Sérgio Hora Lopes
Associação Portuguesa de Distribuidores de Água e Águas do Douro e Paiva
s.lopes@ADP.PT
DOI: https://doi.org/10.14195/2183-203X_53_8

Aggregation in the Portuguese Water Industry: The Case of Retail Service Operators

As Agregações das Operadoras de Água e o Caso das "Baixas" em Portugal

Sérgio Hora Lopes

Received for publication: April 16, 2020
Revision accepted 7for publication: March 24, 2021

ABSTRACT
The regional aggregation of water service operators has been considered a possible solution for improving these services, for enhanced service quality and efficiency in the performance of the entities responsible for providing the service. This paper seeks to study the aggregations that have occurred in Portugal in the last decade, in addition to review some of the most recent and relevant literature published on the subject. Such recent aggregation differs significantly from first and second-generation aggregation that occurred between the late 1980s and mid-2000s, being essentially aimed at (i) integrating only water distribution operators (i.e. direct providers, also known as retail operators), and (ii) integrating smaller and less populated territories.
Keywords: Water services; aggregation of operators; direct provider; and bulk operators; Portugal

JEL Classification: L52; Q25.

RESUMO
A agregação regional de operadores de serviços de águas tem vindo a ser considerada como uma possível solução organizativa para a melhoria destes serviços, quer para uma melhor qualidade de serviço quer para uma maior eficiência no desempenho das entidades responsáveis pela prestação do serviço. O objetivo deste trabalho é o de, para além de referir alguma da literatura mais recente publicada sobre o assunto, estudar as agregações que têm sido feitas em Portugal na última década. Estas são bem diferentes das da primeira e segunda geração, verificadas no final dos anos 80 até meados da 2000/2010, pois dirigem-se essencialmente para a integração de operadores com distribuição e não produção (baixa e não alta) além de integrarem territórios muito mais reduzidos e muito menos populosos, desenvolvidas num contexto diferente e condições de sucesso igualmente diversas.
Palavras-chave: Serviços de água; agregação de operadores; alta e baixa; Portugal.

Acknowledgment: This work was conducted within the scope of the activities developed by APDA, the Portuguese association of water operators. Although it is my sole responsibility, without the precious collaboration of the colleagues of the APDA this work would not have been elaborated. To all my sincere thanks. I am also grateful to João Cabrita for his help with English.

1. Introduction

The responsibility for the provision of water services has historically been a municipal competence and has been understood essentially as a local service. However, the world is constantly changing. Demographics, land occupation, the environment, the economy, technologies, the way we communicate, the values that determine our behaviors, the needs (of nature and humans) change in an accelerated way and water services are an integral part of this change. These transformations, or the accelerated evolution as it is often referred to, has had a huge impact on the way international institutions, scientific and professional organizations of the water sector have been adjusting their thinking on how to analyze the relationship between territory and operators, and on how to articulate themselves aiming at greater efficiency and better quality of service. Policymakers from several countries have also been sensitive to these matters, carrying on important changes in several countries, such as England and Wales, Italy, the Republic of Ireland or Hungary, just to name some European countries. One example of such changes is a clearer process of spatial aggregation in the way services are provided. Aggregations are a current theme and will most likely be on the agenda of water utilities' management for a long time, particularly in Portugal. This study aims at fundamentally analyzing the aggregation currently in place amongst direct providers of water and wastewater drainage, and at addressing, in a preliminary way, the advantages and limitations of such an ongoing process. In this context, we will present an analysis of some recent related literature, a brief historical reference on aggregations taking place in the context of the Portuguese democracy, present a specific study on aggregations, and a synthesis of the main conclusions.

The analysis of the aggregations in this work is focused on the retail service providers' activity, which had its most dynamic period during the course of the XXI Constitutional Government (2015-2019), even though it began in previous governments. Before detailing on the analysis of what happened in regards to these aggregations, we will expand on a few theoretical considerations about aggregations, including, among other aspects, the different types, their justifications, the conditions of success and the factors of failure. To do so, we will consider the international literature and the Portuguese experience. The international literature is already vast and there is even a very comprehensive review by Ferro (2017) that we strongly recommend for those who want to deepen into the theme. The Portuguese experience and the accumulated reflection on the subject are already notorious, with the country been often presented as an example at the international level.

2. Aggregations in Some Recent Studies

The recent World Bank study of 2017 *"Aggregation of Water Supply and Sanitation Utilities - Joining Forces for Better Services?*" where several international experiences are analyzed (including two Portuguese), defines aggregation "as the process by which two or more service providers consolidate some or all of their activities under a shared organizational structure, regardless of whether or not it implies physical connection of infrastructures and whether the original service providers continue to exist or not."

This definition of aggregation can cover a huge variety of situations. We may be discussing a merger of services as a whole, or the share of a Water Treatment Plant (WTP) or Waste Water Treatment Plant (WWTP), or even the simple creation of a common billing or accounting system. This work considers the most comprehensive concept of aggregation, that corresponds, as generically happens in Portugal, to the integration of providers, thus leading to the creation of a new entity to which previous service providers transfer the activities they were responsible for.

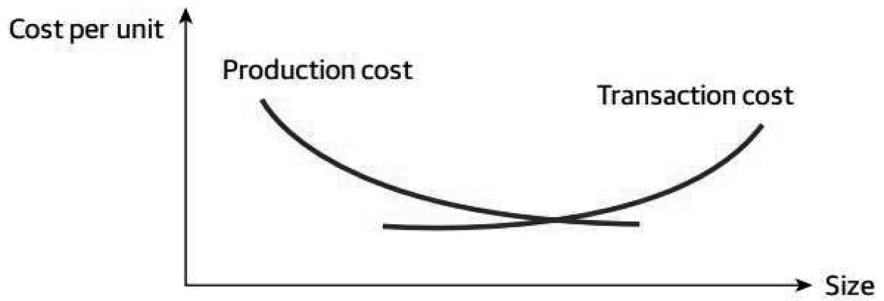
The reasons that justify the aggregation of the service providers are several but, in one way or another, are associated with the possibility of creating synergies brought about by cooperation. Depending on the type of aggregation, literature mentions numerous advantages for the creation of a new managing body, merger or absorption of several services into a single one. The current document discusses in a synthetic way, the three advantages that seem the most relevant:

– the increase in economic efficiency, that translates into lower production costs of both O&M and investment (CAPEX), due to positive internalities, economies of scope, process and scale, through the use of networks that serve several municipalities, enhancing the number of connected consumers. The major beneficiaries will be, in particular, consumers/users who will be able to see the sustainability of the operators with the most appropriate prices guaranteed, and the economy in general that will benefit from greater effective availability of resources for the country as a whole;
– the improvement of the operators' performance – because of the opportunities that the increase in size potentiates. This may occur due to the possibility of the new operators to professionalize (the much-claimed "*entrepreuneurialization",* referred to practically in all documents on the sector in recent decades, and which has taken place very slowly in Portugal), the availability of more qualified human resources and better capacity of organization, the quality of management, etc. The service provider can extend and improve the range of services, and reduce costs potentially benefiting consumers with tariffs better suited to household incomes, in addition to increase environmental best practices, at a time when pollution, resource scarcity and the environmental crisis are so widespread. This positive externality must now be seen as one of the main strategic objectives in the reform of the water sector; and
– the increase in territorial and social cohesion, both at national and regional level. The exercise of aggregation is always based on bringing together in a single entity what was previously separated into different players. By joining territories, among other advantages, it is possible to minimize the consequences of demographic and wealth differences across the various spaces; and take advantage of the management capabilities existent in the most advanced operators. This is an essential exercise of solidarity to guarantee that, in the end, there is equity. Overall, this positive externality of aggregations and the need to efficiently implement the large increase in EU cohesion funds made available from the early 1990s, resulted in one of the main key reasons for the creation of multi-municipal systems (bulk systems).

However, aggregations may bring negative consequences and incur into the so-called transaction costs (see Figure 1). These can be punctual, single or permanent, and long-term ones. The costs of technical and economic studies prior to the kick-off decision are examples of punctual costs. In the preparation of the aggregation there are negotiation costs necessary to reach an agreement between the parts. As it is well known, this type of costs can be relevant and derives from several factors such as the power or information asymmetries between parts, or compensations for key municipalities.

From the various long-term transaction costs, there are some that derive from the solution found not configuring an optimal dimension, either by falling short, or by going beyond the adequate dimension. The issue of optimal size is of the utmost importance when it comes to drawing an aggregation from the point of view of efficient resource use. However, the factors that involve aggregation go far beyond economic ones and, using a concept most appreciated by "conventional" economists, are not based on agents' "rational behavior". It should be highlighted, in any case, that regardless the rational the agents are, determining an optimal dimension is an extremely difficult task. Each space to be added is different, either for demographic (quantity and density), natural (orography, precipitation, etc.), economic, social, cultural, or political reasons. As a result of these complexities, the aggregated entity may fall short or beyond what is desirable in terms of efficiency, due to either external environment or internal reasons (bureaucracy, lay-offs, demotivation, etc.). Ferro (2017, p.17), in the above-mentioned work, refers that concerning the English and Welsh case "there is evidence that the average water and sanitation company is characterized by economies of scale." These costs imply final solutions, designated as subroutines and characterized by the reduction of production costs, not compensating for the increase in transaction costs resulting from the allocation of resources.

Figure 1: Inverse relationship between production and transaction costs



As stated above, the success of aggregations should not be taken for granted, quite the contrary. Hull (2013) cites a study by Abott and Cohen (2009), in which, by analyzing several studies on economies of scale and scope, they concluded that, in 26 examples, 13 show evidence for the existence of economies of scale, five (all in England and Wales) of diseconomy, five in which economies of scale were exhausted and another five are

inconclusive. As for economies of scope, this study reports that in 10 cases, five show positive evidence, two of diseconomies and three are inconclusive. It is interesting to note that in the two types of economies analyzed, 50% of the cases are positive and in the remaining, there are either diseconomies or the results are inconclusive. In conclusion, it can be said that aggregations are useful in certain cases but not in all, and should therefore not be seen as a universal panacea.

Thus, since there are economies and diseconomies of scale, reaching the equilibrium point is a highly complex task. Even though the most realistic/pessimistic person may say that it is impossible at all to reach the optimal point, there is always a "second best".

An important issue to discuss about the advantages and weaknesses of aggregations is the need to understand the importance of economies of scale, the size and density of aggregation and how, in many cases, greater or lesser efficiency is more determined by the size and density of aggregation than by the economies of scale. This subject has a particular acuity in the case of the retail operators and, as far as it seems, has not gained much attention in Portugal so far. Given its relevance, it deserves a thorough analysis.

In his article with a particularly suggestive title ("Urban infrastructure: Density matters, not just size", Wenban-Smith, 2006), and in more detail in his doctoral thesis (Wenban-Smith, 2009) the author shows that, in certain cases, dimension is not the main determinant of utilities' efficiency. He mentions in his thesis that "Water distribution costs are more significant than water production costs. For example, in the case of BWC (alias of the company analyzed), although the distribution operating costs are approximately the same as the operating costs of production, the distribution capital costs are about twice as high. The effects of scale on the distribution therefore deserve careful attention."

In water services we have fixed facilities, WTP, for example, and a distribution network that crosses the whole territory. According to Wenban-Smith, the existence of economies of scale at the level of fixed installations is evident, but using an indicator that combines volume and distance, he concludes that "unit distribution costs are characterized by economies of scale in relation to volume, but diseconomies in relation to the average distance of properties" (p. 3). He concludes that higher distribution densities reduce unit distribution costs, while lower densities increase them.

Wenban-Smith concludes that "Interaction with production costs then means that (a) greater urban density ("Densification") is characterized by economies of scale in both production and distribution; (b) greater territorial dispersion ("Dispersion") leads to dissaving in distribution; (c) "Suburbanization" (expansion to peripheral areas of lower density) is in the middle, with approximately constant scale returns, if production and distribution are together; and (d) the expansion of "constant density" leads to small economies of scale. Keeping water supply costs (per capita) low seems to depend on both density and size."

For those who know the sector well, the author's conclusions are not exactly a novelty. It is already well established that the "per capita" costs of supplying a dense area are much lower than in sparse area. The question that arises when we study a direct provider aggregation, for which the relevant costs are distributional, is that the consequences of aggregation can be diverse. When we group areas with similar densities, the effects of the dimension will benefit all integrated parts. When we aggregate areas with different densities the question arises in a different way, and it is not clear what the result will be. Even assuming that the

size effects will result in a reduction in the average cost, benefiting society as a whole due to a better allocation of resources, the denser areas, with lower per capita costs will see, due to the scattering effect, their costs increase. In contrast, in the less dense areas, with higher per capita costs, the overall costs will decrease. This means that there will always be losers and winners. We face a complex problem which is to assess the consequences at macro (national) and micro levels and, for regions belonging to the aggregation, to be able to make a cost-benefit analysis for aggregating or not.

Another aspect frequently mentioned in the literature on aggregations is the need for anchors, or at least the advantageous of their existence. This concept is now widely disseminated with slightly different meanings but always with the common idea that there are certain operators that can give the necessary viability to the aggregation. Without them, it would be, if not impossible, at least more difficult to achieve that viability. With regard to the water sector, the anchor can be defined as a territorial space with a larger dimension (and density) than the other partners and, therefore, from a quantitative point of view, significantly expands the demand and scale of aggregation. But there is also a qualitative aspect, because scale is normally associated with more know-how, technological and management capacity for that utility. These aspects can work as factors of dissemination of knowledge and modernization for the aggregation.

It can be concluded, therefore, that one does not face an exclusively quantitative factor when it comes to anchoring. For example, there may be aggregations in which a more populous municipality is the one with less infrastructures, and therefore requires a disproportionately large investment, both in absolute and relative terms. There may also be a large operator with very large idle capacity, highly ineffective, that will introduce entropy into the aggregation. In these cases, it is clear that the potential turnover that a large municipality/operator brings will not generate, at least in the short and medium term, any kind of positive effect. Designating as anchor municipalities those with these characteristics may not be correct. Moreover, it should be noted that according to the already mentioned "Aggregation of Water Supply and Sanitation Utilities - Joining Forces for Better Services?", the most important is the existence of a "champion" because: "Having a stable champion throughout the aggregation often improves the likelihood of success." As we will see, among other aspects, the absence of anchor municipalities that can be considered as "champions" is one of the problems in Portugal.

3. Brief Historical Note on Aggregations in Portuguese Democracy[1]

The political debate about the assignment of management competences for water services in Portugal immediately after the-April 25th Revolution, evidences the existence of two trends, underlying the different organizational rationale that continues until today, although in a more mitigated way after the1990s. One is a technical-economic trend, in favor of a water management based on the creation of companies covering large regional territorial spaces,

[1] This section is largely tributary of the study of Pato (2011). About the same subject, another reference for Portugal is APDA (2018).

including several municipalities. The other trend supports the strengthening of municipal (local) power, with the attribution of water supply and sanitation management competencies to municipalities, thus continuing a traditional practice, both in Portugal and in most Western countries, but with greater autonomy, particularly financial, than that existing during the *Estado Novo* regime. The relevance of this issue was brought to light due to the underdevelopment of the water sector in Portugal, and because between 1971 and 1975 there were cholera outbreaks, with 40 deaths for 2,371 cases of the disease in 1975. Also, back then it was discussed how power would be distributed in territorial terms (deconcentration, decentralization and regionalization) in a country that was under a highly centralized authoritarian regime for so many years.[2]

The I Constitutional Government followed a more technical-economic orientation, having proposed [3]a "new configuration that involved a profound change in relation to the political formula that made responsibility for water and sewage services dependent on local authorities: it is now clear the intention to develop an integrated vision of the problem at the national level, through the creation of regional basic sanitation companies capable of integrating its three strands (water, sanitation and solid waste) and obtaining economies of scale, scope and process. Its implementation should be coordinated by the General Directorate for Basic Sanitation (DGSB), created under this Government and in articulation with the municipalities". This proposal was rejected by the opposition parties that advocated the full autonomy of local power. Let us focus on two speeches in the Portuguese National Assembly that summarize this anti-aggregation position of municipalities. The PSD (center right party) asked for the ratification of the proposal and her deputy Mrs. Helena Roseta said that the creation "*of a regional entity that has the sophisticated name of installation commissions of basic sanitation providers, and that in essence is no more or less than the embryos of future public sanitation companies, directly opposes to the law' attributions of municipalities in relation to basic sanitation. Indeed, the law of local authorities gives them the power to act in this matter, being and all the actions of this sector an assignment of the local authorities. Therefore, it is not reasonable that an organic law should create commissions to install public companies that would withdraw this attribution from local authorities.* Also, the deputy of the Communist Party, Veiga de Oliveira, criticized the *"centralist and technocratic"* route presented by the Government, stating that the respective proposal, oriented from *"Terreiro do Paço"*[4]*, with a few employees scattered throughout the province, a few bodies of sophisticated technical apparatus and maybe a few public companies with powers and skills, obviously, for planning and solving everything, would be the solution for basic sanitation. Nothing more wrong and dangerous. Quite the opposite to solve the enormous problems that affect us all, related both to the consolidation of democracy and to the economic, social and political progress of our country."*

Thus, the proposal to create basic sanitation regions was abandoned and the basic sanitation responsibility was practically and exclusively assigned to the local government. Although there was some evolution, namely in the water supply, it was particularly slow and the improvements in the performance evaluation indicators have fell short of what would

[2] See Pato (2011).

[3] Colonel Baltazar Barroco was the Secretary of State for Water Resources and Basic Sanitation, hence this reform was designated at the time by the name of his political officer, Military Engineer.

[4] In a reference to the Portuguese Government.

be desirable. The sector was stagnant and a good part of the more than three hundred operators were unable to fulfill their mission. With few exceptions, the water sector was under-endowed with financial and human resources and that was in fact one of the many concerns of a recent democratic local power that, although having introduced a different dynamic in the territorial management, was unable to have a strategic vision for the sector.

Baptista and Matos (1994) concluded that, from an institutional point of view, the fundamental problem was the difficulty in having an integrated regional vision and to articulate the three hundred and sixty five municipalities responsible for the management of networks in their geographical areas. This had as a consequence the "*excessive disaggregation of systems, with a large number of small or very small systems, which necessarily implies a poor and non-optimized application of investments due to the absence of economies of scale*" (p. 14). Moreover, given that the responsibility is essentially municipal and the municipal budgets were insufficient to bear the costs, the financial situation of the sector would face two problems. On the one hand, 'there are systematic financial difficulties of the municipalities in the implementation of the competences conferred on them' and, despite the diversity of funding forms, it is still frequent "*the inability of municipalities to guarantee their self-financing share*" (p. 16) to benefit from European Community programs. On the other hand, there was a lack of a realistic tariff policy, "with the usual practice of *water and wastewater tariffs below the actual cost of service..., or even the absence of tariffs*" (p. 16), which has prevented the municipalities' revenue increase.

However, in the early 1990s, the first studies about the establishment of regional sanitation companies in the Estoril Coast and of water supply companies in the Cávado region had already been launched, through the collaboration of the Ministry of the Environment and the EPAL (the Portuguese company responsible for the supply and distribution of water in the Lisbon council). This required the articulation of the central government with the municipalities involved, resulting in the preparation of the work that culminated in 1993 in the amendment of the legislative sector's framework, in particular with the opening up of the sector to private initiative and, with regard to our theme, the creation of multi-municipal systems. Using this new legal framework, several public companies were created, mostly owned by Águas de Portugal (AdP), a state-owned holding company created during this period, where municipalities had a shareholding, aimed at managing integrated systems with several municipalities. It is important to note that these new companies were only responsible for the "bulk" part of the industry. The water distribution and sewage collect (the retail part) remained under the municipal sphere without any territorial aggregation.

In addition to the aforementioned problems faced by the sector, in 1986 had become a member of the European Union Community (EEC), which had brought new demands since the EEC legislation was much stricter than the national one. In addition, more financial resources were made available, which increased the possibility of investing in the sector. It was clear to Portugal that EEC funds for economic and social cohesion had to be used, particularly when in the early 1990s the Cohesion Fund (CF) was created, anticipated by the Cohesion Financial Instrument.

During the second half of the 1990s, multi-municipal companies contributed to a significant improvement in the regions covered by these companies, even though there was a slow evolution of municipal utilities (direct management and concessions). Not all problems were solved. Quite the contrary. The multi-municipal systems did not cover the entire country. And

in retail systems, the tariff deficit remained an almost widespread reality, thus preventing the ability to adequately finance many of the operators. The improvement of the service was not a universal reality, the water scarcity tended to worsen, and the utilities' response were not always fast and effective (the water losses were too high e.g.). From the analysis carried out at the time, it was concluded that the problems reached the greatest severity mainly in the direct management of the systems at the distribution level. There were persisting difficulties, namely regarding limited financial and human resources, investment below what was necessary to extend service coverage and quality, inadequate tariffs, low numbers of users and low population density, and insufficient turnover for utilities to gain critical mass. To overcome these issues, it was necessary to complete the policy measures started in the 1990s.

At the beginning of the XXI century a medium-term strategic instrument was developed, defining the policy for the sector, the PEAASAR 2000-2006, which essentially focused on extending the model of multi-municipal systems from the previous decade. But the success of the policy would be accomplished in the subsequent plan – PEAASAR II (2007-2013)[5], with new aspects in the strategy for the sector. "*Depending on the diagnosis developed, it was then considered essential to reorient the overall strategy for the sector in order to develop a model for extending the partnerships between the State and the Local Authorities which should now be oriented, essentially, for the resolution of the problems of the distribution level, which also intended the revision of the legal regime of the existing institutional forms for the management of water and wastewater services, as well as the creation of a new system of partnership contracts to be established between the State and local authorities.*"

'It is therefore recommended that the sector' organizational model should be based on the integration of the distribution corresponding multi-municipal systems (without prejudice for free initiative of municipalities in inter-municipal systems), also assuming the possibility of creating new municipal systems integrated with the participation of the State, either through the AdP or through the concessions of the multi-municipal systems."

At the end of the 2001/2010 decade, an inter-municipal company (*Águas* do Ribatejo, EM) and the first Public-Public Partnership (PPP) between AdP and municipalities (ADRA, SA), in the Aveiro region were created. At the beginning of the following decade, in 2013, another PPP (*Águas* da Região do Noroeste) was created within the multi-municipal company Águas do Norte.

In 2014 a new plan, PENSAAR 2020 — A new strategy for the Water Supply and Wastewater Sanitation sector, was approved, under the XIX Constitutional Government covering the period from 2014 to the end of the decade. It showed some continuity in relation to the previous planning instrument, the PEAASAR II, by stating that it "did not identify the need to define new management models in relation to existing ones in the current legal framework", regardless of the need to make several improvements but not related to what that matters here, aggregations. At the end of the decade, under the XX Constitutional Government, a clear political will to increase the number of aggregations, whether in the form of PPPs or inter-municipal companies, was revealed. Between 2019 and early 2020, seven new entities were created, only at the "distribution" level or vertically integrated", tripling their number.

[5] Approved in 2007 by the XVII Constitutional Government.

The current phase is characterized by a strong political will from the XX Government and a greater acceptance on the part of the municipalities for new and different forms of organizations in the sector. This results from a better understanding of the fact that there are objective aspects that make the scale important, not only to gain critical dimension, but also to increase operators' efficiency, provide services of increased quality and better respond to future challenges such as the ones related to climate change and resource scarcity. This phase intends to be, in some way, the answer to the problems posed after the 25th April Revolution, when there was an awareness that isolated, many municipalities would not be able to create sustainable operators in a context in which regionalization was a forever postponed project.

In summary and analyzing only what happened after the entry of Portugal in 1986 in the EEC, it can be said that, respecting the municipal attributions in the water sector, the legislation and the practice have been adapting to the economic, financial and political requirements. In the 1990s, with the creation of multi-municipal systems, there was a separation of activities between "bulk" and "retail", a form of "unbundling" so popular in those years. Therefore, in many territories of the country, the bulk activities, with a territorial aggregation, was handed over to the central government, although in partnership with the municipalities, the former being responsible for all activities. In a first phase, mainly in urban areas and in the Algarve, and in a second phase – already in this century –, it has extended to practically the whole country. The systems covered water supply and wastewater. It was also at the end of the first decade of this century that the first PPPs appeared, creating the legal framework that allowed governments to encourage the constitution of management entities in a business way, aiming essentially at the retail activity, often at the municipal level and occasionally with the participation of Águas de Portugal. It is on the latter that this empirical investigation is focused on.[6]

In a first phase, the process took place essentially in urban areas and in the Algarve. In a second phase, already in this century, it has extended to practically the whole country. The systems covered water supply and wastewater services. It was also at the end of the first decade of this century that the first public-public partnerships emerged, creating the legal framework that allowed governments to encourage the creation of corporate retail operators, often at the municipal level and occasionally with the participation of Águas de Portugal. It is on the latter that the present empirical investigation focuses.

[6] The "unbundling" that can be translated by separation, disaggregation, is used in utilities as a way to autonomize activities, separating activities to introduce competition in monopolistic sectors. The World Bank has often proposed it, for example, for the energy sector. The creation of multi-municipal systems in water and waste management that took place in the 1990s in Portugal, is part of this conception.

4. The Aggregations Under Analysis[7]

We will analyze spatial and demographic factors (size and population density of aggregations) that affect economic efficiency, as well as qualitative factors (institutional, organizational) and others that influence the quality of service and management (costs, etc.). It is evident that, being a first approach and not having carried out any case study based on empirical analysis on the internal structures of each aggregation, the study is essentially based on demographic data.

We consider five cases of aggregations in activity at the beginning of 2020. The first is from 1997, the case of Águas do Planalto, SA, created by the Association of Municipalities of the Planalto Beirão, being an inter-municipal concession that covers five municipalities. The second case is ADRA – Águas da Região de Aveiro, SA, a public-public partnership started in 2009, between Águas de Portugal, SA and 10 municipalities in the Ria de Aveiro area. Still with the same management model we have ADAM- Águas do Alto Minho, SA that started the activity in 2019. With a different model, although within the type of partnership mentioned above, there is the water system of the Northwest region, an autonomous operation within AdNorte – Águas do Norte, SA, covering eight municipalities. Another model, an inter-municipal company, is the case of Águas do Ribatejo, EM, from Lezíria do Tejo region, which was created at the end of 2007 with six municipalities and that extended to seven municipalities in 2011. These operations cover 30 municipalities with a total of about one million people (10% of Portuguese population). It is interesting to note that these five aggregations are managed according to four different models with an appreciable diversity of management arrangements, because only ADRA and Águas do Alto Minho can be considered similar. The "distribution" operation of Águas do Norte, SA, although separated from the "bulk" system, is managed by the same company, and there is, therefore, a *verticalization*, that is, a common coverage of the bulk and retail activities. Águas do Ribatejo is fully vertical. In other words, we are facing five operations managed by four different models, guaranteeing a diversity of situations.

In addition to the cases already mentioned there are five companies created in 2019 that started their activity in 2020: AIN–Águas Interior Norte, EIM, AMBG – Águas Baixo Mondego e Gândara, Tejo Ambiente EIM, APIN–Empresa Intermunicipal de Ambiente do Pinhal Interior and, more recently, Águas do Alto Alentejo, EIM. The number of municipalities covered is 41 and the population of about 450,000 inhabitants. The most prominent note in relation to these five cases is that they are all of the same model of organization, inter-municipal company. Is the diversity referred in the preceding paragraph an issue?

Let us study the ten cases, and start by analyzing the aspects related to the dimension. Not going into great detail it should be said that in the water market the dimension is essentially created by population. The advantages of aggregation, therefore, begin with an increase in the number of inhabitants covered by the operator. Table 1 makes a synthetic analysis of what is happening in Portugal.

[7] The data used in this analysis were collected from the websites of INE - Instituto Nacional de Estatística (https://www.ine.pt/xportal/xmain?xpgid=ine_main&xpid=INE), Pordata (https://www.pordata.pt/), ERSAR (http://www.ersar.pt/pt) and from interviews and other personal contacts with colleagues from the Secretariat of State for the Environment, Águas de Portugal and the entities mentioned in this study.

Table 1: Population

Agreggations	No. Mun.	Area km²	Population Evolution (Inhabitants and per cent)					Mun. Pop Maximal	Mun. Pop Minimal
			1981	2011	2017	2017--1981	2017--2011		
ADAM Águas do Alto Minho, SA	7	1,588	206,778	203,808	194,599	-5.9%	-4.5%	85,017	8,617
AdNorte (SMM)	8	1,654	292,526	300,102	286,901	-1.9%	-4.4%	68,524	18,653
ADRA Águas da Região de Aveiro, SA	10	1,473	289,115	340,329	335,521	16.1%	-1.4%	77,631	10,307
Águas do Planalto, SA	5	1,051	86,119	71,534	67,426	-21.7%	-5.7%	26,942	8,948
Águas do Ribatejo, SM	7	3,215	140,781	149,153	144,003	2.3%	-3.5%	35,208	7,155
AMBG Águas Baixo Mondego e Gândara	3	618	63,184	57,581	54,851	-13.2%	-4.7%	25,399	11,932
APIN Emp. Intermunicipal de Amb. Pinhal Interior	11	1,938	104,607	87,764	82,462	-21.2%	-6.0%	13,999	3,890
Tejo Ambiente EIM	6	1,500	123,657	113,176	107,424	-13.1%	-5.1%	44,406	3,778
Águas Interior Norte, EIM	8	1,559	126,619	106,999	105,857	-20.1%	-5.4%	51,417	3,677
Águas do Alto Alentejo EIM	10	3,732	71,820	53,561	48,097	-33.0%	-10.2%	15,285	2,910

Source: See footnote 7.

The first finding is that the population is decreasing in the current decade in all cases studied. As it would be expected, the situation is more serious in the interior Norte, Beiras and Alentejo, but even the industrial and urban area of Aveiro is confronted with the same problem.

The second, is that the aggregations carried out correspond to very different operations: some allow to anticipate strong economies of scale, others not so much. Of course, this cannot be seen in abstract: for example, the Águas do Ribatejo EM, with less than half the population than ADRA, can partly compensate for the lack of dimension by extending the service to the entire urban water cycle. AdNorte has a relatively higher than the average population of the aggregations studied, but for more than one third (corresponding to Santo Tirso and Trofa municipalities), the service provided is only wastewater treatment and drainage, and the water supply is of the responsibility of a private concession. That is, only a case-by-case analysis will give us well-founded answers. In any case, many aggregations do not seem, in a quick approach, to be in the best position to ensure operational efficiency

and management gains derived from the scale. In addition, density does not satisfy Wenban-Smith's (2009) concerns and there are not exactly "champion" municipalities.

The third outcome is that even if we may be far from achieving any "optimal dimension", the truth is that we are much better than we were before. In the Area of APIN each utility had a population served between 4,000 and 14,000 inhabitants, but the new entity will have almost 80,000 potential users. Also, other aggregations will end up with dozens of different operators of less than five to ten thousand users. It may not be a giant step but it's a step forward.

A last and brief reference goes to the areas of the aggregations, which vary widely, similarly to the population, ranging from 618 km^2 to 3,732 km^2, although in most cases it is between one thousand and two thousand $km^{2.}$ Although the economies of scale in water services result from the volume of population served, the extension of the territory is not a non-negligible factor for efficiency, since the greater or lesser concentration of the population and population density have an influence on economic efficiency. These issues are analyzed in Table 2, which provides synthetic information on population density in the cases under analysis, in a dual (inter and intra aggregation) perspective, as well as the comparison with some municipalities with autonomous water services management located in metropolitan areas or district capitals.

Table 2: Population density

Agregations	Medium Density Hab/Km^2	Mun. Dens. Maximum	Mun. Dens. Minimal	Relation Max/Min.	Relation Max/ Medium
Águas do Planalto,SA	64	95	36	2.7	1.48
ADRA Águas da Região de Aveiro, SA	228	527	89	5.9	2.31
Águas do Ribatejo, SM	45	131	13	10.4	2.92
AdNorte (SARN)	173	524	64	8.2	3.02
ADAM Águas do Alto Minho, SA	123	267	47	5.6	2.17
ADIN Águas Interior Norte, EIM	65	166	14	11.9	2.55
AMBG Águas Baixo Mondego e Gândara	89	111	66	1.7	1.25
Tejo Ambiente, EIM	72	148	16	9.2	2.06
APIN Emp. Intermun. de Amb. Pinhal Interior	43	125	10	12.1	2.93
AAA Águas do Alto Alentejo	13	20	8	2.5	1.54

Agregations	Medium Density Hab/Km^2	Mun. Dens. Maximum	Mun. Dens. Minimal	Relation Max/Min.	Relation Max/ Medium
Braga	988	n.a.	n.a.	n.a.	n.a.
Coimbra	420	n.a.	n.a.	n.a.	n.a.
Gondomar	1,255	n.a.	n.a.	n.a.	n.a.
Seixal	1,734	n.a.	n.a.	n.a.	n.a.
Sintra	1,206	n.a.	n.a.	n.a.	n.a.
Vila Nova de Gaia	1,780	n.a.	n.a.	n.a.	n.a.
Viseu	196	n.a.	n.a.	n.a.	n.a.

Source: See footnote 7.

The first note from Table 2 is the huge difference between the densities of aggregation operations and those from suburban municipalities in metropolitan areas. It is not something we did not know, but it is always worth pointing out. When compared with district capital municipalities (last seven lines of Table 2), in which urban concentration is evident, these differences in density are no longer so evident; also worth of note are the differences between the various aggregations in terms of population density: from 13 to 228 inhabitants/km^2. Returning to the Wenban-Smith line of reasoning, surely there will be important differences in inter-aggregation economic efficiency.

Looking at what is happening intra each of the aggregations, we see once again the presence, in some cases more than in others, of a multiplicity of situations. In several aggregations, municipalities with high population density are joined with low density ones, as in ADRA and AdNorte (this, with the already pointed out caveat that in the two municipalities with higher density, only the activity of wastewater is covered, thus being more difficult to recover costs), and, although less marked, in Águas do Alto Minho. In theory, we can see a loss of efficiency in some of the previously existing utilities, which is offset by greater efficiency resulting from the aggregation.

As already mentioned, the existence of "anchors" are considered advantageous for the success of this type of operations. "Anchors" are the municipalities that due to various factors (e.g. dimension, productivity, good organization, technological evolution) when associated with others, give scale and generate innovation in the aggregate set. It is not easy to say at first sight whether an operator/municipality will be an "anchor" of a future aggregation, which can only be concluded "*a posteriori*", but the analysis of the size of the municipality and its relative weight in the aggregation can help to understand whether or not it can become an "anchor". As we saw before, "champions" may play an important role, but one question arises when we look at the cases of the previous aggregations: where are the "champions"?

Of course, we have no case of municipalities with more than a hundred thousand consumers, with financial, management and technical capacity.

Thus, we did a quantitative exercise to analyze the existence or not of "anchors" in the Portuguese aggregations, analyzing the information available for the 75 municipalities of the ten aggregations of the sample, very representative of our reality.

The first finding is that there are no "champions" and, in their absence, we classify the municipalities into three types, according to population and density criteria (the only objectives available) as follows:

> *Gold*: population above 50,000 inhabitants and density greater than twice the aggregate average;
> *Silver*: population above 50,000 inhabitants and density higher than the aggregate average;
> Bronze: population above 30,000 inhabitants or density greater than 1.5 times that of aggregation.

The choice of intervals was defined based on the generally small size of the municipalities and low density differences, an essential factor in reducing costs, as we saw before. No municipality alone would essentially change the configuration since it is the necessary a greater scale. Let us focus on the results of the analysis.

The aggregations of Águas do Planalto, AMBG – Águas Baixo Mondego and Gândara, APIN – Empresa Intermunicipal de Ambiente do Pinhal Interior, do not have any municipality that meets the criteria for being "anchor", of any kind. In the case of ADAM – Águas do Alto Minho, there is a municipality that meets the criteria of anchor *Gold*, Viana do Castelo; the same happened with Vila Real in AIN – Águas Interior Norte, EIM,

Santo Tirso, in AdNorte, also meets the criteria for the *Gold* group, although as mentioned above, only wastewater is included in the whole; another similar municipality is the Trofa corporate group, which is part of the *Silver* group. Amarante, with more than 50,000 inhabitants, but with a low density, practically equivalent to the global average, is part of the *Silver* anchor group.

ADRA has three municipalities that are part of the *Silver* group: Aveiro and Ovar, mainly by size, with respectively more than 75,000 inhabitants and 55,000 inhabitants, and Ílhavo, which, from the 75 municipalities analyzed, is the one with the highest density, 527 inhabitants/km^2. This is the aggregation that presents itself, at least quantitatively, as the most balanced one.

In Águas do Ribatejo, the only "anchor" is Torres Novas, small in absolute terms, but with some relative weight in terms of population in the aggregation, because it has almost three times the average density (131 Hab/Km^2, which compared with the average 45 Hab/Km^2), integrating into the *Silver* group. In the case of Tejo Ambiente, Ourém and Tomar have more than 30,000 inhabitants each, but although they are close, they do not have 1.5 times the density of the aggregation, so in all 75 municipalities they are the only that are considered *Bronze* anchors.

The scenario presented about anchors is not the most favorable, but we must keep in mind that as the poet and Cardinal José Tolentino de Mendonça (2020, p. 117) says, "Exactly because we are not just beings of the present, we don't just have anchors; we also have wings."

5. **Conclusion**

From what has been stated in the previous sections it is possible to draw some conclusions and assess the issues that these aggregations raise for the development of water services in Portugal, especially in low-density regions.

1. Let us start with economic efficiency via reducing production costs. From this point of view, what can be concluded from the literature is that, both regionally and nationally, comparing the *ex-ante and ex-post situations,* everything points to the final situation being better than the initial one. In terms of intra-aggregation analysis, the evaluation is more complex and would require a deeper analysis. If the final solution corresponds to the optimal economic dimension, every intervenient will win. But, as already mentioned, this is not easy, given the multiplicity of factors, such as the size of the population and territory, the available water resources (quantity, location and type), orography, the sophistication of existing utilities, revenues and their distribution, among others, that influence efficiency. Thus, the existence of cross-subsidization will certainly contribute to the impossibility of verifying a Pareto Optimal. But the cases studied show that the possible negative financial effects for the municipalities that are negatively affected, those called "anchor gold", are always mitigated through the application of compensatory mechanisms from external elements to the aggregation. In fact, with the contribution of external support, it is intended that the intra-aggregation is "balanced" and thus equity in the treatment of all territories and their representative bodies is guaranteed. [8] In national terms, the post-aggregation situation will be better, because the size of these aggregations will not be sufficient to lead to diseconomies of scale.[9]

2. But is the effective purpose of aggregations the economic efficiency understood only as a short-term cost reduction for all players. Undoubtedly, reducing costs by size is an important factor in justifying the need to create aggregations, but we must be able to see that aggregations aim at broader, holistic objectives even, going far beyond the immediate view of problems from an exclusive cost perspective. The essential objectives to be pursued for water services to ensure their mission are generally: to ensure the preservation of the environment and to provide the population with adequate and affordable water services. For this,

[8] This issue should be properly examined, but, as far as we know, it has not caught so far the attention of researchers. Probably the small number of operations still existing limits the empirical information base, so it is likely and useful that it will deserve more attention in the near future.

[9] According to Ferro (2017, p. 9), there is "an ample empirical literature [showing] that agglomeration leads to economies of scale in the WSS industry, at least up to a certain level. Furthermore, it seems that large utilities tend to operate at a lower unit cost and perform better than smaller ones do. Yet there are also counter examples that show that sometimes scale is beyond the optimal efficiency size. An exhaustive examination of empirical literature on economies of scale is presented next. Empirical studies indicate that economies of scale are prevalent in small-size providers and diseconomies of scale appear in very large ones. In the middle, there seems to be a continuum of possible minimum efficient scale."

the sector and its operators need to have at least a business and professional management, be endorsed with financial autonomy and their own decision-making capacity/ability, be economically and financially sustainable, have sufficient human, financial and organizational resources not only to manage day-to-day activities, but also to keep up with the sector's permanent innovation and the complex challenges it has to overcome[10]. A water utility in the 21st century must have a holistic vision and a long-term horizon. However, without an appropriate dimension that gives it what is normally called a critical mass, certainly the operators will not have the necessary tools to fulfil their mission.[11]

3. The arguments put forward, *often off-record*, by many municipal policy-makers who, having entered into negotiation processes for the aggregations, then abandoned it, relate to increases in tariffs which aggregations will "inevitably" bring. In general, this argument is fallacious because the existence of low tariffs does not result from cost efficiency but from the application of tariffs that do not recover costs and thus do not guarantee the sustainability of the operation, nor avoid dependence on other budgetary benefits. In these cases, the quality of the service provided is also far below that legally required, as can be seen in the annual service evaluation reports drawn up by the regulator. The tariff increase is not the result of aggregation, but of pricing policy options. Another argument which is also put forward, usually by larger municipalities, is the refusal of possible cross-subsidization. The issue is complex, as we have already mentioned in point 1, and is highly linked to political motives, often electoral, short-term oriented. For economic reasons, the long-term interest of all, even the citizens of these municipalities, is set aside.[12, 13]

---

[10] This issue gains particular acuity when we are looking at cases of geographical spaces where services are less evolved. In the developing world, aggregation is primarily a mean to deliver better services rather than to lower costs. To some extent, several Portuguese water service providers are still far from European average performance, perhaps because the cases studied correspond to aggregations of operators with limited dimensions and densities.

[11] Two brief notes on business management. Firstly, business management should not be confused with private management, in any way used. This generates discussions about the corresponding option, while the defense of the former is generalized by those who study the sector: academics, international organizations or experts. Secondly, a note on national legislation and the importance that is given to the sector' business-oriented management. There is virtually no legal diploma on the subject in which this reference does not exist. Moreover, the Administrative Code of 1936, in its article 146, referred to the possibility of municipalities creating Municipal services to organize "in industrial form" the activities of "capture, conduct and distribution of drinking water" at their responsibility. Seen in: https://www.fd.unl.pt/Anexos/Investigacao/2195.pdf.

[12] This is noteworthy, as there is a permanent tendency to impute to the utility resulting from the aggregation the responsibility for tariff increases. However, that reasoning omits whether the average tariff previously applied by the municipalities alone was much lower than the required one, resulting in a tariff deficit which increases year after year.

[13] The analysis of the relationship between increased tariffs and election results deserves a detailed analysis, because it is not clear the existence of a direct relationship between them. Analyzing only what happened in Portugal, there is a discrepancy between, for example, the extreme cases of Barcelos and Paços de Ferreira, in which it was evident the impact of tariff increases on the loss of elections of the mayors responsible for the increases. There are other cases, where the increases were politically well prepared and explained: in the Aveiro region, the tariff increases following the creation of ADRA did not have any evident electoral effect; or Santa Maria da Feira, in which, despite the significant increases in tariffs during the first years of the concession, there was also no obvious effect over the election's result; or even Águas do Ribatejo, in which there was a very significant increase only in some municipalities, which had initially very low rates, with subsequent re-election of all executives who joined the aggregation. In any

4. As mentioned before, the size, although necessary, is not sufficient for the success of the aggregation. It is necessary to minimize transaction costs and, therefore, to not go beyond the point at which the reduction of production costs is exceeded by the increase in transaction costs. This means that the advantages of the dimension are limited. Then, the central issue is to ensure better management, not to grow without need or with limited need for a larger number of customers, greater sales volume or increase in the number of workers. What is intended is not a mere exercise of addition of municipalities, but that of creating a new organization: quantity has to be accompanied by quality. In other words, it is essential that the transition to a new management paradigm – with the characteristics already mentioned of autonomy, professionalization, sustainability, innovation, among others – follow the extension of the geographical scope of action of the utility.

5. It is well known that the problems that the sector has to overcome are increasingly complex. Also well-known are the technical, financial and human weaknesses of most of the operators involved – as we have seen, even after aggregation, are generally very small and have limited human and financial resources – and therefore the choice of the most appropriate management model is decisive for the success of the aggregation. In Portugal, there are different types of aggregations, larger and smaller, with and without anchors, endorsed with greater or lesser tradition of professionalization, etc. However, it is especially in cases where the shortcomings, mostly technical and human, are more evident, that the way in which aggregation is designed is more important, so that the operator resulting from the aggregation is endorsed with the necessary means to meet the short, medium and long term challenges. It is crucial, decisive and imperative to ensure that aggregations have the necessary competences. However, in many of the cases we have examined, it does not seem credible that this can be achieved only through the use of municipal capacities. Without municipalities finding partners that add value to the new utility, be it of any type, public or private, the success of the aggregations is not guaranteed.

case, nothing can be concluded and this question deserves to be studied, namely to understand the reasons that explain these differences in behaviour.

REFERENCES

Abott M.; Cohen B. (2009) Productivity and efficiency in water industry. *Utilities Policy*, *19*, 233-244.

APDA (2018) Water and Sanitation in Portugal: The Market and Prices. Comissão Especializada de Legislação e Economia (CELE), APDA.

Baptista, J. M.; Matos, R. (1994). O Saneamento básico em Portugal. In LNEC (1994) *Instrumentos de Apoio a Uma Política de Desenvolvimento Sustentável em Saneamento Básico*, Vol. I, Lisboa, LNEC.

CELE/APDA (2018) Água e Saneamento em Portugal: O Mercado e os Preços. APDA, Lisboa.

Ferro, G. (2017) Literature Review- Global Study on the Aggregation of Water Supply and Sanitation Utilities. Washington, DC, World Bank.

Hull, M. (2013) *Infrastructure & Utility Economics*. Professional Economics Limited, London.

Mendonça, J. T. (2020) *O Que é Amar um País: O Poder da Esperança*. Quetzal, Lisboa.

Pato, J. H. (2011) *História das políticas públicas de abastecimento e saneamento de águas em Portugal*. ERSAR.

Wenban-Smith, H. (2006) *Urban infrastructure: Density matters, not just size*. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.522.7455&rep=rep1&type=pdf

Wenban-Smith, H. (2009) *Economies of scale, distribution costs and density effects in urban water supply: A spatial analysis of the role of infrastructure in urban agglomeration*. PhD thesis. London School of Economics and Political Science (LSE).

World Bank Group (2017) *Joining Forces for Better Services: When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together*. Washington, DC, World Bank.

XIV Governo Constitucional (2000) PEAASAR-Plano Estratégico de Abastecimento de Água e Saneamento de Águas Residuais 2000-2006.

XV Governo Constitucional (2014) PEAASAR-Plano Estratégico de Abastecimento de Água e Saneamento de Águas Residuais 2007-2014, 2007 XIX Governo Constitucional.