality independence and low degree of commitment

+ Light   **- Light**

Independent	**Tariff**	Uniform
-	**Share of services**	**+**
Independent	**Application to European Funding**	Together

Figure 14b) – Light Management Model Demonstration
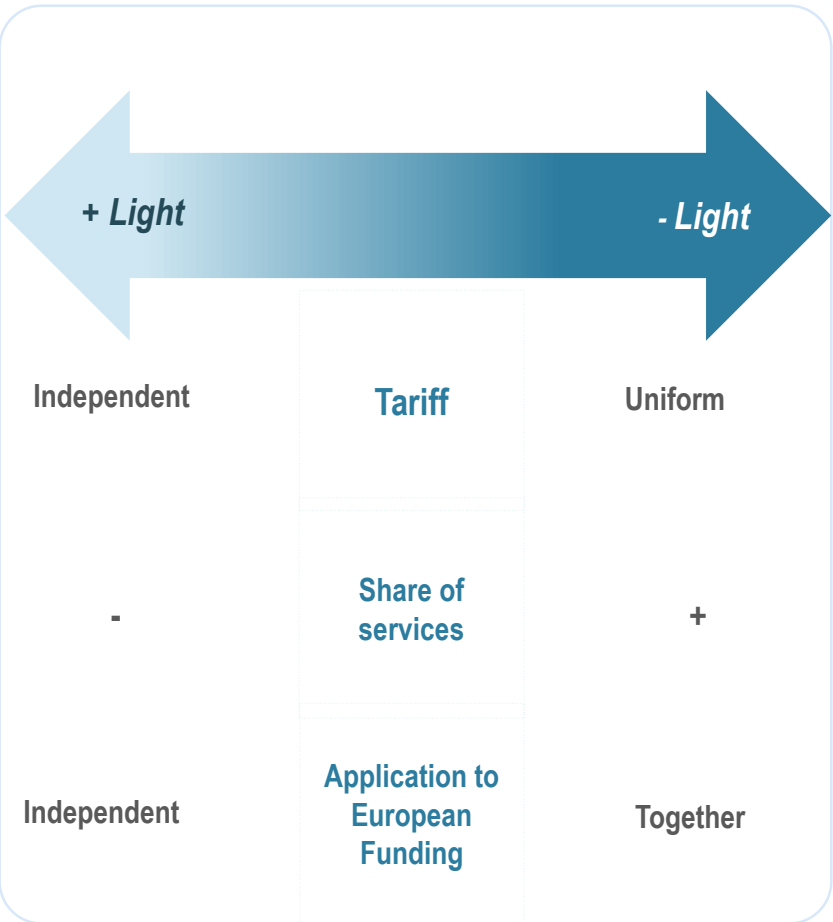
ADVANTAGES

With this model, there are several advantages that Municipalities can enjoy, most of them being the same as the ones provided by an aggregation model. Firstly, they maintain their own independence and autonomy. They still keep their identity, management structure and direct control over management. Secondly, this model requires less commitment and higher flexibility and, consequently, it decreases the risk and implications associated. Moreover, Municipalities can have other advantages, such as: enjoy from economies of scale and have an easier access to European funding; Municipalities can create synergies and promote good relationships between them; maintain the assets ownership and cut costs in services that were otherwise sub-contracted; among other things.

The Light Model is an easier and simpler solution and can be the right way for those Municipalities who prefer a solution of cooperation instead of a full aggregation, with less commitment but still aiming for higher levels of efficiency and consumer satisfaction. Furthermore, this model has some characteristics with some degree of flexibility, and their establishment will define the degree of lightness the model will take. One of these characteristics is the determination of the tariff charges. At this point, municipalities have to decide if they are going to apply uniform tariff charges across all municipalities that belong to the cooperation, or not. The second parameter is the number of services shared between the municipalities: the fewer the number of services provided to the CIM, the lighter the model is, and vice-versa. Finally, municipalities may decide to apply individually to the European funding, or together as one.

Light Management Model

Despite of the low level of commitment required for this model, a certain number of parameters have to be created to regulate the partnership. Supervision parameters and sanctions have to be defined, in order to have an efficient cooperation

APPLICABILITY

Despite of the fact that this model requires a lower degree of commitment from the municipalities than an actual aggregation model, it is necessary to define and implement a contract, as well as to establish certain paramaters to make sure everything goes as it is supposed to according to the agreements made. Before the cooperation and the exchange of the services, the parties involved need to define all the parameters and conditions of the contract, in order to establish all the variables, obligations and responsabilities that regulate the interaction within the partnership. These contracts might have different levels of commitment and goals, that can be defined by the number of hours or level of satisfaction. Additionally, Municipalities must decide the duration of the contract.

Moreover, the responsability of supervising everything has to be allocated to an entity, such as the CIM, ERSAR or the Municipalities. This entity will be in charge of the supervision and the enforcement of the contract parameters. The sanctions to those municipalities that do not comply or violate the parameters have be defined, in order to have an adequate penalization.
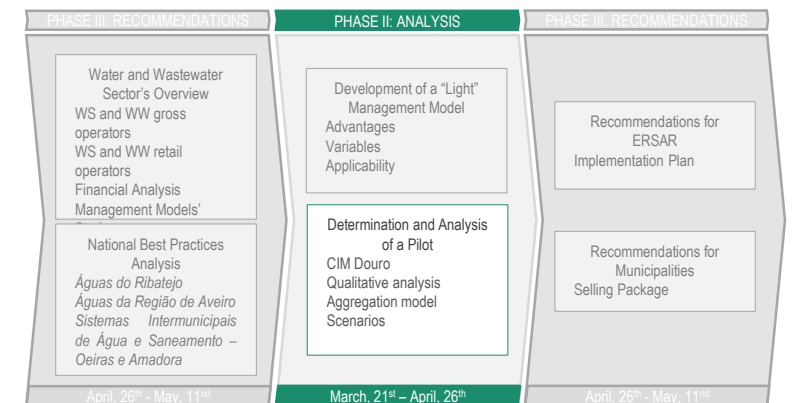
3. PHASE II: ANALYSIS

LIGHT MANAGEMENT MODEL

PILOT ANALYSIS

- **QUALITATIVE ANALYSIS**

- AGGREGATION MODEL

- SCENARIOS

Qualitative Analysis – REGION

CIM Douro is a rural region with great disparities on the economic and demographic indicators. It is a region with low population density and it has a low purchasing power per capita. This represents a big challenge to the management of water services

Area

4032 km²

Population

205 157

Population Density

50,9

Purchasing Power per capita

68,31 %

REGION FRAMEWORK

CIM Douro belongs to a mainly rural region , however there are three municipalities – *Vila Real, Peso da Régua and Lamego* - that are considered semi-urban according to ERSAR's criteria. CIM Douro occupies 5% of the Portuguese territory.

Vila Real represents 25% of CIM's population with 50 000 habitants. *Lamego, Peso da Rágua* and *Alijó* represent other 25% of CIM's population. *Lamego* has a population of 27 000 people, *Peso da Régua* 17 000 and Alijó has a population of 12 000.

This region has great disparities. There are five municipalities with a population density above 100 and seven municipalities below 30. The population density varies between 15,5 – *Freixo de Espada à Cinta* – and 180,3 – *Peso da Régua.*

The purchasing power of the region represents around 70% of the national average which is a low level of economic well-being. 100% corresponds to the national average.

Tabuaço is the municipality that has the lowest purchasing power of the region with 57% per capita. Furthermore, Tabuaço is the municipality with the second lowest purchasing power per capita in Portugal.

"Entidade Reguladora dos Serviços de Águas e Resíduos." ERSAR's Portal. Accessed May 18, 2016. https://portal.ersar.pt/
"RELATÓRIO ANUAL DOS SERVIÇOS DE ÁGUAS E RESÍDUOS EM PORTUGAL (2014) Sumário Executivo (1st ed., Vol. 1). 2015. Lisbon: ERSAR. Accessed May 18, 2016
http://www.ersar.pt/website/ViewContent.aspx?FolderPath=\Root\Contents\Sitio\MenuPrincipal\Documentacao&SubFolderPath=\Root\Contents\Sitio\MenuPrincipal\Documentacao\PublicacoesIRAR&BookCategoryID=1&BookTypeID=3&Section=MenuPrincipal

Figure 15 – CIM Douro Geographical and Demographical Information

In CIM Douro region, most of the operators buy their water in 'alta'. The price of the water is around 0,53€/m^3. There is a high tariff disparity in the region, there are four operators that do not charge the consumers the wastewater management service
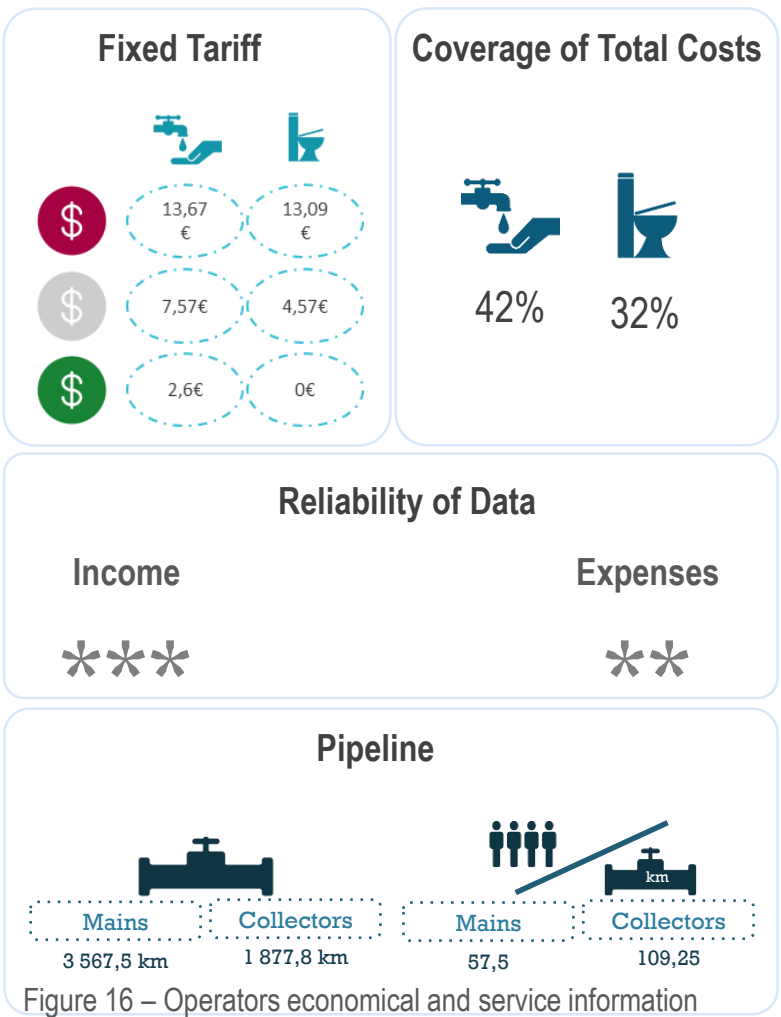
Fixed Tariff

13,67 €	13,09 €
7,57€	4,57€
2,6€	0€

Coverage of Total Costs

42%   32%

Reliability of Data

Income ✶✶✶

Expenses ✶✶

Pipeline

Mains	Collectors	Mains	Collectors
3 567,5 km	1 877,8 km	57,5	109,25

Figure 16 – Operators economical and service information

OPERATOR FRAMEWORK

There are 19 operators in *CIM Douro*, 17 operators control their systems in "Gross" and the other 2 operators control their systems both in "Gross" and "Retail", namely *Penedono* and *Carrezeda de Ansiães*. Those 17 operators buy their water to *Águas do Norte* which is an operator of a multi-municipalized system in "gross".

Regarding the tariff charges in *CIM Douro* there are differences between water supply and wastewater management through the municipalities. The highest tariff charges regarding water supply is €13,67 in *Mesão Frio* and regarding wastewater management is €13,09 in *Vila Real*. The average tariff charges in the region is €7,57 and €4,57 regarding water supply and wastewater management, respectively. The municipality with the lowest tariff charges is *Penedono* with €2,60 in water supply. However, there are operators that do not charge the wastewater management service.

The indicator of coverage of total costs is the ratio between income and total costs. *Lamego* is the only municipality that has its value equal to 1. This value represents a good quality of the service. The municipalities' revenues in this region cover 42% of their costs regarding the water supply. On the other hand, concerning the wastewater management the municipalities' revenue only cover 32% of their costs.

The reliability of data tells us if the data that the municipalities provide ERSAR is reliable or not. In this case there are 7 municipalities that have reliable data both in income and costs. Though, there are still some municipalities namely *Vila Nova de Foz de Côa* and *Freixo de Espada à Cinta* that do not present reliable data. *CIM Douro* has 3567,5 km of mains and 1877,8 km of collectors through the region. The population ratio per pipeline kilometer allow us to calculate the lack of infrastructures in the region.

The SWOT Analysis of CIM Douro allow us to understand the characteristics of the region and also some constraints that CIM Douro should take into account when analyzing the aggregation

Strengths

▪ **Vila Real is the most developed municipality of the region:** this municipality shows a higher financial level and service quality than the other municipalities of the CIM. This municipality can be a good driver for the other municipalities of the region.

▪ **Douro Alliance** – composed by Vila Real, Lamego e Peso da Régua: economic attraction, it works as a strategic cooperation between municipalities.

▪ **Aggregation history:** there are relationships between the municipalities and the CIM which contributes to a better communication and reliability between the municipalities.

Weaknesses

▪ **Wide area and scattered population:** 205 157 habitant dispersed through 4032 km2. The region has a rugged ground that makes it difficult to develop the infrastructures and to increase the water supply.

▪ **Tariff disparity:** most of the municipalities have low tariff charges. The management of the service is extremely inefficient.

▪ **Costs Coverage:** The municipalities' revenues in this region cover 42% of their costs regarding the water supply. Furthermore, the municipalities 'revenues only cover 32% of their costs regarding wastewater management. The recommended values are between 1 and 1.1.

▪ **Non-revenue water:** this region shows high percentage of water losses, it has an average of 53%, though the national average is 30, 9%.

Opportunities

▪ **Scale**: have a great scale in order to improve the efficiency and the service quality of the municipalities that are worst.

▪ **Financial capacity:** sustainable management of the business

▪ **Technical capacity:** the municipalities would have specialized technicians to a operational management of the sector.

▪ **Funding Access:** the aggregation will allow the municipalities to achieve some requirements to have access to funding.

▪ **Investment:** improve the quality of water and the service in order to decrease water losses in all municipalities.

Threats

▪ **Loss of autonomy**: the municipalities would not want to lose financial and administrative autonomy. If the water service was delegated to a Municipal company or to a Intermunicipal company the loss of autonomy would be smaller.

▪ **Small municipalities' resistance:** autonomy

▪ **Big municipalities' resistance:** sustainability decrease

▪ **Tariff charge increase:** to have a sustainable management of the service in the municipalities it is necessary to increase the tariff charge.

▪ **Liquidity Illusion**

CIM Douro has a high water and service quality. However there are some indicators that have room to improve. The Non-revenue water indicator is 20% above the national mean which is quite concerning

Physical Accessibility of the Service

Safe Water

95%* 96%
83%* 82%

99,6%* 98,39%

Reply to written suggestions and complaints

Non-revenue water

91%* 81%

53,1%

Real water losses

147L
124L*

30%*
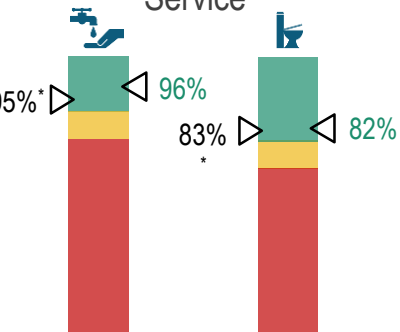
INDICATORS

The **Physical Accessibility indicator** tells us the accessibility of the service to the population. *CIM Douro* presents values around the national average for this indicator – 95% in water supply and 83% in wastewater management. the average of the CIM Regarding water supply, *CIM Douro*'s average value is 1% above the national average. However, regarding the wastewater management the average of *CIM* is 1% below the national average, though it still represents a good quality of the service. The municipality that represents the worst result is *Sernancelhe* with 82% in wastewater management.

The **Safe Water indicator** evaluates the quality of the water provided by the operator. In this region only 9 of the 19 municipalities have a good quality of water. The other 10 municipalities show acceptable quality. The average of this indicator in this region is also acceptable.

The **Reply to written suggestions and complaints** indicator evaluates the capacity of the operator to respond the suggestions and complaints written by the consumers. In *C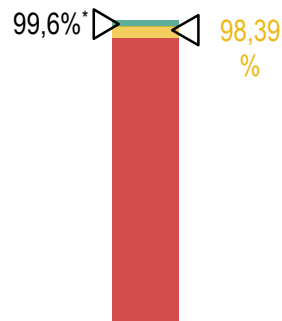IM Douro* most of the municipalities have a good service quality, however *Torre de Moncorvo* only reply to 28% of suggestions and complaints which decreases a lot the average of the region.

The **Non-Revenue Water indicator** evaluates the level of economic and physical losses of water that is abstracted and distributed but is not charged to the consumers. In this region the level of non-revenue water is high, with the Municipalities of *Freixo de Espada à Cinta* and *Moimenta de Beira* featuring percentages of non-revenue water above 70.

The **Real Water Losses indicator** tells us the volume of water losses. In this case, the values of real water losses are between 39 and 299. Though, we cannot conclude anything from this indicator because it depends on the dimension of each municipality.

Drinking Water Supply
Wastewater
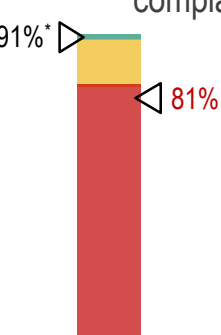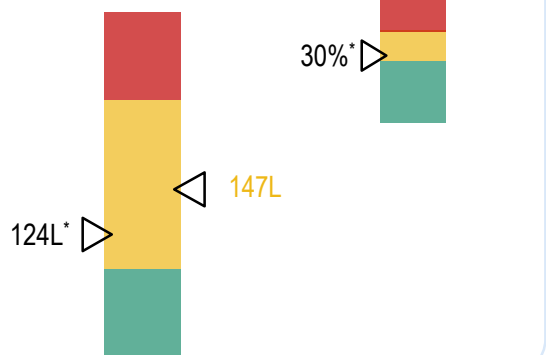
*National Average

3. PHASE II: ANALYSIS

LIGHT MANAGEMENT MODEL

PILOT ANALYSIS

- QUALITATIVE ANALYSIS

- **AGGREGATION MODEL**

- SCENARIOS
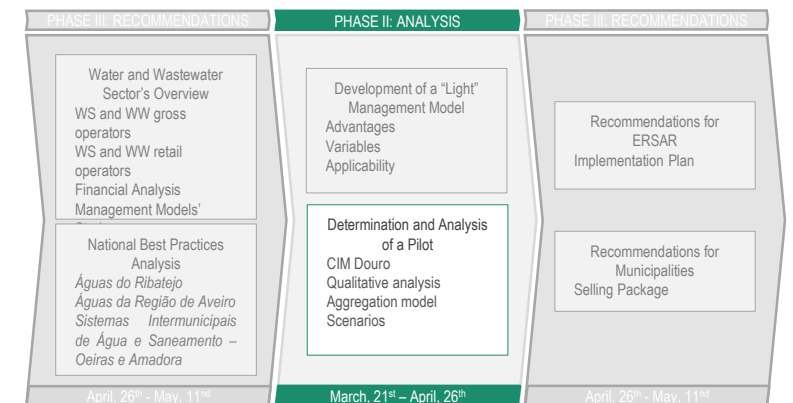
With every aggregation there economies of scale that can be exploited, furthermore, tipically the operator improves their management and technical areas and are able to be more efficient. This model simulates these effects within an aggregation

GENERAL ASSUMPTIONS

- *There will only be considered the water supply and wastewater management services of the Municipalities;*

- *The financial data was taken from the most recent validated annual reports of the Municipalities (2014), apart from Alijó, Lamego, Moimenta da Beira, Peso de Régua and Tabuaço which were from 2013 and Freixo de Espada à Cinta which was from 2012;*

- *Non-financial data is from the year 2014 and comes from ERSAR's portal;*

- *Some estimates were made based on critical thinking and opinions of experts in the area, and therefore can be deviated from reality. In any case, this model was created in order to the user be able to change this estimates with simple actions (on the input spreadsheet). Thus, if the user is able to create better assumptions, he can meliorate the model and make it more accurate.*

INTRODUCTION

This Model was created as an attempt to simulate the effects of an aggregation for a certain number of Municipalities.

Besides the straight-forward economies of scale that can be part of an aggregation that reaches a certain dimension, there were also taken into account some improvements that an aggregation, specifically in this sector, can imply. Generally these improvements result in more efficiencies for the new entity and in this case can arise from a different management with more specialized technicians and people that understand the needs of the water supply and wastewater management services.

For this project the model was applied to the nineteen Municipalities that form CIM Douro, but in the future, with some adaptations and adjustments, the model is prepared to simulate other aggregations.

MODEL'S LIMITATIONS:

- The results from the model and the respective scenarios do not distinguish water supply from wastewater management services;

- The model is only as reliable as the input data used.

Aggregation Model – DATA

The aggregation model is a simulation of what an aggregation would bring in terms of revenues and costs to an operator. It is divided into three parts, the data used for the model, the calculations and the final results and variables that may be altered by the user

TABLE OF CONTENTS

Índice
Output - Agregação
Input - P&L
Input - Info Geral
Cálculo - Receitas
Cálculo - CMVMC
Cálculo - FSE's
Cálculo - RH
Cálculo - Investimento

Figure 17 – Aggregation Model Table of contents

Output   Data   Calculations

The first thing to know about the model is that it was build in Portuguese to be used in the future by ERSAR..

The model is divided into three parts: the data, the calculations and the variables and output. Each part has one or more spreadsheets dedicated to it.

The Data part contains all the data that will feed the model, whether it is financial data, demographic, information regarding the quality of the service or any other kind.

The Calculations part has all the tables that gather information from the inputs and then calculate the respective outputs. These spreadhseets also contain the values of the estimates that are all inserted on the Output part of the model.

Finally the Variables and Output part contains only one spreadsheet that displays all the results of the aggregation, financial and quality of the service related, and also shows the starting point of CIM Douro, showing for example the compounded P&Ls of the 19 Municipalities. Furthermore, this part contains all the estimated that are inserted by the user that can be changed at any time and that impact the final results, including the Municipalities that will take part of the aggregation and the final tariff charges.

The data used for this model can be divided into financial data and other data. Both were gathered from the reports of the operators in ERSAR's portal. The financial data used is the most recent reports validated by ERSAR and in general data all the missing information was estimated mainly through proxies and using the average of CIM Douro

FINANCIAL DATA

On the first part of the model there is all the data gathered from the Municipalities through ERSAR that serves as the foundations for the model. This data is mainly quantitative, with some exceptions, for example the entity that sell water in "gross" to the Municipalities of CIM Douro. In the future, if ERSAR wants to apply this model to a different aggregations the main changes that have to be made are in this part, by inserting the data from the Municipalities that will take part in that aggregation.

The Input part of the model is divided into two different spreadsheets: "Input – P&L" and "Input – Info Geral".

The first spreadsheet, "Input – P&L", as the name implies, it contains all the P&Ls from the Municipalities from CIM Douro. In this spreadsheet apart from the financial data, there is also a column called "selected" that filters out the Municipalities that the user does not want to include in the aggregation.

GENERAL DATA

The second spreadsheet, "Input – Info Geral", contains all the other information that is important for the calculations, from demographic information, information regarding the quality of service to the infrastructures found in the Municipalities. Below there is a sample of the spreadsheet, and in appendix there is a table with all the data from this spreadsheet.

The fields encountered in the general data are the following: area (km2), number of accommodations, number of connections in WS, number of connections in WW, population, population between 1 and 19 years old, population between 20 and 34 years old, population between 35 and 54 years old, population with more than 55 years old, water in the system (m3), water bought from "gross" operators (m3), price of the water from "gross" operators (€), water supply "gross" operator, water captured (m3), water invoiced (m3), non-revenue water (m3), wastewater collected (m3), wastewater invoiced (m3), wastewater treated (m3), water losses (m3), apparent losses (m3), safe water (%), laboratory, number of clients WS, number of clients WW, mains length, collectors length, physical accessibility of the service WS (%), accessibility of the service WW (%), tariff charges for WS for 10m3 (€), tariff charges for 10m3 (€), kWh spent in WS, kWh spent in WW, number of field supervisors, number of field workers, number of administrative supervisors, number of administrative workers, average household yield (€), Initial Investment WS + WW, actual rehabilitation WS (%) and actual rehabilitation WW (%).

Aggregation Model – CALCULATIONS

The calculations are organized by item within the P&L with a spreadsheet for each one. Most of the calculations required estimates that may not demonstrate exactly what happens in a Municipality

The second part of the model consists on several spreadsheets, each one dedicated to a specific item in the P&L that may suffer some changes from the aggregation, whether it is a cost reduction, an increase in revenues or any other type of change.

As said before, this part of the model takes information from inputs and estimates that are inserted in the output spreadsheet. All the spreadsheets with the respective calculations have cells to incorporate the number of Municipalities and other Variables that the user decides to insert in the scenario being tested.

The spreadsheets and respective items of the P&L that can be found here are the following: "Cálculo – Receitas" for the revenues, "Cálculo – CMVMC" for the cost of goods sold, "Cálculo – FSE" for the supplies and external services, "Cálculo – RH" for the personnel expenses and "Cálculo – Investimento" for the financial expenses.

Município AA	Encargo total 10m3 AA	Receitas por via tarifária AA	Tarifa Alvo AA	% Perdas Aparentes	Δ Perdas Aparentes	Δ Receitas AA
Alijó	6,25 €	280 574 €	12,13 €	9%	17 327	284 981 €
Armamar	9,30 €	232 023 €	12,13 €	5%	4 317	75 841 €
Carrazeda de Ansiães	9,88 €	314 225 €	12,13 €	19%	8 594	81 984 €
Vila Real	12,13 €	3 193 851 €	12,13 €	23%	0	- €
Freixo de Espada à Cinta	5,50 €	61 604 €	12,13 €	7%	16 756	94 587 €
Lamego	10,25 €	879 203 €	12,13 €	5%	19 473	184 879 €
Mesão Frio	13,67 €	189 279 €	12,13 €	29%	15 571	- 2 435 €
Moimenta da Beira	5,35 €	204 085 €	12,13 €	5%	27 140	291 382 €
Murça	10,00 €	181 990 €	12,13 €	3%	5 557	45 504 €
Penedono	2,60 €	34 264 €	12,13 €	39%	14 515	143 198 €
Peso de Régua	3,60 €	267 966 €	12,13 €	64%	113 400	772 486 €
Sabrosa	4,75 €	128 777 €	12,13 €	0%	0	200 078 €
São João da Pesqueira	6,74 €	234 388 €	12,13 €	0%	0	187 578 €
Sernancelhe	6,45 €	113 385 €	12,13 €	5%	4 821	105 697 €
Santa Marta de Penaguião	9,85 €	230 483 €	12,13 €	1%	2 702	56 628 €
Tabuaço	5,25 €	126 821 €	12,13 €	5%	11 275	179 871 €
Tarouca	7,50 €	216 812 €	12,13 €	0%	0	133 845 €
Torre de Moncorvo	8,50 €	269 261 €	12,13 €	21%	40 410	164 008 €
Vila Nova de Foz Coa	5,65 €	252 278 €	12,13 €	18%	31 536	327 591 €
Total					333 395	3 327 706 €

Figure 18 – Aggregation Model Example of a calculation sheet

The variables that are inserted and may be chaned at any time by the user have a great impact on the results. Usually the values inserted in these fields come from the best practices or even Vila Real the most advanced Municipality in CIM Douro

INPUTS

Variáveis	
Tarifa Alvo AA	12,13 €
Tarifa Alvo AR	13,09 €
Perdas alvo	28,3%
% AR Faturadas (p Δ Perdas)	90%
Mult. Salário Técnico Superior	1,50
AT Superior por Pop. Ab.	0,13
AT Técnico por Pop. Ab.	0,89
AA Superior por Pop. Ab.	0,22
AA Técnico por Pop. Ab.	0,55
Electricidade	0,14
Electricidade - Administrativo	5%
Combustível	10%
Comunicações - Débito Direto	45%
Comunicações - Fatura Eletrónica	25%
% das Comunicações - Portes Correio	80%
Poupanças Telemóvel/Internet	10%
Poupança Outros FSE	10%
Fundos Comunitários %	50%
Duração Amortizações	50
Custo por Metro de Rede	50
Custo por Ramal	70
% Reabilitação	0%

Figure 19 – Aggregation Model Inputs

The third and last part of the model has only one spread sheet that can be divided into two parts: the variables that shape the results and that are inserted by the user to adjust the calculations to the reality of the Municipalities and the results, before and after the aggregation.

The variables for the model are presented in two tables and can change entirely the results of the aggregation.

To the left, there is a figure with all the variables regarding the different calculations are inserted, such as the tariff charges, the % of electricity that is used in support and administrative infrastructures, among others.

To the right there is a figure showing how the user can select which Municipalities take part of the aggregation.

MUNICIPALITIES

Municípios	
Alijó	☑
Armamar	☑
Carrazeda de Ansiães	☑
Vila Real	☑
Freixo de Espada à Cinta	☑
Lamego	☑
Mesão Frio	☑
Moimenta da Beira	☑
Murça	☑
Penedono	☑
Peso de Régua	☑
Sabrosa	☑
São João da Pesqueira	☑
Sernancelhe	☑
Santa Marta de Penaguião	☑
Tabuaço	☑
Tarouca	☑
Torre de Moncorvo	☑
Vila Nova de Foz Coa	☑

Figure 20 – Aggregation Model Municipalities

Aggregation Model – OUTPUT

There are two types of results, the P&L of the simulated aggregation and the information regarding the quality of service. In both cases the model shows the results before the aggregation so the user can be aware of the changes and the impact of an aggregation

P&L and Quality Indicators

P&L Agregado					
	Situação Atual AA	Situação Atual AR	Situação Atual Total	Poupança Agregação Total	Estimado Agregação Total
Receitas	10 230 976 €	6 266 559 €	16 497 535 €	14 073 303,41 €	30 570 839 €
Outras receitas	945 050 €	505 090 €	1 450 140 €		1 450 140 €
CMVMC	7 492 866 €	183 576 €	7 676 442 €	- 1 407 275,66 €	6 269 166 €
Custos pessoal	6 194 989 €	2 047 582 €	8 242 571 €	- 1 710 609,65 €	6 531 962 €
Eletricidade	767 973 €	276 488 €	1 044 460 €	- 361 758,24 €	682 702 €
Combustíveis	166 221 €	102 787 €	269 008 €	- 32 945,32 €	236 062 €
Comunicações	202 357 €	92 456 €	294 813 €	- 110 415,31 €	184 398 €
Outros FSE	2 284 066 €	8 379 261 €	10 663 327 €	- 1 066 332,70 €	9 596 994 €
EBITDA	-5 932 446 €	-4 310 500 €	-10 242 946 €	18 762 640,30 €	8 519 694 €
Depreciação	2 441 604 €	3 756 608 €	6 198 211 €	695 336 €	6 893 547 €
Provisões	119 970 €	65 493 €	185 463 €		185 463 €
Outros	973 575 €	454 336 €	1 427 911 €		1 427 911 €
Res. Líquido	-9 467 595 €	-8 586 937 €	-18 054 531 €	18 067 304,04 €	12 773 €

Indicadores	Antes da Agregação		Depois da Agregação	
	AA	AR	AA	AR
Cobertura de Gastos Totais	54,14%	44,09%	79,07%	
Acessibilidade Económica	45,90%	28,70%	74,13%	80,00%
Conhecimento Infraestrutural	16,89			
Índice das melhorias nos sisten	5,84			
Água não faturada	0,489			

Figure 21 – Aggregated P&L and Quality indicators

The results have two outbreaks, the P&L results from before and after the aggregation and the quality of service indicators such as the affordability of the services or the total coverage of costs, also before and after the aggregation.

On one hand, into the P&L the information before the aggregation can be split into water supply and wastewater management, but after the aggregation, given the limitations of the data gathered, is a sum of both services. For some items such as Revenues or Costs it is possible to estimate the correct amount of saving in each service (and it is done in each calculation sheet). However, in other cases, for instance, supply and external services, it would be very difficult to assess the accurate impact of WS and WW in the total value.

On the other hand, the indicators are calculated both to Water Supply and Wastewater management whenever is possible to split information (e.g. Affordability of the Service). Otherwise, the info is aggregated.

The actual situation among the Municipalities of CIM Douro is quite fragile, with a very big deficit both in Water Supply and Wastewater Management. In 2014, the Municipalities had to inject more than 18 million euros to cover their losses

EX-ANTE SITUATION

REVENUES

Sales: 6 984 047 €

Services: 8 849 547 €

Taxes and Fees: 663 940 €

Other Revenues: 945 050 €

EXPENSES

Cost of Goods Sold: 7 676 442 €

Supplies and External Services: 12 271 608 €

Personnel Expenses: 8 242 571 €

Amortization and Depreciation: 6 198 211 €

Other Expenses: 1 613 374 €

NET INCOME

- 18 054 531 €

WATER SUPPLY

- 9 467 595 €

WASTEWATER MANAGEMENT

- 8 586 937 €

COVERAGE OF TOTAL COSTS

WATER SUPPLY

● 54,1%

WASTEWATER MANAGEMENT

● 44,1%

AFFORDABILITY OF THE SERVICE

WATER SUPPLY

● 46%

WASTEWATER MANAGEMENT

● 29%

Without the aggregation of CIM Douro's operators, the Tariff Charges for 10m^3 that would allow for an economic sustainability of the business would be much higher than with aggregation. In some cases this increment would make the Tariff Charged unbearable for the population

TARIFF CHARGES < 20€

Municipality	Water Supply	Wastewater Management
Águas de Carrazeda	9,00 €	8,83 €
CM de Alijó	16,55 €	16,23 €
CM de Armamar	14,60 €	14,32 €
CM de Lamego	14,20 €	13,92 €
CM de Sabrosa	17,20€	16,87€
EMAR de Vila Real	10,80 €	10,59 €

TARIFF CHARGES > 20€

Municipality	Water Supply	Wastewater Management
CM de Freixo de Espada à Cinta	200,00 €	196,12 €
CM de Mesão Frio	48,50 €	47,56 €
CM de Moimenta da Beira	21,75 €	21,33 €
CM de Murça	23,20 €	22,75 €
CM de Penedono	21,40 €	20,99 €
CM de Peso da Régua	23,50 €	23,04 €
CM de Santa Marta de Penaguião	30,10 €	29,52 €
CM de São João da Pesqueira	20,65 €	20,25 €
CM de Sernancelhe	25,60 €	25,10 €
CM de Tabuaço	20,50 €	20,10 €
CM de Tarouca	31,10 €	30,50 €
CM de Torre de Moncorvo	21,50 €	20,08 €
CM de Vila Nova de Foz Coa	23,30 €	22,85 €

SUSTAINABLE TARIFF CHARGES

Tariff Charges that result in a positive coverage of total costs.

Only Vila Real presents a positive coverage of total costs and therefore can lower its tariff charges. All the other municipalities should increase their tariff charges, and some of them drastically, if they want to stop subsidizing the water supply and wastewater management services with local budget.

Figure 22 – Tariff charges per CIM Douro municipality

With an increase of the Tariff Charges to 12,13€ on WS and 13,09€ on WW converging to the same value practiced in Vila Real, and a decrease in the apparent losses, the Revenues have gone up 41%, to a new total of 25 308 454€

ASSUMPTIONS

- *Number of clients used comes from WS, as the number always surpasses the WW;*

- *Wastewater invoiced from Penedono, Tabuaço and Vila Nova de Foz Côa was estimated multiplying 90% of the water invoiced multiplied by the physical accessibility of the wastewater services;*

- *Every client consumes around 10m^3 of water per month and therefore pays the tariff charge associated with that level of consumption;*

- *The revenues from tariff charges were calculated using the tariff charge in ERSAR's portal for each Municipality;*

- *Every Municipality lowers its percentage of non-revenue water to the same level as Vila Real, which is 28,3;*

REVENUES

Ex-ante	+ 7 360 777€	Ex-post
17 947 676€	(41%)	25 308 454€

The increase in revenues that comes from this model can be explained by a convergence of the tariff charges and a reduction of the apparent losses. The new tariff charges will be 12,13€ in water supply and 13,09€ in wastewater management, for a monthly consumption of 10m^3 and the reduction of the apparent losses will come as a result of the decrease in non-revenue water to 28,3%. With the decrease in apparent losses the water invoiced will increase. Both values of the new tariff charges and the non-revenue water come from Vila Real.

METHODOLOGY

The tariff charges for 10m^3 have converged to the actual values from Vila Real. Multplying these values (12,13€ and 13,09€ for water supply and wastewater management respectively) by the water invoiced will result in the following revenue: 24 874 040€.

The non-revenue water can be split into three different types: apparent losses, water losses and authorized water consumption of unaccounted-for water. Assuming that the value of unaccounted-for water drops down to 28,3% (value from Vila Real), the aparent losses would also drop. The proportion of apparent losses to the actual non-revenue water was calculated and then multplied by the decrease of non-revenue water for each Municipality of CIM Douro. The result was a decrease of apparent losses of 311 751 m^3. This value was then multplied by the tariff charges. Finnaly, the two new sources of revenue were added up resulting in the increase in revenues seen above.

Aggregation Model – COGS

Costs of Goods Sold is one of the biggest expenses for Municipalities, it comes mainly from the water bought from gross operators. With a decrease in the water losses, the amount of water in the system will reduce, bringing down the Cost of Goods Sold to 6 269 166€

ASSUMPTIONS

- *Every Municipality lowers its percentage of unaccounted-for water to the same level as Vila Real, which is 28,3;*

- *Gross operators prices are fixed;*

Water in the System

9 977 970m³   7 265 865m³

COST OF GOODS SOLD

Ex-ante	- 1 407 275€	Ex-post
7 676 442€	(18%)	6 269 166€
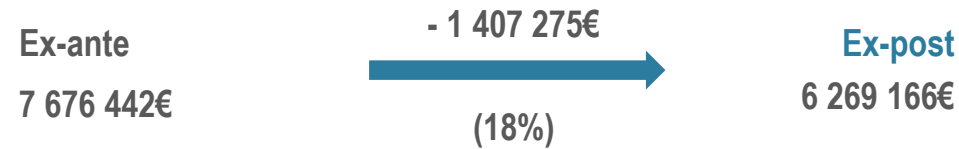
The savings in cost of goods sold will come from the reduction of the water losses. This results in a decrease of water in the system, either by buying less quantities from "gross" or collecting less water.

This reduction is relevant not only due to the impact on the costs but also for environmental sustainability since it reduces waste and protects water, a scare resource.

METHODOLOGY

Assuming that the non-revenue water comes down to 28,3% in all the Municipalities from CIM Douro, multplying the proportion of water losses in the reduction of non-revenue water we get the value of decrease in water losses of 2 712 105 m³.

It was then calculated the value of water in the system, by dividing the cost of goods sold by the water in the system of each Municipality. With these values, and multiplying it by the reduction of water losses, the savings combined by all the Municipalities will be 1 407 275€.

Personnel expenses is the most relevant cost item of the Municipalities, the reason why it is so, is because of the disproportionate number of employees working for operators. Lowering the number of employees to more efficient levels will make personnel expenses go down by 21%

ASSUMPTIONS

▪ *The personnel expenses from Carrazeda de Ansiães, Freixo de Espada à Cinta and Santa Marta de Penaguião were estimated using the average of the personnel expenses by covered population of the other municipalities from CIM Douro;*

▪ *Supervisors receive an annual salary 50% higher than workers;*

Field Worker	# 228 ➝	91
Field Supervisor	# 33 ➝	13
Administrative Worker	# 45 ➝	56
Administrative Supervisor	# 44 ➝	22

#350 ➝ #247

PERSONNEL EXPENSES

Ex-ante
8 242 571€

- 1 710 609€

➝

(21%)

Ex-post
6 531 962€
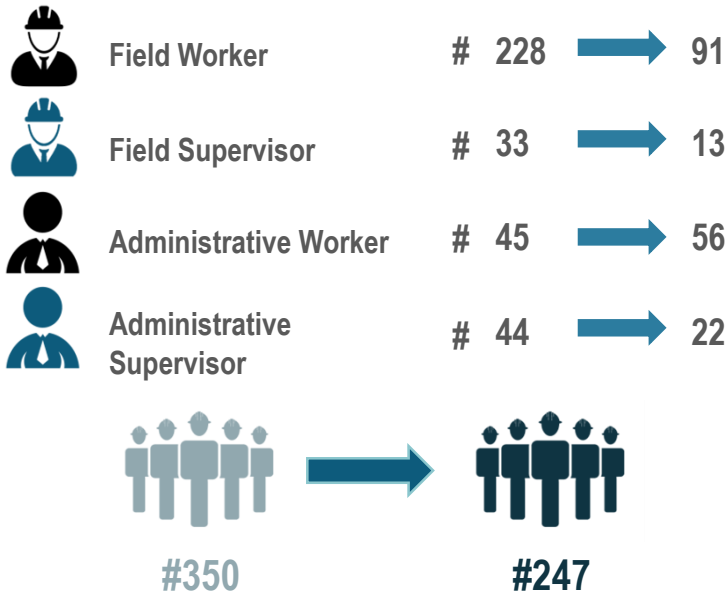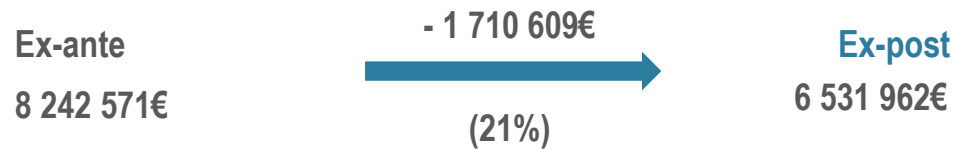
The savings from personnel expenses will come from a reduction of the number of employees to a optimal level, according to the indicators form our best practices analyzed.

METHODOLOGY

All employees from Munucipalities were accounted for and divided into four categories: field worker (228 employees), field supervisor (33 employees), administrative worker (45 employees) and administrative supervisor (44 employees).

The same exercise was applied to the best practices, then the total number of employees by category was divided by the population of all three best practices and multplied by one thousand, the results were as follow: field worker (0,13), field supervisor (0,89), administrative worker (0,22) and administrative supervisor (0,55). Then, these indicators were used as the optimal number of workers by population, resulting in a new total number of employees for CIM Douro of 247.

With the personnel expenditures, the number of workers per category and the assumption that a supervisor has a salary of 50% more than a worker, the average annual salary was calculated for each category and for each Municipality.

Multplying the indicators of optimal number of employees by the number of habitants in each Municipality and then multplying it by the average annual salary would result in the new personnel expenses by Municipalty.

ERSAR   NOVA School of Business & Economics   Shaping powerful minds

Despite of being the biggest Supplies and External and Serices item, the wastewater treatment comes from a fixed and regulated price and therefore will not suffer from any decrease in the aggregation. On the other hand, there are some items on this list that can be better analyzed.

Supplies and external services

- Wastewater treatment
- Other Subcontracts
- **Electricity**
- **Fuel**
- Office Supplies
- Rent
- Equipment Rental
- **Communications**
- Insurance
- Transport Goods
- Fees
- Legal Services
- Repairs and Maintenance
- Advertising
- Cleaning and Hygiene
- Specialized Jobs
- Miscellaneous

OTHER SUPPLIES AND EXTERNAL SERVICES

Ex-ante	1 066 332€	Ex-post
10 663 327€	(10%)	9 596 994€
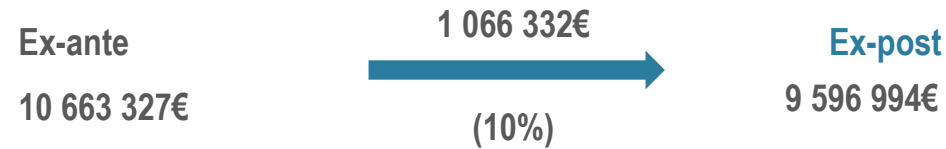
To estimate the savings in supplies and external services there is a need to analyze some of the items more closely. From the external supplies and services, electricity, communications and fuel were chosen to be more deeply investigated.

The remaining items were either to small to be relevant to the overall cost structure of the operator or were to broad to analyze, such as the 'other subcontracts' or the 'repairs and maintenance' items.

Apart from the electricity, fuel and communications, there were estimated savings of 10% as a result of better negotiations with the entities that supplies or provides the operator with services. These negotiations are only possible given the increase in scale that the aggregation brings. For example, with the aggregation it will only be necessary to hire one single cleaning company, one single legal services company or maybe have in-house paralegals and lawyers, this can be replicated to virtually every supplies and external services item.

Above, it is shown the amount saved with this 10% cut in the price of the supplies and external services, which is now 9 596 994€.

Aggregation Model – SUPPLIES AND EXTERNAL SERVICES

The electricity expenses correspond to 9% of the supplies and external services, due to a high usage in pumping, treatment and storage of the water. With a better elctricity contract with the supplies, these expenses can go down to 682 702€.

ASSUMPTIONS

- *The kWh comsumed by headquarters and other support infrastructures account for 5% of the total electricity used;*

- *Water supply services' kWh from Alijó, Vila Real, Freixo de Espada à Cinta and Moimenta da Beira were estimated using the average of kWh by two times the collected water plus the water bought from external suppliers of all other municipalities from CIM Douro;*

- *The wastewater services' kWh from Alijó, Vila Real, Freixo de Espada à Cinta and Moimenta da Beira were estimated using the average of kWh by the wastewater collected and treated of the other municipalities from CIM Douro;*

- *The electricity expenses in Tabuaço were estimated using the average of electricity expenses by kWh from the other Municipalities of CIM Douro;*

ELECTRICITY EXPENSES

Ex-ante

1 044 460€

- 361 758€

→

(35%)

Ex-post

682 702€
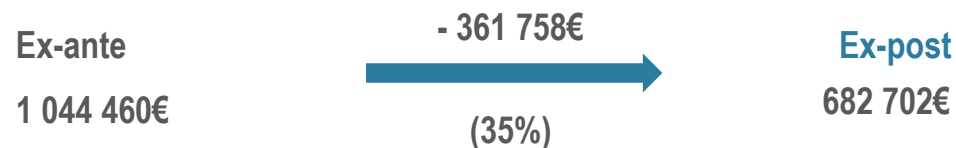
The savings in electricity will come only from a better unit price, as the quantity will not change due to the aggregation. To improve the unit price, Municipalities would have to negotiate a new contract with the electricity supplier using their new and increased buying power as a way to decrease price.

METHODOLOGY

To estimate the new expenses with electricity related with the new unit price, the electricity expenses were divided by the kWh used by each Municipality. This calculation was repeated for the best practices and for the average of all Municipalities, the results are shown in the graphic below.

Finally it is necessary to multiply the indicator of the average of the best practices, by the kWh used in every Municipality in CIM Douro and the result was 682 702€ in electricity expenses.

Electricity expenses by kWh

CIM Douro	Vila Real	AdR	AdRA	SIMAS	Best Practices' Average
€0,21	€0,14	€0,15	€0,14	€0,20	€0,15
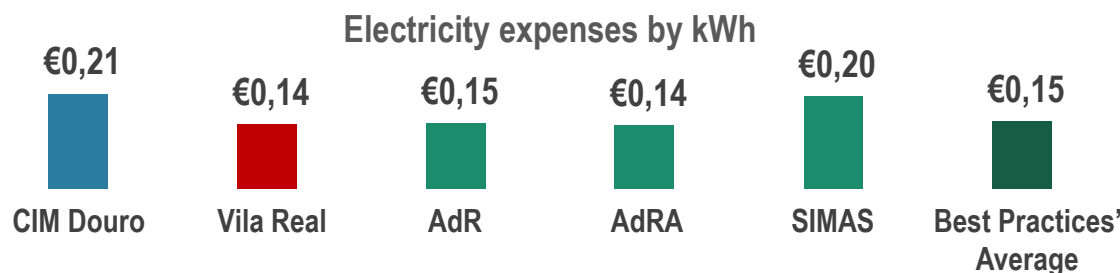
The fuel costs have various possible origins, either because of a repair or a visit to a customer, so it is difficult to find an appropriate driver to explain for this expense. Therefore the only way to reduce these costs is through a better contract with a new unique oil company

ASSUMPTIONS

- *Mains' length from Freixo de Espada à Cinta was estimated using the average of mains' length by km^2 of the other municipalities from CIM Douro;*

- *The fuel expenses from Freixo de Espada à Cinta, Peso de Régua, Tabuaço and Vila Nova de Foz Côa was estimated using the average of fuel expenses by mains' length of the other municipalities from CIM Douro;*

Fuel expenses by # clients and mains' length

€89,26   €41,27   €87,68   €82,34   €175,77

€97,61

€2,49   €1,20   €2,37   €2,18   €1,00   €1,69

CIM Douro | Vila Real | AdR | AdRA | SIMAS | Best Practices' Average

■ Fuel expenses by number of clients

—●— Fuel expenses by mains' length

FUEL EXPENSES

Ex-ante

269 008€

- 32 945€

(12%)

Ex-post

236 062€
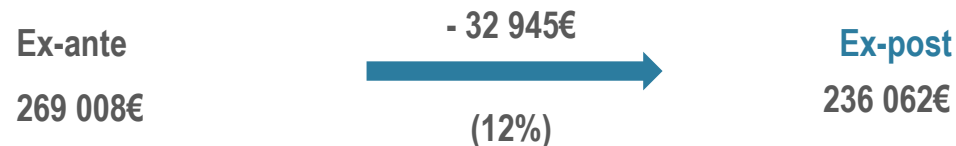
To save costs in fuel it is important to look for the cheapest unit price, because the amount of fuel used will not change with the aggregation. Therefore, Municipalities will have to come together and negotiate a new contract with a single oil company to find a better unit price.

METHODOLOGY:

Given there is no truly accurate proxy to estimate the fuel expenses of an operator, these were divided by number of clients and by mains' length and compare with the values from the best practices to see if there was room for improvement. Looking at the graphic below we can see that, apart from SIMAS in the expenses by mains lenght, CIM Douro can find a better unit price for fuel.

With that information into account, the savings estimate sat on 10%, lowering the fuel expenses to 236 062€. The reason why the actual savings represent 12% is because of the fuel expenses that had to be estimated for some of the Municipalities.

The savings in communication expenses can amount to a total of 110 000€ mainly because a a strategy to adopt and spread two new forms of payment, using direct debit and electronic invoice. With these two initiatives the amount of maillinng would be greatly reduced

ASSUMPTIONS

- *The number of clients was estimated using the number of clients from the water supply services;*

- *80% of the communication expenses correspond to mail expenses;*

- *The communication expenses of Armamar, Freixo de Espada à Cinta, Peso de Régua, Sernancelhe, Santa Marta de Penaguião and Tabuaço were estimated based on the average of communication expenses by number of customers from all the other Municipalities from CIM Douro;*

- *Customers have the same age distribution as the population of the respective Municipality;*

COMMUNICATION EXPENSES

Ex-ante
294 813€

- 110 415€

(38%)

Ex-post
184 398€
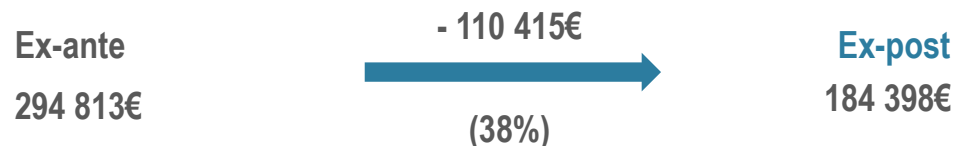
The approach for the communication savings was different from the others, first, based on the reports from AdR, the communication expenses were split into mail expenses (80%) and internet, telephone and mobile expenses (20%).

The 20% on internet, telephone and mobile expenses were reduced by 10% due to new contracts with single suppliers for all the Municipalities in the aggregation.

For the mail expenses SIMAS served as an example since they have reduced their costs with mail, sending invoices to customers by increasing the number of clients that adopt direct debit and electronic invoice.

METHODOLOGY

First step is to divide the population of all the Municipalities into age groups and calculate the percentage of population that is between 20 and 54 years old, and then apply that percentage to the clients of each Municipality.

After knowing the number of clients more likely to adhere to these new method payments, the target was then set to 45% to direct debit and 25% to electronic invoice. With these estimates, and deducting the number of clients that have joined the new methods by the mail expenses by customer, the savings totalled 92 702€ from direct debit and 81 072€ from the electronic invoice.

Finally add those savings with the ones from internet, telephone and mobile resulting in a total of 110 415€.

With an aggregation there are also some expenses that can go up, and one of them is the Amortizations due to the new investments made on the systems. Estimating investments of around 70 milion euros, the increase in amortizations will be of 695 336€

ASSUMPTIONS

▪ *All values taken from the Strategic Plan for Water Supply and Sewerage Services 2020 represent all of the needed investment for the Municipalities to expand and rehabilitate all of the infrastructures in need;*

▪ *All infrastructure will depreciate over 50 years according to ERSAR's recommendations;*

▪ *The European Union funds non repayable will cover 50% of the total investments;*

FINANCIAL EXPENSES

Ex-ante	+ 832 601€	Ex-post
7 811 585€	(11%)	8 644 187€

The increase in the financial expenses can be explained by the investments that will have to take place in order to fulfill all of the aggregation expectations, such as the decrease of non-revenue water to 28,3%.

The value from the amortizations was deducted over 50 years given the recommendations of ERSAR for the operators to renew their infraestructures every 50 years. Some of these costs can be attenuated by the European Union funds that will cover 50% of all investments.

METHODOLOGY

To calculate the increase in financial expenses, the amount of investment was taken from the predictions that were used for the Strategic Plan for Water Supply and Sewerage Services 2020 and then divided by the 50 years that it take to fully depreciate.

That value was then reduced by half, given the European Union funds.

This will lead to an increase in financial expenses of 832 601€.

The situation after the aggregation, despite the negative net income, is very positive. There was an increase of the net income of 11 354 778€. This means that with some additional measures or subsidies from the Municipalities there is a chance to make this service sustainable

EX-POST SITUATION

REVENUES

Sales: 10 664 435 €

Services: 12 529 962 €

Taxes and Fees: 663 940 €

Other Revenues: 945 050 €

EXPENSES

Cost of Goods Sold: 6 269 166 €

Supplies and External Services: 10 700 157 €

Personnel Expenses: 6 531 962 €

Amortization and Depreciation: 7 030 812 €

Other Expenses: 1 613 374 €

NET INCOME

- 18 054 531 € ➡ - 6 837 018€

COVERAGE OF TOTAL COSTS

49,9%   **77,5%**

AFFORDABILITY OF THE SERVICE

WATER SUPPLY

● **46%**   ● **74%**

WASTEWATER MANAGEMENT

● **29%**   ● **73%**

3. PHASE II: ANALYSIS

LIGHT MANAGEMENT MODEL

PILOT ANALYSIS

- QUALITATIVE ANALYSIS

- AGGREGATION MODEL

- **SCENARIOS**

PHASE II: RECOMMENDATIONS	PHASE II: ANALYSIS	PHASE III: RECOMMENDATIONS
Water and Wastewater Sector's Overview WS and WW gross operators WS and WW retail operators Financial Analysis Management Models'	Development of a "Light" Management Model Advantages Variables Applicability	Recommendations for ERSAR Implementation Plan
National Best Practices Analysis Águas do Ribatejo Águas da Região de Aveiro Sistemas Intermunicipais de Água e Saneamento – Oeiras e Amadora	Determination and Analysis of a Pilot CIM Douro Qualitative analysis Aggregation model Scenarios	Recommendations for Municipalities Selling Package
April, 26th - May, 11nd	March, 21st – April, 26th	April, 26th - May, 11st

Scenarios

Even though the aggregation brought several positive changes to CIM Douro, the net income was still negative by circa 6 millions, some scenarios were created where this result could be improved

ACTION PLAN
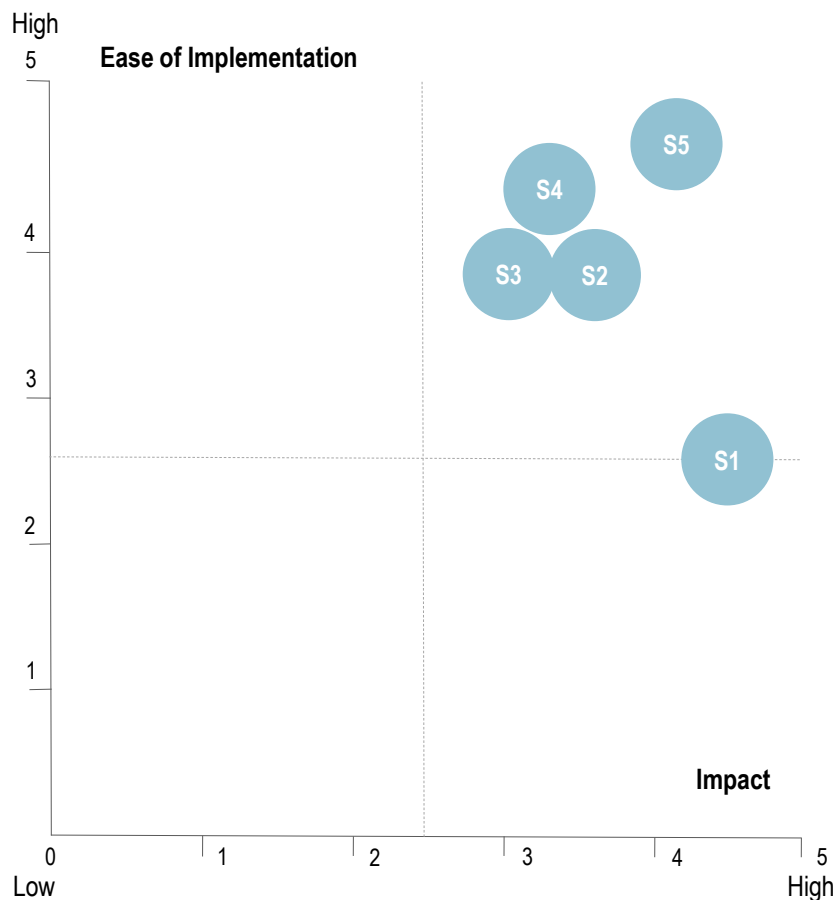
SCENARIOS

After concluding the analysis there were several economies of scale and efficiency improvements that would increase CIM's net income from (- 18 054 531) € to (- 6 837 018) €. However, as the net income is still negative, some scenarios were created there the results could be improved not only in financial terms but also in the quality of the service.

S1 – SUSTAINABLE TARIFF

It is assumed a sustainable tariff of € 17.10 - for an average consumption of 10m3 in WS.

S2 – *ALTO DOURO*

It is assumed an aggregation with only *Alto Douro*'s municipalities.

S3 – *BAIXO DOURO*

It is assumed an aggregation with only *Baixo Douro*'s municipalities.

S4 – AGGREGATION WITHOUT 1 MUNICIPALITY

It is assumed an aggregation with all municipalities except for *Freixo de Espada à Cinta*.

S5 – AGGREGATION WITHOUT 4 MUNICIPALITIES

It is assumed an aggregation with all municipalities except for *Freixo de Espada à Cinta*, *Tarouca*, *Peso da Régua* and *Vila Nova de Foz Côa*.

Aggregation Model – SCENARIOS

On Scenario 1 the tariff charges were increases until the point of a positive total coverage of costs. This means raising the water supply tariff charges to 17,2€ and the wastewater tariff charges to 16,7€. The downside of the scenario is the negative score in the affordability of the service

ASSUMPTIONS

- *In Scenario 1, a sustainable tariff in water supply for 10 m³ was applied. The tariff will be equal to €17,20. This value was calculated setting Net Income as close as possible to zero. With this tariff the income will cover the total costs.;*

- *The Wastewater management tariff charges were calculated based on the proportion of unit costs of WW on the total costs, prior to the aggregation;*

SCENARIO 1 – SUSTAINABLE TARIFF
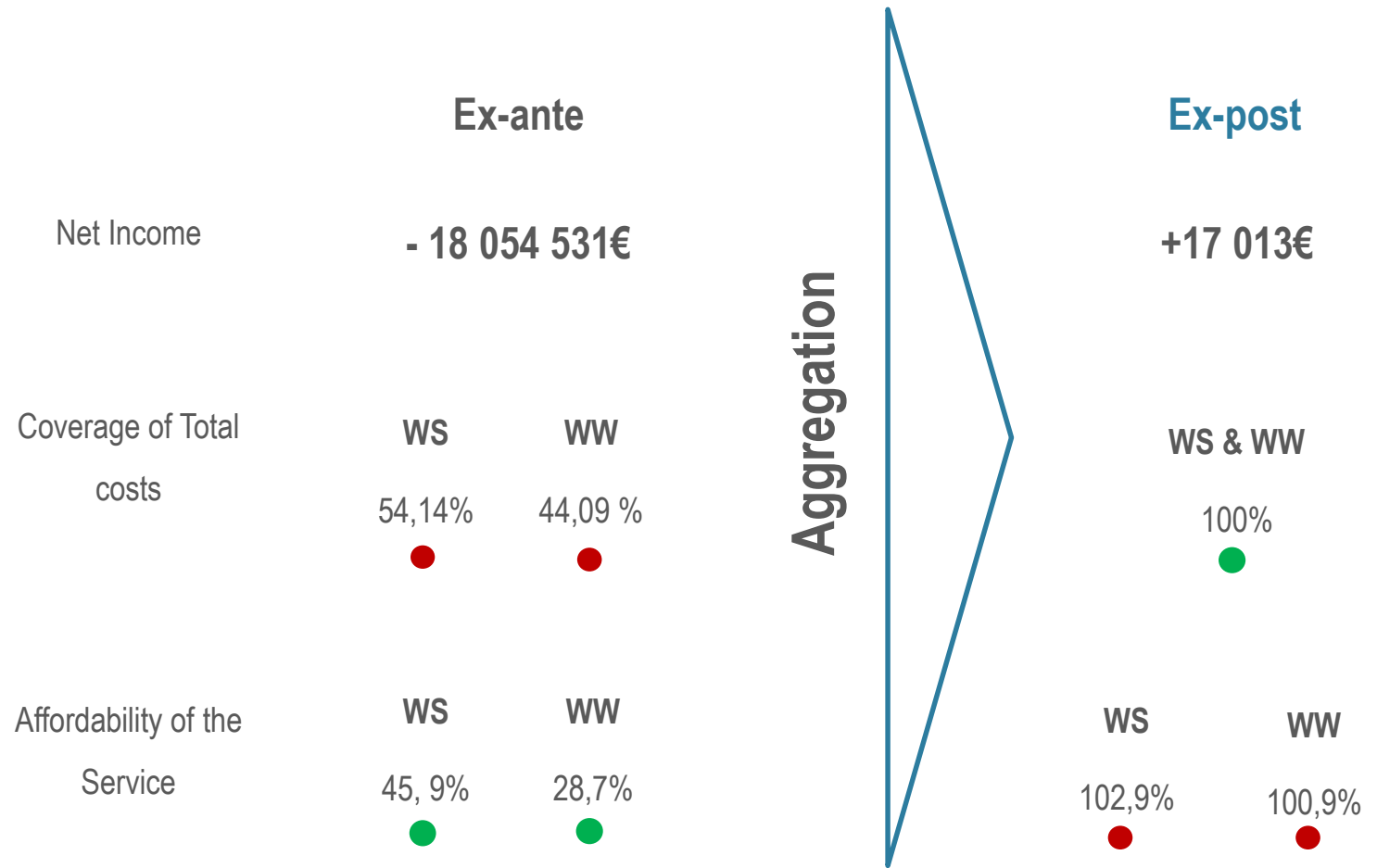
Ex-ante

Net Income	**- 18 054 531€**	

Coverage of Total costs	WS	WW
	54,14%	44,09 %
	🔴	🔴

Affordability of the Service	WS	WW
	45, 9%	28,7%
	🟢	🟢

Aggregation

Ex-post

+17 013€

WS & WW

100%

🟢

WS	WW
102,9%	100,9%
🔴	🔴

Scenarios 2 and 3 show a aggregation of Alto Douro and Baixo Douro. These scenarios reveal the fragilities of the municipalities of Alto Douro that even a worse result than Baixo Douro. It is also shown that this option is not the best for the municipalities of CIM Douro

ASSUMPTIONS

- *In Scenario 2 and Scenario 3 the region was divided between Douro River's north municipalities and South ones.*

- *Alto Douro's municipalities are the following: Alijó, Freixo de Espada à Cinta, Mesão Frio, Murça, Sabrosa, Santa Marta de Penaguião, Torre de Moncorvo, Peso de Régua and Vila Real, these municipalities are all north of Rio Douro;*

SCENARIO 2 – *ALTO DOURO*

Ex-ante

Ex-post

Aggregation

	Ex-ante		Ex-post	
Net Income	**-9 834 383 €**		**-4 491 976 €**	
	WS	WW	WS & WW	
Coverage of Total costs	54,14% 🔴	44,09 % 🔴	76,6% 🔴	
	WS	WW	WS	WW
Affordability of the Service	45, 9% 🟢	28,7% 🟢	74,1% 🟡	80% 🟡

Scenarios 2 and 3 show a aggregation of Alto Douro and Baixo Douro. These scenarios reveal the fragilities of the municipalities of Alto Douro that even a worse result than Baixo Douro. It is also shown that this option is not the best for the municipalities of CIM Douro

ASSUMPTIONS

- *In Scenario 2 and Scenario 3 the region was divided between Douro River's north municipalities and South ones.*

- *Baixo Douro's municipalities are the following: Armamar, Lamego, Moimenta da Beira, Penedono, São João da Pesqueira, Sernancelhe, Tabuaço, Tarouca and Vila Nova de Foz Côa, these municipalities are all south of Rio Douro;*

SCENARIO 3 – *BAIXO DOURO*

Ex-ante

Ex-post

	Ex-ante		Ex-post	
Net Income	- 8 220 148 €		- 2 345 042 €	
	WS	**WW**	**WS & WW**	
Coverage of Total costs	54,14% 🔴	44,09 % 🔴	81,9% 🟡	
	WS	**WW**	**WS**	**WW**
Affordability of the Service	45, 9% 🟢	28,7% 🟢	74,1% 🟡	80% 🟡

Aggregation

Scenarios 4 and 5 show an aggregation without certain municipalities. If this were to happen, the result of the aggregation would be much better. These scenarios could be used as a warning sign for those municipalities to improve their businesses

ASSUMPTIONS

- *In Scenario 4, the aggregation with all municipalities except from Freixo de Espada à Cinta*

SCENARIO 4 – AGGREGATION WITHOUT 1 MUNICIPALITY

Ex-ante

Ex-post

Net Income

- 14 162 740 €

- 3 947 800 €

Aggregation

Coverage of Total costs

WS	WW
54,14%	44,09 %

WS & WW

85,8%

Affordability of the Service

WS	WW
45, 9%	28,7%

WS	WW
74,1%	72,1%
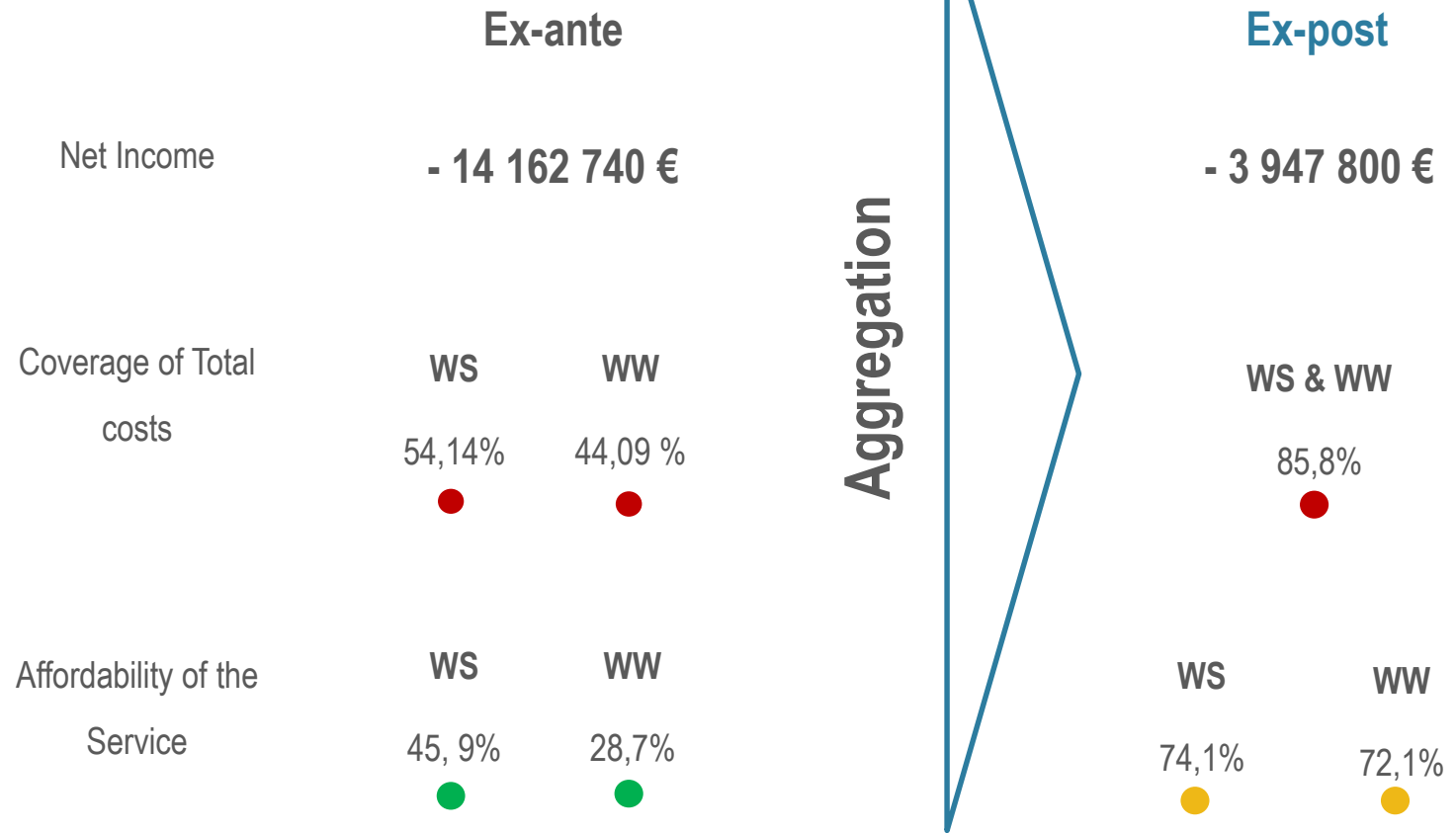
Aggregation Model – SCENARIOS

Scenarios 4 and 5 show an aggregation without certain municipalities. If this were to happen, the result of the aggregation would be much better. These scenarios could be used as a warning sign for those municipalities to improve their businesses

ASSUMPTIONS

- *In Scenario 5, the aggregation with all municipalities except from Freixo de Espada à Cinta, Tarouca, Peso da Régua e Vila Nova de Foz Côa. Those municipalities are the ones that have a worst evalutation in the indicators: Affordability of the service, Infrastructural knowledge index and asset management, Non-revenue water and Index of System Improvements which are indicators essential to have access to European Fundings.*

SCENARIO 4 – AGGREGATION WITHOUT 1 MUNICIPALITY
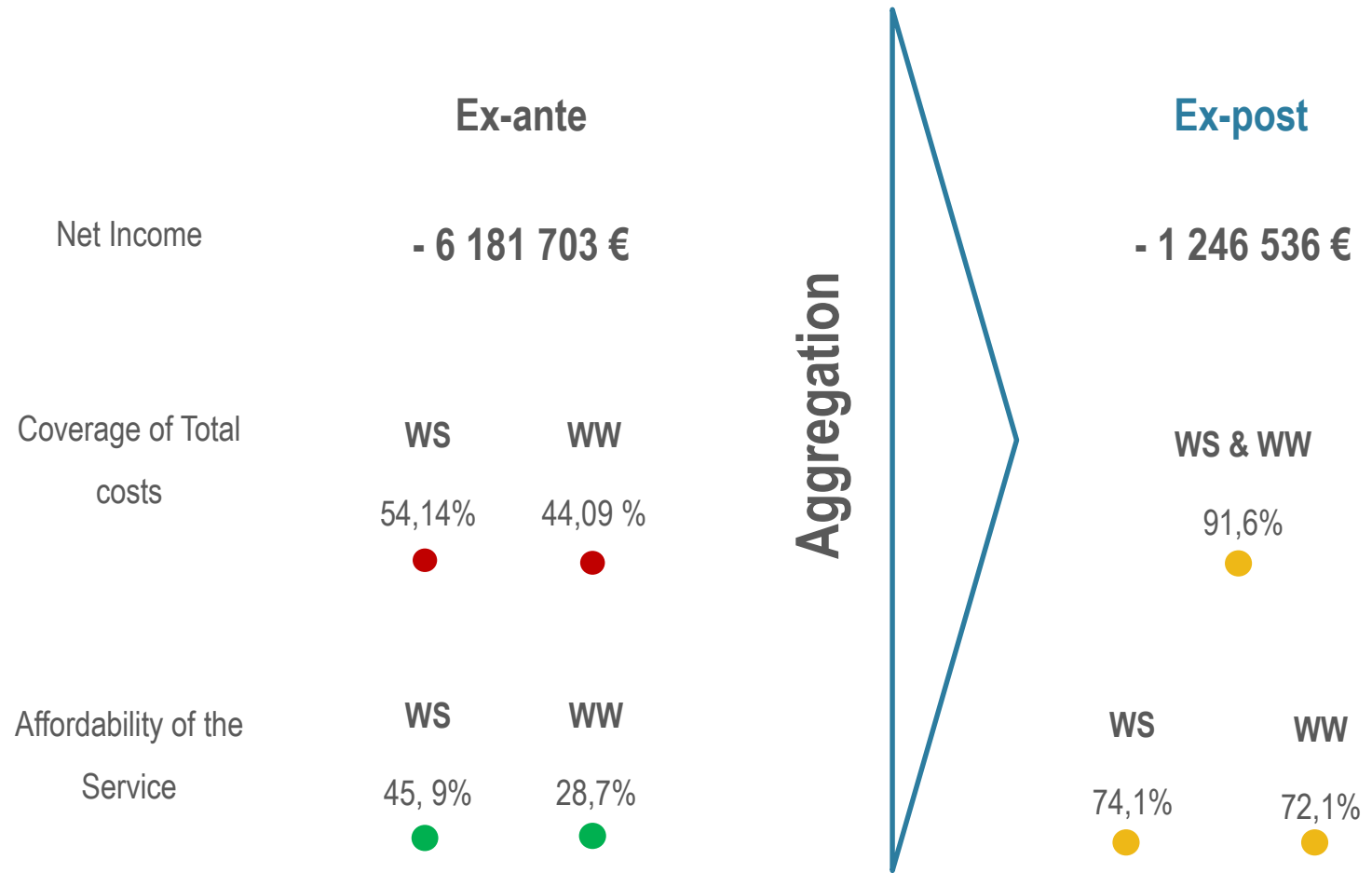
Ex-ante

Ex-post

Net Income

- 6 181 703 €

- 1 246 536 €

Aggregation

Coverage of Total costs

WS	WW
54,14%	44,09 %

WS & WW

91,6%

Affordability of the Service

WS	WW
45, 9%	28,7%

WS	WW
74,1%	72,1%

4. PHASE III: RECOMMENDATIONS

RECOMMENDATIONS FOR ERSAR

- IMPLEMENTATION MODEL
- OTHER RECOMMENDATIONS

RECOMMENDATIONS FOR MUNICIPALITIES

- SELLING PACKAGE
- OTHER RECOMMENDATIONS
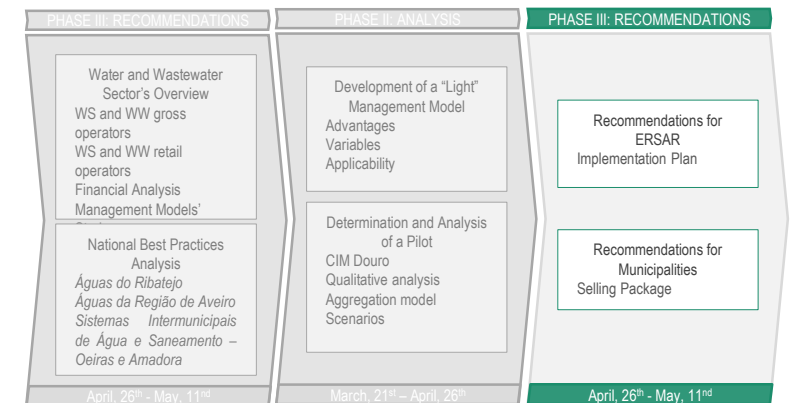
Recommendations

The work developed allowed us to test the aggregation needs proposed by ERSAR. However, throughout the project it was possible to quantify improvements and potential aggregations

Initial Situation:

- Country with socio-economic differences;

- Operators with different levels of performances;

- Economic debility of the operators;

- Issues to fulfill ERSAR's service quality requirements;

- Accountability report issues;

Goal:

- Economic and Financial Sustainability

- Enhance scale in order to guarantee the operator autonomy with investment capacity;

- Capacity to invest in infrastructures that provide services with quality to the clients at low prices;

- Fulfill water and service quality indicators;

Recommendations for ERSAR:

- Implementation Plan;
- Other Internal Recommendations;

Recommendations for the municipalities:

- Selling Package;
- Other Recommendations;

4. PHASE III: RECOMMENDATIONS

RECOMMENDATIONS FOR ERSAR

- **IMPLEMENTATION MODEL**

- **OTHER RECOMMENDATIONS**

RECOMMENDATIONS FOR MUNICIPALITIES

- SELLING PACKAGE

- OTHER RECOMMENDATIONS

PHASE III: RECOMMENDATIONS	PHASE II: ANALYSIS	PHASE III: RECOMMENDATIONS
Water and Wastewater Sector's Overview WS and WW gross operators WS and WW retail operators Financial Analysis Management Models'	Development of a "Light" Management Model Advantages Variables Applicability	Recommendations for ERSAR Implementation Plan
National Best Practices Analysis *Águas do Ribatejo* *Águas da Região de Aveiro* *Sistemas Intermunicipais de Água e Saneamento – Oeiras e Amadora*	Determination and Analysis of a Pilot CIM Douro Qualitative analysis Aggregation model Scenarios	Recommendations for Municipalities Selling Package
April, 26th - May, 11th	March, 21st – April, 26th	April, 26th - May, 11nd

NOVA
School of Business & Economics

Shaping powerful minds

ERSAR

Recommendations

Our work ends with some recommendations, for ERSAR and for the Municipalities. For ERSAR there is an implementation plan for the municipalities to aggregate. For the municipalities there is a selling package that tries to convince and motive them into aggregating

RECOMMENDATIONS FOR ERSAR

IMPLEMENTATION PLAN

1st STEP: Approach to anchor municipality

2nd STEP: Approach to the municipalities all together

    - Selling Package delivery

3rd STEP: Approach to the municipalities individually

4th STEP: Workshops with municipalities to include in the aggregation

5th STEP: Creation of an intermunicipal company

- The Implementation Plan is the procedure that ERSAR should take when approaching a region/set of municipalities.

- It includes five steps and takes approximately 44 to 68 weeks to be complete - approximately one year and a half.

- This plan includes the whole process of approaching, explaining and convincing the municipalities that aggregation is needed and beneficial.

OTHER RECCOMMENDATIONS

- Apart from the Implementation Plan, other recommendations were made to ERSAR.

In the first step ERSAR will approach the Anchor Municipality. The main challenge of this step is for ERSAR to convince a municipality that probably has a sustainable business with good quality of service that it could benefit from an aggregation and that this is the right option

1st STEP
APPROACH TO ANCHOR MUNICIPALITY

2nd STEP
APPROACH TO THE MUNICIPALITIES TOGETHER

3rd STEP
APPROACH TO THE MUNICIPALITIES INDIVIDUALLY

4th STEP
WORKSHOPS WITH MUNICIPALITIES TO INCLUDE THE AGGREGATION

5th STEP
CRIATION OF AN INTERMUNICIPAL COMPANY

2 weeks

1st STEP: APPROACH TO ANCHOR MUNICIPALITY

Message to convey: In a first step, ERSAR should approach the Anchor Municipality.

It is important to show the municipality that it needs and can benefit from an aggregation and how it will become a reference for the entire region. The Anchor Municipality will be recognized for the success of the aggregation.

In spite of the aggregation , well-developed municipalities and also those with great difficulties and needs, will improve their performances that will be reflected in the evolution of the region.

Message to withdraw: In this step, ERSAR will try to understand if the Anchor Municipality is willing to join the aggregation and what are the conditions it imposes.

Methodology: This approach will be made in one or more meetings between ERSAR and the Anchor Municipality.

Recommendations for ERSAR - IMPLEMENTATION PLAN

In the second step ERSAR has to approach all other municipalities and advise them to aggregate almost as their only option in order to improve their businesses and make them sustainable. Showing the municipalities' fragilities can be the most effective way to achieve this target

1st STEP
APPROACH TO ANCHOR MUNICIPALITY

2nd STEP
APPROACH TO THE MUNICIPALITIES TOGETHER

3rd STEP
APPROACH TO THE MUNICIPALITIES INDIVIDUALLY

4th STEP
WORKSHOPS WITH MUNICIPALITIES TO INCLUDE THE AGGREGATION

5th STEP
CRIATION OF AN INTERMUNICIPAL COMPANY

4 weeks

2nd STEP: APPROACH TO THE MUNICIPALITIES TOGETHER

Message to convey: In a second step, the ERSAR must approach the remaining municipalities to include in the aggregation.

It is up to ERSAR to explain to the municipalities how the region and operators' current situation (region's framework, operators' framework and SWOT) reveals a need for re-organization.

ERSAR should also show the municipalities their main weaknesses and needs and the advantages and potential gains the aggregation would bring not only at a local but also at a regional level.

Message to withdraw: In this step, ERSAR will understand which municipalities want to be part of the aggregation and what conditions each municipality imposes. ERSAR should also focus on the relations between municipalities.

Methodology: This approach will be made in one or more meetings between ERSAR and the several municipalities. In these meetings ERSAR will deliver and present the Selling Package.

Recommendations for ERSAR - IMPLEMENTATION PLAN
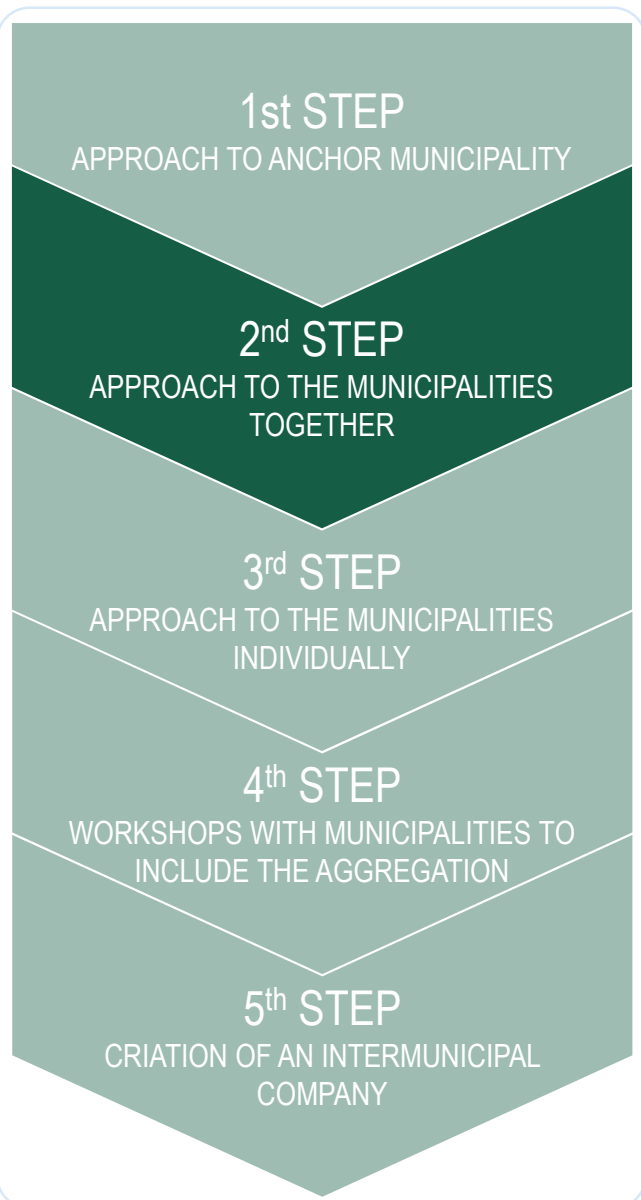
In the third step ERSAR will meet individually with the municipalities reinforcing the messages that have already been conveyed using also a new selling package tailored to the municipalities that are more likely to join the aggregation

1st STEP
APPROACH TO ANCHOR MUNICIPALITY

2nd STEP
APPROACH TO THE MUNICIPALITIES TOGETHER

3rd STEP
APPROACH TO THE MUNICIPALITIES INDIVIDUALLY

4th STEP
WORKSHOPS WITH MUNICIPALITIES TO INCLUDE THE AGGREGATION

5th STEP
CRIATION OF AN INTERMUNICIPAL COMPANY

6 weeks

3RD STEP: APPROACH TO THE MUNICIPALITIES INDIVIDUALLY

Message to convey: In this step ERSAR will meet individually with each municipality showing the current status of each one: their main weaknesses and needs and the potentials gains of the aggregation. For this step ERSAR should prepare two different approaches:
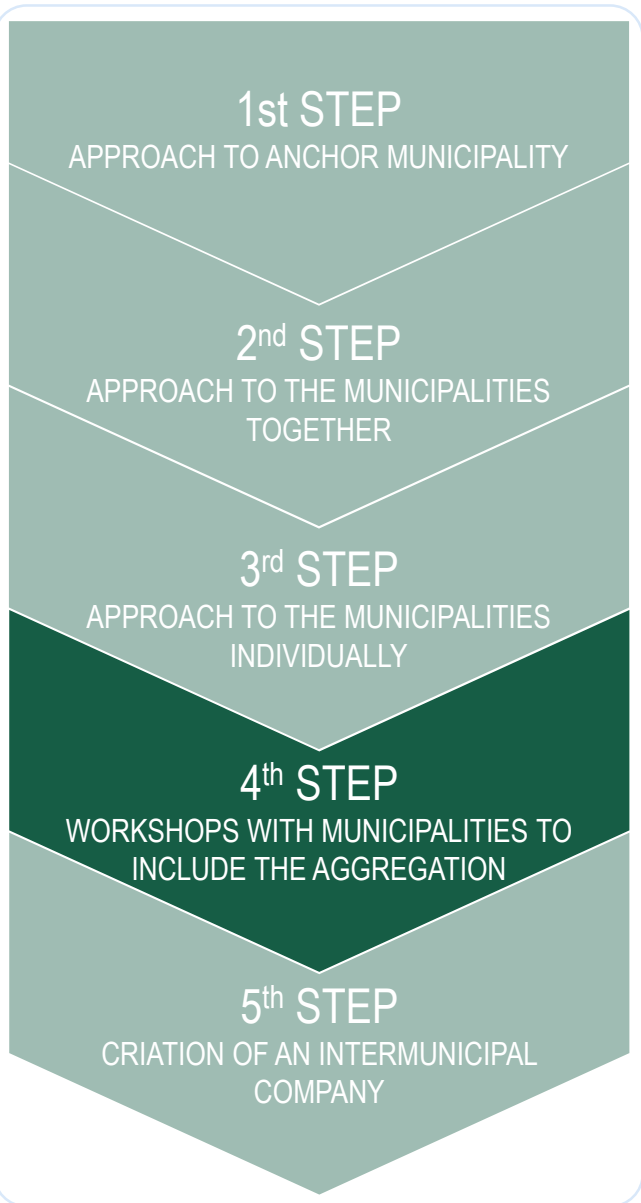
- Show "the best" municipalities that will embrace "the worst" municipalities:

  - It is necessary that the more developed municipalities realize that they are contributing to regional development by accommodating and helping minors to grow. Thus, the region will improve its economic and social levels, with the larger municipalities benefitting greatly from this point.

- Show "the worst" municipalities that will benefit from "the best" municipalities:

  - The least developed municipalities will benefit from the scale of the most developed ones. This allows for a rapid development and sustainable growth, which individually was not possible to achieve. Sometimes these municipalities present bigger resistance due to pride and political issues.

Message to withdraw: In this step, ERSAR will have a clear picture of which municipalities are willing to aggregate and what are the final conditions that have to be met for the aggregation to go forward.

Methodology: This approach will be made in one or more meetings between ERSAR and each municipality individually. In these meetings ERSAR will deliver and a new presentation of the Selling Package with a special focus on the municipalities that are more likely to go forward with the aggregation.

In the fourth step ERSAR will host some workshops for the municipalities that are taking part in the aggregation in order for them to discuss the details of what will be the new company in charge of the water supply and wastewater management services in that region

Steps

1st STEP
APPROACH TO ANCHOR MUNICIPALITY

2nd STEP
APPROACH TO THE MUNICIPALITIES TOGETHER

3rd STEP
APPROACH TO THE MUNICIPALITIES INDIVIDUALLY

4th STEP
WORKSHOPS WITH MUNICIPALITIES TO INCLUDE THE AGGREGATION

5th STEP
CRIATION OF AN INTERMUNICIPAL COMPANY

8-12 weeks

4th STEP: WORKSHOPS WITH MUNICIPALITIES TO INCLUDE THE AGGREGATION

In a fourth step ERSAR will hold meetings with municipalities in order to realize their flexibility and pre-arrangement for the following aspects:

Management Model: Discussion about the management model to adopt by the participating municipalities: direct management, concession, delegation to a company or partnership between municipalities and the state.

Tariff Structure: The availability of local authorities for a uniform tariff structure should be discussed. If there is convergence, there will have to be established the convergence period (time frame). In addition, ERSAR must highlight the need for a convergence and demonstrate that the benefits always outweigh the disadvantages.

Assets ownership: Each municipality will have to designate what kind of infrastructure it possesses and is willing to deliver. It will have to be carried out an assessment of infrastructure in terms of economic value and physical state.

Duration of Contract: Defining the time frame in which the aggregation is taking place. In this period, responsibilities are assigned and established, as well as commitments, activities and functions of both contracting parties.

Shareholder structure: It must be discussed the criteria that will generate the shareholder structure, which will depend on the management model adopted.

Methodology: The workshops can be realized individually or not, regarding the availability of municipalities. However, together is a better option. It is important to distinguish this step from the next one. On this step, these matters will only be discussed, where on the next one they will be defined.

ERSAR

NOVA
School of Business & Economics
Shaping powerful minds

In the fifth and final step, the municipalities will finalize all the details needed for the formalization of the aggregation, including the technical studies, final deliberations, examination of the Audit Court and the signing of the partnership agreement and constitution of the company

1st STEP
APPROACH TO ANCHOR MUNICIPALITY

2nd STEP
APPROACH TO THE MUNICIPALITIES TOGETHER

3rd STEP
APPROACH TO THE MUNICIPALITIES INDIVIDUALLY

4th STEP
WORKSHOPS WITH MUNICIPALITIES TO INCLUDE THE AGGREGATION

5th STEP
CRIATION OF AN INTERMUNICIPAL COMPANY

24-48 weeks

5th STEP: CREATION OF AN INTERMUNICIPAL COMPANY

- **Preparation of technical studies on the aggregation**, including the project plan from the perspective of investment, operation and funding. This study must have pre-set quantified targets and goals to be achieved by the company, including organizational, financial and social character. (Article 32 - Economic and financial feasibility and rationality económica1).

- **Deliberations of the municipalities**. According to Article. 22 - Constitution of local companies - the same legal regime, powers to decide on the creation or participation in local companies belong to the Municipal Assemblies, on the proposal of the respective municipalities. This constitution must necessarily be communicated to the General Finance Inspection and to the General Direction of Local Government.

- **Preliminary examination of the Audit Court**. If the decisions are favourable to the formation of the company, and before the formalization, it is required the supervision of the draft of the local business establishment contract (or purchase of social participation), as well as the elements present in Article 32 (Article 23 - Prior Review by the Court of Auditors1).

- **Signing the partnership agreement and constitution of the company**. After Court's approval and, in concrete terms, visa's approval, municipalities will be able to progress to the celebration of the contract and formally constitute the company.

Besides the implementation plan, ERSAR could train the operators that do not provide with provide the information requested by ERSAR correctly, also create a forum to share knowledge and create a second deliverable for the financial data to help municipalities test their data

MANDATORY SPECIALIZED TRAINING TO OPERATORS WITH ONE OR MORE OF THE FOLLOWING CHARACTERISTICS

- 4 or more items not answered (Index the System Improvements);

- Economical Data in "Not Validated" state;

- Economical Data in "Returned" State;

- Reliability of costs and revenues "low".

DEVELOPMENT OF AN ONLINE PLATFORM TO SHARE EXPERIENCES AND KNOWLEDGE

Develop a forum that would serve as a space for municipalities to share their experiences, their innovations and any initiative to improve efficiency. This space could be improved and highlighted with the release of articles on a weekly basis to stimulated the discussion between Municipalities.

HELP THE OPERATORS TO COMPLETE THE ECONOMICAL AND FINANCIAL DATA THROUGHOUT THE YEAR

Deliverable 1: September of year N

- Optative;
- Help Operators;
- Change to operators to "test" data
- Change to ERSAR to test reliability of data (e.g: with CEMS model);
- Scattered work during the year to ERSAR

Deliverable 2: March of year N+1

- Mandatory;
- Final delivery of audited documents;
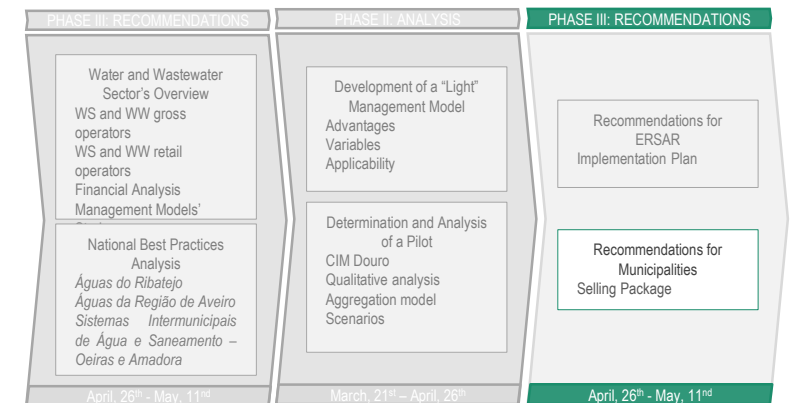- Revision of data previously delivered

Portugal. Assembleia Da República. Lei Nº50/2012, Diário Da República, 1.ª Série — N.º 169 — 31 De Agosto De 2012.1

4. PHASE III: RECOMMENDATIONS

RECOMMENDATIONS FOR ERSAR

- IMPLEMENTATION MODEL
- OTHER RECOMMENDATIONS

RECOMMENDATIONS FOR MUNICIPALITIES

- **SELLING PACKAGE**
- **OTHER RECOMMENDATIONS**

Recommendations

Our work ends with some recommendations, for ERSAR and for the Municipalities. For ERSAR there is an implementation plan for the municipalities to aggregate. For the municipalities there is a selling package that tries to convince and motive to aggregate

RECOMMENDATIONS FOR MUNICIPALITIES

SELLING PACKAGE

Qualitative Analysis

Quantitative Analysis

National Best Cases

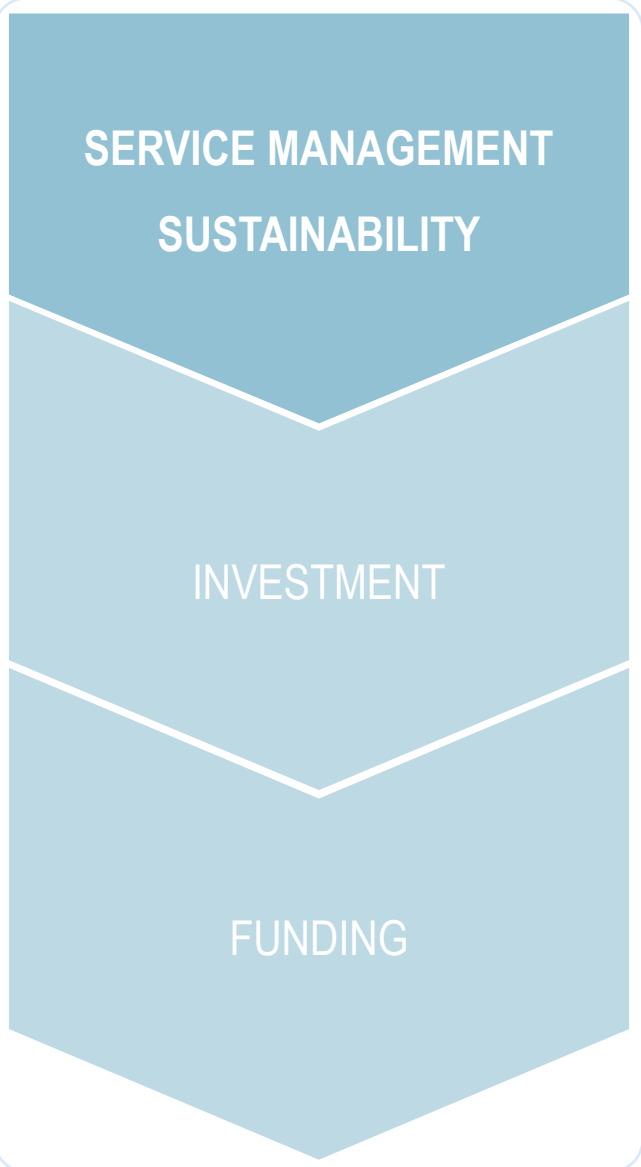Potential Gains From an Aggregation

Aggregation Model

Scenarios

OTHER RECCOMMENDATIONS

- The selling package is the document that ERSAR should present to the municipalities at the second step of the implementation plan, when approaching the municipalities all together.

- This document gathers an overall analysis of the municipalities which ERSAR wants to aggregate, including several arguments to use when convincing them to joint this process.

- There were delivered two "Selling Packages" to ERSAR, one with CIM Douro Analysis and another one that can be adjusted to any other situation.

- Because most of these points were already analyzed, the recommendations analysis will focus, now, on the Potential Gains from an Aggregation and the Other Recommendations.

Recommendations for Municipalities – SELLING PACKAGE

Besides the financial benefits that an aggregation brings due to economies of scale and efficiencies, the improvements in quality of service are also an important message to convey to the municipalities as this is an essential product for the lives of the customers

SERVICE MANAGEMENT

SUSTAINABILITY

INVESTMENT

FUNDING

POTENTIAL GAINS FROM AN AGGREGATIONS

Revenues
17 947 676€

Expenses
36 002 207€

Net Income
-18 054 531€

Aggregation

Net Income
-6 837 018€

Revenues
25 308 454€

Expenses
32 145 471€

Annual Financial Improvements:
11 217 513€

With an aggregation municipalities are able to improve their net income, reducing the costs and increasing the revenues. This is possible through economies of scale and efficiency improvements that are transversal to the operator's departments.

AA08ab – Non-revenue Water

53,1%   20%

AA13ab – Real water losses

147L   100L

OPERATIONAL MEASURES

- Substitution of water meters;
- Installation of new water meters.

DECREASE THE PERCENTAGE OF NON-REVENUE WATER AND REAL WATER LOSSES

- **Investment in equipment to control losses of water and to measure the caudal:** the investment in this equipment will allow the decrease in losses of water.
  - **Measurement and Control Zone**
  - After a macro localization of the water leaks, other equipment is used such as: *Geofone, Correlador Acústico, Logger Acústico e Loger Correlador Acústico;*

The investment in this equipment will allow the decrease in losses of water and a quick repair of the water leak. The installation of the measurement and control zone depends on several local constraints of pipeline distributions such as the connection density, the pipeline length and number of water entrances in the system.

Recommendations for Municipalities – SELLING PACKAGE

An aggregation would allow the municipalities to have the scale that is needed for the investments that are a necessity. These would in turn generate efficiencies and a better quality of service, for example by introducing new treatment phases to guarantee quality parameters

SERVICE MANAGEMENT

SUSTAINABILITY

INVESTMENT

FUNDING

POTENTIAL GAINS FROM AN AGGREGATIONS

With the aggregation comes the capacity to invest in Infrastructures, Information Systems, technical experts and other equipment that are crucial for the sustainabilitiy and quality of the business. This also leads to an improvement in the indicators of the operator.

AA04ab – Safe Water

98,4%   98,5%

- **Introduce additional treatment phases, in order to guarantee the accomplish the quality parameters;**

- **Switch to one single contract for all Municipalities regarding the laboratory external analysis;**

- **Adoption of new practices in terms of the exploitation of the distribution.**

AA05ab – Reply to written suggestions and complaints

81%   100%

Decrease the number of Suggestion and Complaints:

- **Create a department of CRM - *Customer Relationship Management;***

Increase the written answers to Suggestions and Complaints:

- **Awareness campaign in order to answer the suggestions and complaints on time. Choose one person to manage and control the deadlines of the reply to suggestions and complaints.**

"Entidade Reguladora dos Serviços de Águas e Resíduos." ERSAR's Portal. Accessed May 18, 2016. https://portal.ersar.pt/

With an aggregation, municipalities will be able to fulfill certain requirements to apply for European Union funds. Individually only three municipalities from CIM Douro would have the Infrastructural Knowledge Index and Asset Management good enough to apply

SERVICE MANAGEMENT

SUSTAINABILITY

INVESTMENT

FUNDING

**POTENTIAL GAINS FROM AN AGGREGATIONS – FUNDING**

The aggregation will allow municipalities to fulfil the requirements for applications for the European Union Funds within the *POSEUR - Programa Operacional da Sustentabilidade e Eficiência no Uso de Recursos.*

INFRASTRUCTURAL KNOWLEDGE INDEX AND ASSET MANAGEMENT:

"Alínea b) do nº 1 do Artigo 98º - Índice de conhecimento infraestrutural e gestão patrimonial:

The article 98º states that an operator needs to prove the existence of pipeline register on the existing infrastructures. This will be attested by looking at ERSAR's indicator, Infrastructural Knowledge Index and Asset Management , which will have to be equal or higher than 40 points, with an exception for cases where the operator show actions that will result in an increase of this value."

CIM Douro represents an average value of this index of 16,55 which shows how it is a very weak region in terms of Infrastructural knowledge and asset management. In fact, evaluating each case at a time, there are seven municipalities presenting a zero value. And there are only three municipalities who would fulfil the requirement.
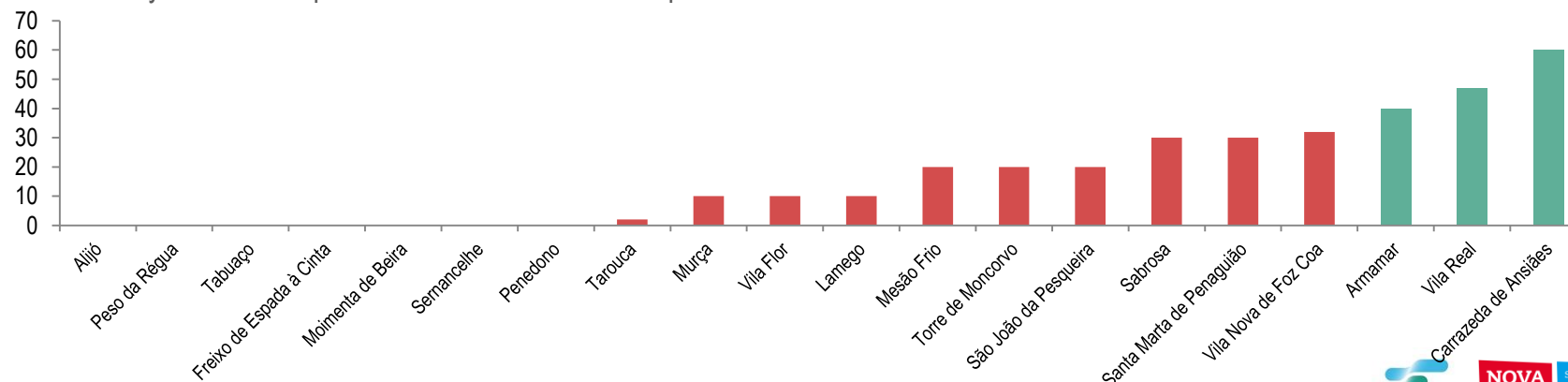
Another requirement for applying to external funds in the number of indicators reported. In CIM Douro the individual and actual scenario would dictate that only nine municipalities would satisfy this requirement

SERVICE MANAGEMENT

SUSTAINABILITY

INVESTMENT

FUNDING

POTENTIAL GAINS FROM AN AGGREGATIONS – FUNDING

INDEX OF SYSTEM IMPROVEMENTS

"Alínea c) do nº1 do Artigo 98º - Índice das melhorias nos sistemas de AA e AR:

The article 98º states that operators must make available to ERSAR the data with which the regulator will evaluate the improvements of the operators. This can be done by filling the official individual evolution document or by handing over to ERSAR some more recent data. The delivery of this information will result in the indicator: Index of System Improvements".

Every year operators must report to ERSAR to a several indicators (quality, financial, etc). To be able to apply to EU funds, each operator must have a maximum amount of 4 indicators with no answer and this number must be reduced by one, each year. Nowadays, there are ten municipalities with more than 4 indicators with no answer given, Sabrosa being the most critical case with 16 indicators.

Application year	Year of the last service quality evaluation available	Maximum number of indicators with no answer given
2015	2013 or 2014	4
2016	2015	3
2017	2016	2
2018	2017	1
2019	2018 and following	0

Another requirement for funding is the tariff structure and coverage of total costs. The situation in CIM Douro is not positive, as only two municipalities in WS and three in WW fulfil the requirements of a cost coverage above 0.8

SERVICE

MANAGEMENT

SUSTAINABILITY

INVESTMENT

FUNDING

POTENTIAL GAINS FROM AN AGGREGATIONS – FUNDING

TARIFF STRUCTURE AND COVERAGE OF TOTAL COSTS

"Alínea d) do nº 1 do artigo 98º - requisitos em matéria de estrutura tarifária e grau de recuperação de custos:

The article 98º states that operators must comply with ERSAR's minimum requisites for the tariff structure and the total coverage of costs.

All operators with a Total Coverage of Costs above or equal to 0.8 will be eligible;

All operators with a Total Coverage of Costs below 0.8 but whom the average of the results from the last three years is above 0.8 are eligible;

All operators that do not comply with any of the two points above will not be eligible unless they commit to increase their total coverage of costs above or equal to 0.9 until 2017, having to report financial data that can attest to this commitment".

COVERAGE OF TOTAL COSTS   54%

COVERAGE OF TOTAL COSTS   44%

Recommendations for Municipalities – OTHER RECOMMENDATIONS
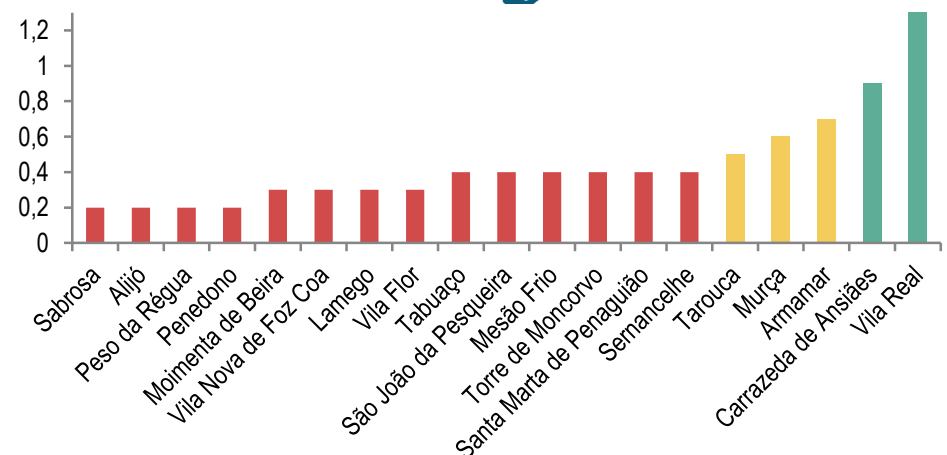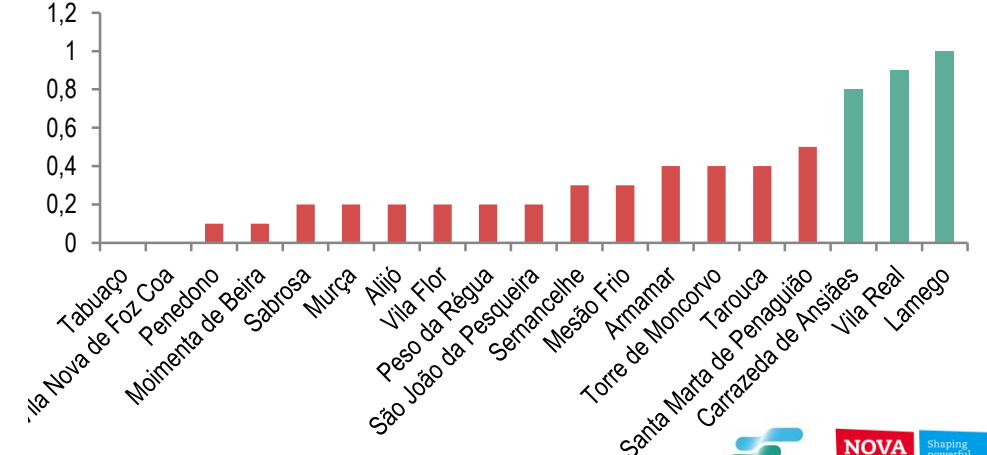
The municipalities from CIM Douro are advised to leave some municipalities out of the aggregation until they meet with certain requirements, this would allow for better financial and quality improvements. Also the recommended model is a Delegation to an Inter-Municipal Company

MUNICIPALITIES' CHOICE

Total Aggregation except from the municipalities of Freixo de Espada à Cinta, Peso de Régua, Tarouca and Vila Nova Foz de Côa:

- Setting goals and convergence measures to these municipalities, therefore they can improve their weaknesses. In this sense these municipalities could integrate the firm afterwards:

  - Require the municipalities present bi-annual accounts to the ERSAR – provide support and training in the presentation of accounts;

  - Require the presentation of ERSAR's quality indicators – provide support and training in the presentation of accounts;

  - Provide some infrastructures – i.e. laboratory.

MANAGEMENT MODEL

The most appropriate management model to Douro region is the Delegation to an Inter-Municipal Company:

- The best solution would be to join EMAR of Vila Real, it would not only reduce the cost of establishing a new company but also it would reduce the cost of building new infrastructures.

CAPITAL SHARE

The composition of the shareholder should be based on the municipalities' dimension (turnover) and the need of investment of the municipalities. It is a very disperse region, therefore a capital share based on the municipalities' population does not make sense.

The investments should prioritize the municipalities that find themselves in a more precarius situation. To ease the increase in tariff charges there should be made a social tariff that could be subsidized by the municipalities

ASSETS OWNERSHIP

The assets acquired during the partnership belong to the company and in the end of the contract belong to each municipality. The assets that already existed before the company's creation are managed by the company until the end of the partnership period but are turned back to municipalities at its end.

INVESTMENTS

- In order to cover the initial investments, the minimum period of the partnership is 50 years;
- The investment criteria is to prioritize the municipalities that need more investment in the beginning.

TARIFFS

- Practice a social tariff to overcome the increase in the tariff charge, these tariffs could be subsidized by the municipalities in which they are applied;
- Practice a tariff to non-domestic consumers. It will be discriminated by who consumes more, pays a higher tariff charge. This can decrease the average tariff of the aggregation model.

OTHERS

- Decrease the non-authorized consumption, leading to a increase in revenue.

5. INDIVIDUAL REPORTS

DIANA TOMÁS #2274

LUÍS ANDRADE E SOUSA #2141

MAFALDA VEROL MARQUES #2317

MARTA SOARES #2444

SIMÃO TAVARES #2021

The Belbin test is very useful when building a team because all kind of roles are needed. I think this test ends up showing a reflection of our strengths and weaknesses and it is up to us learn how and when to reinforce and to soften them

TOP 3

PRESIDENT	The first though I had when I realized this test was: "wow, this is me". Actually I relate a lot with these three characteristics and with their strengths and weaknesses. I have that natural tendency to coordinate people and tasks and I am very self-disciplined such as a "President". Moreover, I am also an action-oriented person, instrumental and task-centered, and like to work methodically. These are clearly "Strategist" and "Operational" characteristics.
STRATEGIST	During the project I tried to take advantage of these good characteristics but some times I ended up personifying the worst ones, such as being dominating, discipline-imposing and suffering from anxiety.
OPERATIONAL	However, I considered myself a good piece of the puzzle and I know that my assertive role was compensated by my enthusiasm and constant motivation along the project.

BOTTOM 3

INTELLECTUAL	I am very methodically and like to solve problems with numbers and not with creativity, contrarily to the intellectual.
PROSPECTOR	Despite of being a very enthusiastic and positive person, while working I am more serious and I like to work at a calm environment. It is true that I get demotivated with routine work
FINISHER	If on one hand I have a huge easy to start things, to finish them is not one of my strengths. I get lazy when something its getting to its end and I always find something new to do that prevents the work to get finished.

Along the project I was able to improve several competences and to learn and retain others, both at a personal and professional levels. I truly believes that this experience was very important and results will show up in the future

PERSONALLY

TEAM WORK

The best gift of team work is to have a constant opportunity of learning something new and share ideas. It is very important to respect each other and understand differences between group members and learn how to take advantage of them. To learn how to adapt to several situations, to be able to motivate others and to be able to give and receive feedback is crucial to the success of a team.

MOTIVATION

One of the main key learning I got the opportunity to get from this project was the motivation that each one gets every day. I think it is very important to get ourselves motivation along the project even when times are not the best ones and it is also crucial to ensure all group's motivation.

RESILIENCE

Resilience is a characteristic everyone must have in order to be successful not only at a professional level but also at a personal one. Having said that, this project helped me to improve this characteristic, at times when everything seemed to be wrong and time inexistence and those are the times one must be strong enough to get up and starts all over again we the certain that the effort will bring results.

PROFESSIONALLY

SYNDICATION

To maintain a good and constant relationship with the client is vital for the success of the project. Syndication allows a group to be always aware of the client's wants and needs. Besides that, it is very important that the team's work is aligned with the client's objectives. Not to keep an high level of syndication was the main reason of our problems in the beginning of the project.

COMMUNICATION SKILS

Having the opportunity to participate in several reunions along the project, with a various audience allowed me to improve my communications skills. It is needed a grand respect and comfort to argue with experts and receive and accept critics.
Within presentations it was important to learn how to captivate the client and to deal with interruptions especially when time was short.

EXPECTATIONS MANAGEMENT

To maintain a good and close relation with the client and to be able to communicate properly with him are not enough to assure the success of the project. In fact to be able to manage the client's expectations is another essential key point to keep him satisfied. It is crucial to try to reach the client's goals but never to promise something that can not be done.

My Belbin results actually were in line with my self image, I am a very practical and methodic person. I need clear goals and targets to be motivated. These results also helped me to see that I should work on my creative side and try to be more extrovert in the work environment

TOP 3

OPERATIONAL	I am a very practical person, very organized and methodical. I try to define the objectives and tasks at hand to work make my work more precise and clear.
TEAM WORKER	I try to listen to everyone's opinion and support the good ideas that come from my team members. I feel it is important to try and take the best out of every team member in order for them to feel valued and motivated.
FINISHER	I am very detail oriented and perfeccionist, these traits demand high levels of concentration from my part. I like to control the final deliveries to insure that there is no detail left unchecked.

BOTTOM 3

PROSPECTOR	Being a more introvert person, and not the social type of person, I find it hard to get in contact with new people. This is something that I developed in this project given the necessity to contact with people from different backgrounds everyday.
INTELLECTUAL	I never considered myself a creative person, I always like to stick with the facts and numbers instead of trying to figure out creative solutions.
STRATEGIST	Although the score says I am not a strategist, I think I was able to show some of these traits. I was able to guide my team members given my knowledge over the whole project and its different ramifications.

ERSAR   NOVA School of Business & Economics   Shaping powerful minds

This project taught me to pay more attention to the relation between the team and the client, always keeping in touch and managing expectations. Through the project I was able to improve my communication skills and also the capacity to work under pressure

PERSONALLY

TEAMWORK

I learned that keeping my team members motivated is very important and so, finding out what motivates them and knowing them is also very important;
Understanding the strenghts of each person and putting them to use;

COMMUNICATION

I have improved the way how I transmit my messeage, making it more clear and precise;
Learn how to proper participate in a busines meeting with high officials;

HANDLE PRESSURE

Working with deadlines every week helped me to improve my concentration levels through a long period of time;
Being put under several situations under pressure, it was important to never lose sight of the objectives and not succumb to pressure.

PROFESSIONALLY

PROBLEM SOLVING

Through the project I have improved my capacity to deconstruct a problem in order to find the right solutions;
It is very importanto to always keep in mind the "so what" of the deliverables I am presenting to a client.

SYNDICATION

A key learning from this project was that whenever you are working with a client it is crucial to always keep the channels of communication open;
Maintaining good relations with the client is something of the most importance.

MANAGE EXPECTATIONS

Working with a client for three months demands of the consulting team to manage the expecations. As the time passes the client can have different ideas for the project and so it is important to keep track of the clients' real needs and adjust them to our resources.

ERSAR

NOVA
School of Business & Economics
Shaping powerful minds

The results of Belbin Model helped to understand which role I perform . It had also helped to understant which were my stregths and weakenesses as a team member that I could improve throughout the project and in the future.

TOP 3

TEAM WORKER	I consider my self a person that manage to solve the conflicts and that overcome the differences between the team members. I believe that I can adapt easily to different people with different points of view.
PRESIDENT	During the stressful days I always tried to prioritize the team's tasks taking into account the team member the knowledge, skills and preferences of each one, showing my coordination and discipline skills.
STRATEGIST	I do not agree with this role. I do not consider myself a person with innovative and disruptive ideas. Although I always try to explain my point of view and make suggestions during the projection.

BOTTOM 3

OPERATIONAL	I believe I am quite a flexible person and I can rapidly adjust to new ideas and to new situations.
PROSPECTOR	This role represents the social person which I totally identify with. I believe I am an enthusiastic and positive person.
MONITOR	I do not identify myself with this role. I find it difficult to see all the available options when dealing with a problem.

ERSAR

NOVA School of Business & Economics Shaping powerful minds

This project helped to improve and develop the following personal and professional skills

PERSONALLY

LEADERSHIP

Being the project manager of the team helped to improve my leadership skills, my critical observation and also to be opened to suggestions. Guaranteeing that the whole team was motivated to their tasks was a constant concern. It is extremely important to set deadlines to ourselves and to the team. And to guarantee that the team has its objectives with each other.

FEEDBACK

Receiving a constant feedback from the client about our project helped us to improve our work. Furthermore, receiving a constant feedback from the Professor about our group and individual work was extremely important to improve our weaknesses throughout the project , in order to add more value to the project and also to the team.

CHALLENGE

The entire project was a huge challenge. Being the first consulting project that I was working in and being in the public sector in the water sector was certainly a tough test. But we need challenges to motive ourselves, to improve our skills and to achieve success. Being challenged everyday in this project prepared me to my future career.

PROFESSIONALLY

COMMUNICATION SKILLS

Being able to summarize, pass the main message during a presentation and to adapt the speech to different types of audience was one of the key leanings of the project. Sometimes, we were surprised with a shortage of time and we have to be able to present only the main conclusions of that phase of the project.

SYNDICATION

I believe that the main takeaway of this project is syndication. Throughout the project we have learned that meeting with the client would help us to understand what was the client´s perspective about our project and if we were going in the right direction. We have learned that is very important to keep the client updated about the project and to be aligned with the client's objectives and expectations.

TEAMWORK

Overcoming the differences between team members and overcoming stressful times during the project was a lesson to life and career. Understanding that together we make a better job, that together we overcome the challenges faster and better was a lesson learned and it was very enriching.

Belbin test helped me to know my strengths, but more important to take advantage of weaknesses in order to help the group and the organization. Generally the results were not surprising and were aligned with my expectations

TOP 3

STRATEGIST	All those three traits have a lot in common and in fact are totally related with me. On one hand I believe I am a stable, analytical and a pragmatic person, but also extrovert and full of energy just like the "President" and the "Strategist". I also believe, like the "Monitor", that I can easily give feedback to the group and that I can submit people to a certain standard of performance. On the other hand, I may have a tendency to be dominant and sometimes I try to impose my opinion.
PRESIDENT	During this project I assumed these roles naturally. I tried to take advantage of my natural energy and enthusiasm to keep the group motivated and working with efficiency. Furthermore, I also used my communication skills to interact specially with the client and team members. However, in some situations my temperament and my obsession with perfection created some challenges with colleagues that were successfully solved. Moreover, I believe I have the a natural ability to coordinate projects, but I tried not to assume this role to prevent my tendency to dominate and impose my point of view.
MONITOR	In general I believe my role within the group was very important and that I was able to use my best characterictics to help the work.

BOTTOM 3

TEAM WORKER	When I finished the Belbin test, I was really disappointed because one of the least scored roles was the "Team Worker". Maybe, I am not in the right place and I should consider writing my project individually", was my first thought. I rapidly understood that, in fact, I have some characteristics of a "Team worker", such as enthusiasm, extroversion and pleasure to help colleagues. However I needed (and I still need) to work on other characteristics: know how to listen to others' opinions, value them and to not dominate. These were my challenges during the consulting lab. I am not sure if I was able to fully complete them, but at least I really tried.
INTELLECTUAL	The prospector is not how I see myself at all. Apart from the enthusiasm and working under pressure, I am not very good at improvising and I tend to be a little bit more serious while working.
PROSPECTOR	Finally, the intellectual, just like me is systematic minded person and has critical thinking, but I really like to work with people, I am very objective and organized. Thus I like deadlines, operational aspects and details. In general I have to agree that these roles are not the most related with me, but life is a learning process and mine is just at the begginning.

ERSAR   NOVA School of Business & Economics   Shaping powerful minds

This project was very important to me, both in my personal and professional life. It will be, for sure, very useful in the future this experience that gave me so much

PERSONALLY

RESILIENCE

This adventure really helped me to be more patient and resilient with problems. It made me swap the word "problem" for "challenge" and It made me focus on the process to achieve a solution.
The project also taught me that there is always a way out to every situation and aided me to deal with failure and adversity.

GROUP WORK

We worked together 8 hours a day, 5 days a week for more than three months. It was a great opportunity to be more group oriented and to really learn to cooperate. I had to work with people that think, work and act differently and I learned to respect, accept and enjoy working with them. I learned a lot with them and that is a great value added to my personal life.

NEW CONCEPTS

I really enjoy learning new things and this project gave me the opportunity to learn about a totally new sector and industry which is very rewarding.
I knew that everyday I was going to learn new concepts, terminologies, work processes, etc.
This challenge kept me motivated every day.

PROFESSIONALLY

"ADD VALUE" MINDSET

This mindset is, in my opinion differente from school where we are used to do projects for grades.
This project was an opportunity to understand the concept, "add value". I realized that I have to keep this in mind and try everyday to be as much productive, helpful and useful to the organization as possible. I learned to think as "If I was the client, I would want…"

SYNDICATION

The most powerful word inside an organization. This gave me, and my colleagues, some heartbreakes during the project.
Trying always to keep everyone related with the project updated is the only way to perform a good work.
A good relationship with the client is fundamental for the success of the work to manage expectations and get as much information as possible.

PROBLEM SOLVING

More than gathering information, it is essential to learn a process to manage it and to draw conclusions.
During this time I was able to improve my problem solving mind and be more prepared to my future work life.
Finally, one of the most importan steps of the problem solving is deciding how it is going to be presented to the client and sometimes this can be a challenge.

Belbin Test helped me to understand which role I play within a group, showing my weaknesses and strengths in a work environment. These results were completely aligned with my initial expectations

TOP 3

OPERATIONAL	I do not consider this point as my strongest one, but I am person more interested in pratical things than abstract ideas. If I am interested and motivated to achieve a goal, so clearly I will work efficiently to achieve it.
TEAM WORKER	This might be my strongest characteristic. I am used to work in team, either be in school, professional life or in sports. I consider myself as a enthusiastic member of a team, always ready to help the others and promote harmony within a group.
INTELLECTUAL	I definitely agree with this point. I consider myself as intelligent, creative and an imaginative person. My way of thinking is clearly different from the others. Moreover, I always like to redefine problems and purpose different actions plans.

BOTTOM 3

STRATEGIST	I agree with this point, in the sense that I am not a person that gives form and coherence to the group´s ideas and put them in practice. I am more a creative and innovative person, and I really need to become more strategist. I am not a task-oriented at all.
FINISHER	I am not definitely a finisher individual, and I have to improve my skills and capacities in this characteristic. I am very relaxed person, a little bit impacient and with some difficulty to have a high degree of concentration. Furthermore, I do not like to define deadlines, check details and errors.
PRESIDENT	This characteristics clearly relies in which kind of environment we are talking about. However, I am not used to clarify objectives and define the business agenda by establishing priorities and fulfil schedules.

This project taught me to pay more attention to water issues, mainly to its importance and how they get until us. Furthermore, I understand the role and importance of being in touch/contact with the client and the others, as well as to develop some professional skills during a work team

PERSONALLY

TEAMWORK

In group, we are stronger and more effective. One of the main advantages of working in groups is the overall brainstorming that is generated. Keep team members motivated is an essential point to have a good work environment. It was positively to deal with different personalities and people.

MOTIVATION

In this project, I faced different levels of motivation at different stages of the project. It was important to understand that sometimes the work does not motivate us, but we have to overcome it.

COMMUNICATION

Communication is essential to work in groups. During this project I could improve my communications skills, mainly due to the high contact that I had with all the people involved in the project, as well as the presentations made.

PROFESSIONALLY

PROBLEM SOLVING

Across all the project, we faced different problems and, in the most of times, there is "no light at the of the tunnel". It is important to define an action plan, generate alternatives, and think outside of the box.

SYNDICATION

This was clearly the most important key learning from this project. It is essential to manage expectations from the client and to achieve an effective solution or outocome. Furthermore, allow us to create synergies and good relation with all the members involved in the project.

"ADD-VALUE"

No matter what we do, we have o create value. We can not limit our work just to fulfill what is demanded. It is always about to "go beyond".

Appendices

Appendix List

- **Appendix 1 –** Management Model

- **Appendix 2 –** Estimated Investments

- **Appendix 3 –** Basic Formulas of Aggregation Model

- **Appendix 4 * –** Data used in Aggregated Model

- **Appendix 5 * –** Financial Data From Municipalities

- **Appendix 6 * –** Water Supply Indicators

- **Appendix 7 * –** Wastewater Management Indicators

* Appendices in a separate presentation

Management model	Management sub-model	Operator	Entity holder	Number of Operators		Number of municipalities		Population served		Private/public management	Financial autonomy	Assets owenership	Average coverage of total costs	
				WS	WW	WS	WW	WS	WW				WS	WW
Direct management	Individual solution	Municipal services	Municipality	186	197	186	197	3 033 494	3 845 897	Public	No	Yes	0,77	0,66
		Municipalized services	Municipality	18	16	18	16	1 624 554	1 143 477	Public	Yes	Yes	1,08	0,91
	Intermunicipal solution	Inter-municipalized services	Municipalities	2	2	4	4	691 069	691 069	Public	Yes	Yes	1,1	1,15
		Association of municipalities	Association of municipalities	-	-	-	-	-	-	Public	Yes	Yes	-	-
		Inter-municipalized services	Association of municipalities	-	-	-	-	-	-	Public	Yes	Yes	-	-
Delegation	Individual solution	Municipal company	Municipality	17	18	17	18	1 439 001	1 503 639	Public	Yes	Yes	1,2	1,06
	Intermunicipal solution	Intermunicipal company	Association of municipalities / Municipalities	2	2	9	9	330 907	330 907	Public	Yes	Yes	1,29	0.81
Concession	Individual solution	Concessionaire	Municipality	28	23	33	23	1 970 615	1 714 194	Private	Yes	Yes	1,13	0,86
	Intermunicipal solution	Concessionaire	Association of municipalities	-	-	-	-	-	-	Private	Yes	Yes	-	-
Partnership with the State	Intermunicipal solution	Company with share capital from the State and municipalities	Association of municipalities	1	1	10	10	339 752	341 244	Public	Yes	Yes	1,2	0,83
TOTAL				254	259	277		9 929 392	9 570 427					

Appendix 2 – Estimated Investments

EXAMPLE: EXPANSION IN ARGANIL (WS)

- Mainly Urban Area, with no operation in the "gross" business;

- Accommodations: 10 937

- Physical Acessibility of the Service: 67% (goal 80%)

- Accommodations still to serve: 1 421 (23%)

- Multiplier of mains lenght by accommodations for mainly rural areas: 1,0

- Mains lenght by accommondations: 43,3

- Mains lenght (meters) still to serve: 67 738,4

- Expansion Cost: 60€ per meter of mains

- Expansion Cost: 60 * 67 738,4 * 1,0 = 4 064 303€

- Additional Infrastructures: 4 064 303€ * (1-80%) / 80% = 1 016 075€

- Total Investment for Expansion: 5 080 379€

The investments that were estimated were divided into WS and WW, but the logic behind the calculations is similar, only changing some of the indicators. There are two types of investments: expansion and rehabilitation.

For the expansion investments, in WS, there are targets of physical acessibility of the service defined for each type of area: mainly urban (95%), semi urban (90%) and mainly rural (85%). The value is calculated using a price of € per mains lenght and it depends on the type of area, being more expensive as the area becomes more urbanized. Furthermore, there are two factos that can add to this price, if the operator handles the "gross" part of the business and the meters per accommodation, that also becomes more expensive as the area becomes more urbanized. The investment is calculated until the operator reaches the targets defined above.

For WW the investment in expansion is similar with the difference that the targets for the physical accessibility are as follow: mainly urban (90%), semi urban (85%) and mainly rural (75%).

For the rehabilitation investments, in WS, the price of the investment is the same , using the € per collectors lenght and also with the two extra factos, meters by accommoadtion and if the operator handles the "gross" side of the business. To assess what are the needs of rehabilitation for a certain operator, there are four indicators: service interruptions, mains rehabilitation, mains failures and real water losses. Based on these indicators the operators are characterized according to the need for rehabilitation, having a % of infrastrutures to rehabilitate in line with their evaluation: maintenance (1%), recovery (1,5%), severe (2%) and urgent (3%).

The difference for WW is that the indicators to assess the needs for rehabilitation are the following: floodings occurrences, sewer rehabilitation, sewer collapses and emergency control discharges.

Finally these results oly account for 80% of the total investment as the rest wil be added according to these values, taking into calculations the additional infrastructures that need to be taken care of, such as a water treatment station.

- **Δ Apparent losses:** (Apparent losses t_0 / Non-revenue water t_0) * (Non-revenue water t_0 - (Non-revenue water t_0 * 28,3% non-revenue water) / Unncaounted-for water)

- **Δ Water losses:** (Water losses t_0 / Non-revenue water t_0) * (Non-revenue water t_0 - (Non-revenue water t_0 * 28,3% non-revenue water) / Unncaounted-for water)

- **Average annual salary for worker:** Personnel Expenses / (((# Field Supervisors + # Administrative Supervisors) * 1,5) + (# Field Workes + # Administrative Workers))

- **Average annual salary for supervisor:** Average annual salary for worker * 1,5

- **Savings with people that will join direct debit:** (# Habitants between 20-54 years old / Population) * % People will join direct debit * Mail Expenses

- **Savings with people that will join electronic invoice:** (# Habitants between 20-54 years old / Population) * % People will join electronic invoice * Mail Expenses

References

"ABASTECIMENTO DE ÁGUA INTERROMPIDO NA ZONA DO PINHAL NOVO." SetubalTV STV. 2015. Accessed May 18, 2016. http://setubaltv.com/abastecimento-de-agua-interrompido-na-zona-do-pinhal-novo/.

(S.Lopes (SIMAS), Divisão de Estudos, Planeamento e Controlo de Gestão, April 27th, 2016)

(S.Oliveira (SIMAS), Divisão de Estudos, Planeamento e Controlo de Gestão, April 27th, 2016)

"Empresa – Investimento". ADRA. Accessed April 4, 2016. http://www.adra.pt/content/index.php?action=detailfo&rec=1806&t=Investimento

"Empresa – Modelo de Governo." ADRA. Accessed May 18, 2016. http://www.adra.pt/content/index.php?action=detailfo&rec=1803&t=-Modelo-de-Governo

"Empresa – Quem somos". ADRA. Accessed May 18, 2016. http://www.adra.pt/content/index.php?action=detailfo&rec=1800&t=Quem-somos

"Entidade Reguladora dos Serviços de Águas e Resíduos tem nova imagem com assinatura da MyBrand". Meios e Publicidade. 2016. Accessed May 18, 2016. http://www.meiosepublicidade.pt/2016/03/entidade-reguladora-dos-servicos-de-aguas-e-residuos-tem-nova-imagem-com-assinatura-da-mybrand/

"Entidade Reguladora dos Serviços de Águas e Resíduos." ERSAR's Portal. Accessed May 18, 2016. https://portal.ersar.pt/

"POSEUR – Documentação" POSEUR. Accessed May 18, 2016. https://poseur.portugal2020.pt/

"POVT – Candidaturas." POVT. Accessed May 18, 2016. http://www.povt.qren.pt/

"QREN - Quadro de Referência Estratégico Nacional." Accessed May 18. http://www.qren.pt/

"Quem Somos – Águas do Norte" Águas do Norte. 2016. Accessed May 18, 2016. http://www.adnorte.pt/pt/aguas-do-norte/quem-somos/?id=5

"Quem Somos - Apresentação da ERSAR". ERSAR. 2016. Accessed May 18, 2016. http://www.ersar.pt/website/ViewContent.aspx?FolderPath=\Root\Contents\Sitio\MenuPrincipal\QuemSomos&Section=MenuPrincipal&SubFolderPath=

"Quem somos - Mensagem do Presidente" Águas do Ribatejo. Accessed May 18, 2016 from http://www.aguasdoribatejo.com/artigo.aspx?lang=pt&id_object=392&name=Mensagem-do-Presidente

"Quem somos – Natureza e Atribuições." Águas do Ribatejo. Accessed May 18, 2016. http://www.aguasdoribatejo.com/artigo.aspx?lang=pt&id_object=395&name=Natureza-e-Atribuicoes

"Quem somos – Natureza Visão, Missão, Atribuição e Notas Históricas." SIMAS Amadora e Oeiras. Accessed May 18, 2016 http://www.smas-oeiras-amadora.pt/#/natureza_visao

"Quem somos - Organização." Águas do Ribatejo. Accessed May 18, 2016. http://www.aguasdoribatejo.com/artigo.aspx?lang=pt&id_object=394&name=Organizacao

"Quem somos – Organograma." SIMAS Amadora e Oeiras. Accessed May 18, 2016http://www.smas-oeiras-amadora.pt/#/organograma

"Quem somos - Plano de investimentos." Águas do Ribatejo. Accessed May 18, 2016. http://www.aguasdoribatejo.com/artigo.aspx?lang=pt&id_object=396&name=Plano-de-Investimentos

"Quem somos - Síntese Histórica." Águas do Ribatejo. Accessed May 18, 2016
http://www.aguasdoribatejo.com/artigo.aspx?lang=pt&id_object=397&name=Sintese-Historica

"RELATÓRIO ANUAL DOS SERVIÇOS DE ÁGUAS E RESÍDUOS EM PORTUGAL (2014)
Sumário Executivo (1st ed., Vol. 1). 2015. Lisbon: ERSAR. Accessed May 18, 2016
http://www.ersar.pt/website/ViewContent.aspx?FolderPath=\Root\Contents\Sitio\MenuPrincipal
\Documentacao&SubFolderPath=\Root\Contents\Sitio\MenuPrincipal\Documentacao\Publicac
oesIRAR&BookCategoryID=1&BookTypeID=3&Section=MenuPrincipal

"Sistema – Introdução." ADRA. Accessed May 18, 2016 http://www.adra.pt/

Apresentação (company Presentation). PPT. SIMAS.

CONCURSO PARA APRESENTAÇÃO DE CANDIDATURAS - Critérios Específicos De Elegibilidade
Das Operações. PDF. POSEUR - Portugal 2020.DOCUMENTO DE ENQUADRAMENTO
ESTRATÉGICO ÁGUAS DA REGIÃO DE AVEIRO. PDF. 2009.

Critérios de Seleção da Tipologia de Intervenção "Gestão Eficiente do Ciclo Urbano da Água". PDF.
POSEUR - Portugal 2020.

Pordata. Accessed May 5, 2016.
http://www.pordata.pt/Municipios/Popula%C3%A7%C3%A3o+residente-359

Portugal. Assembleia Da República. Lei Nº50/2012, Diário Da República, 1.ª Série — N.º 169
— 31 De Agosto De 2012.

Thank you