Evolution of cost recovery levels in the Portuguese water supply and wastewater industry 1998-2005

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Dinâmia - ISCTE

October 2008

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WP nº 2008/73

Outubro de 2008

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<u>Abstract:</u>

This paper assesses the situation in Portugal in 2005 regarding cost recovery in the water supply (WS) and wastewaterdrainage and treatment (WWDT) industry by type of system (bulk and retail water and wastewater), by type of utility and by NUTS III, halfway between the publication of the Water Framework Directive (WFD) and the meeting of the 2010 deadline. For that purpose, we build on the previous contribution by Monteiro (2007), which reported the situation in 2002, by updating the indicators to 2005 and assessing the evolution since 1998. We also present a brief historical overview of the presence of the cost recovery principle in Portuguese law regarding the industry. The main conclusions that stand out are: the introduction of the cost recovery principle is prior to the WFD and the more recent Water Law, although it lacked practical implementation; the level of revenues collected by the WS and WWDT utilities is insufficient to meet the financial costs of their activities; the situation is worse for wastewater than for WS systems, revealing evidence of cross-subsidization within the utilities which manage both systems; the situation has worsened in recent years; cost recovery levels are lower in the less densely populated and poorer inland regions; finally, we find no evidence associating cost recovery levels and the type of utility.

Keywords: Water Supply Systems; Wastewater Drainage and Treatment; Cost Recovery; Water Framework Directive; Water Law.

JEL Code: Q25

1. INTRODUCTION

Cost recovery for water services is not a consensual recommendation across the world. While some international organizations from the developed world tend to recommend it as being essential for the financial sustainability of water utilities (OECD, 2006), that is not the case for some worldwide reaching organizations such as the United Nations, which is more concerned with the impact such a principle would have on the poor, leading it to recognize the role that subsidization may have on the improvement of population provision levels in water supply and sewage drainage and treatment (UNDP, 2006 and WWAP, 2006). This may be due to the fact that in developed countries, the water outlays represent a very small portion of the average household income, whereas in developing countries the implementation of full cost recovery would put greater stress on households' budgets. Foster and Yepes (2006), for example report that in Latin America's "lower-income countries (Bolivia, Honduras, Nicaragua, and Paraguay), reaching cost recovery tariffs would represent a significant affordability problem for around half of the population" (ibid., p. 34). They compare these results to India and Africa where around 70% of households could be expected to face difficulties in paying full cost recovery tariffs. This would not be the case for a country like Portugal, where water expenditures are estimated to represent less than 1% of average household income (Roseta-Palma et al., 2006). Even when affordability is a real issue, the use of water consumption subsidies as a poverty alleviation measure can be controversial, not only because of their perverse effects on economic efficiency and the financial health of water utilities, but also because their efficacy is also questionable. For example, Komives et al. (2006) find in their study that "most common forms of residential utility subsidies - quantity-based consumption subsidies such as increasing block tariffs - are highly regressive. Most poor households are excluded from these subsidies, and the majority of benefits accrue to the non-poor" (ibid., p. 3). Dahan and Nisan (2007) and Bithas (2008) provide further evidence on the unintended consequences of IBT pricing policies regarding the equity objective.

In theory, this is not an open debate for Europe, where since the publication of the Water Framework Directive (WFD) in 2000, cost recovery in the water supply and sewage industry (including scarcity and environmental costs) has been a main focus of concern (despite the recent surge in interest in the notion of disproportionate costs from article 4 as a reason for exempting a region from compliance with WFD requirements). Although the document's main focus is the enhancement of the quality of Europe's water bodies, the introduction of specific sections dealing with economic and financial requirements and instruments has sparked a lot of debate, reports and action all over the European Union.

The WFD (EU, 2000) takes up the principle of cost recovery in water services in its article 9, requiring the economic analysis of water uses in article 5. WATECO (2003) and Ribeiro (2006 and 2007) provide an excellent overview of the economic implications of the WFD, its deadlines and the institutional settings in which it came about. For the purpose of our document it suffices to say that article 9 establishes 2010 as the deadline for the establishment of an adequate contribution of the several water users (at least households, agricultural and industrial users) for the implementation of cost recovery for the water industry. We assess the cost recovery situation in Portugal in 2005, halfway between the publication of the WFD and the meeting of the established deadline. For that purpose, we build on the previous contribution by Monteiro (2007), which reported the situation in 2002, by updating the indicators to 2005 and assessing the evolution since 1998. To our knowledge, this is the only independent assessment of cost recovery levels for the water industry outside the analysis performed by the Portuguese official institutions (Alves and Pinto, 2004; INAG, 2005, 2007 and 2008)

2. COST RECOVERY IN PORTUGUESE LAW

In Portugal, the cost recovery principle has gained legal recognition, even though many times it still lacks practical implementation. This section describes the evolution of Portuguese Law regarding the cost recovery principle in the water industry, of which we present only a synthesis (more details on the history of the cost recovery principle in Portuguese legal documents are presented by Ribeiro (2007) and APDA (2006)). The remaining sections will assess its implementation.

The awareness about the need to raise revenues from the water supply activity to help finance infrastructure building can be found in Portuguese Law as early as 1892. The decree of 19 December 1892, regarding the hydraulic services of the Ministry of Public Works, defines in its article 21 the revenues of the water districts, assigning them to the public works to be performed in the district, including tariff payments for irrigation water, sand removal or license fees for the use of water surfaces to name a few (Ribeiro, 2007, p. 126).

According to Ribeiro (2007, p. 131), the requirement that the beneficiary should pay for public works improvement of water supply can also be found in the 1930's, where increased State intervention in the development of hydraulic works for agriculture is accompanied with the payment of an Irrigation and Improvement Charge (a fixed annual fee per hectare), which could be paid in money or in land. Regarding urban water supply, the Administrative Code of 1936

states in article 165 that water tariffs should be set "so as to cover the operation and management costs and to allow the formation of the necessary reserves" (ibid, p. 132). It was by this time also that water supply became one of the main tasks of the municipalities. Despite this evidence that revenue collection from users was important, this is far from pointing to full cost recovery. Just as an example, the investments in water and sewage infrastructure have always been subsidized by the State (and from 1986 onwards by European funds also). This is also pointed out by the Portuguese Association of Water Suppliers and Wastewater Drainage by stating that "the legal regime has always faced the difficulty intrinsic in the distance between the legal stipulations and their effective implementation. Examples can be found in the several attempts of the legislator to impose the economic balance of the services (…) also present, since the 40's, in the requirement that municipal services should have tariffs which covered the costs of operation and allowed the formation of the necessary reserves" (APDA, 2006, p. 22).

Nevertheless, the principle that, at the very least, the service should not be free has been deeply entrenched in Portuguese legislation. The Decree-Law n. 70/90, which regulates the previous Framework Law for the Environment (approved in 1987 to update the Portuguese environmental law to the European Community standards, to which Portugal had just joined), also states that beneficiaries of water supply and sewage infrastructures should pay for their services. The several laws published since 1979 regulating the finances of the municipalities have always included water and sewage tariffs as part of the municipalities' revenues[1]. Furthermore, they established that the tariffs should cover operation and investment costs[2] (although this has not always been the case as we shall demonstrate). This legal principle also covers the State-owned companies like EPAL[3] and the private concession services (which had been forbidden between 1977 and 1993).

The Economic and Financial Regime for the Water Resources published in 1994 (Decree-Law 47/94) introduced the polluter pays principle and the user pays principle in the Portuguese Law

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[1] The current version of the Law of Local Finances (for municipalities) is Law n. 2/2007 of January 15. Fees are established as legal revenue in article 16 whereas water and sewage tariffs/prices are established in article 17. Previous versions were: Law 1/79 of January 02; Decree-Law n. 98/84 of March 29; Law n. 1/87 of January 06; Law n. 42/98 of August 6.

[2] For example, article 9 of the Decree-Law n. 98/84 of March 29 stated that tariffs "should not be less than the forecasted operation and management expenditures plus the necessary amount for equipment amortization". This principle is still maintained in the current Law n. 2/2007, where article 16 n.1 reads "The prices and remaining payment instruments set by the municipalities regarding the services and goods supplied by the municipal organic units, either through direct management or through [autonomous] municipal services, should not be less than the cost directly or indirectly incurred with the activity of supplying those goods and services." (Assembleia da República, 2007)

[3] EPAL is the water supplying company for the country's capital, Lisbon, and it also supplies bulk water to some neighbouring municipalities. APDA (2006, pp. 32-33) cites some examples regarding the presence of the cost recovery principle in the legislation regulating this company from 1974 onwards as it changed from a 100% State-owned public company to a Public Limited Company with share capital held by the State's holding company for the Water and Waste industry, AdP - Águas de Portugal.

regarding the use of water resources (Ribeiro, 2007, p. 138). It also includes the definition of charges for water withdrawals according to the water availability in the basin and wastewater effluent discharges into the environment according to the treatment cost for each pollutant type. The revenue raised in this way should have accrued to the budgets of the National Water Institute and the Regional Environmental Public Offices, but they were never implemented in practice for lack of subsequent regulation.

In 2005, a new Water Law was published transposing the WFD into Portuguese Law (Assembleia da República, 2005). Its chapter VII brought with it a new economic and financial regime for water resources. The economic principles of the WFD are fully reflected in this law, which recognizes the economic value of water as a scarce resource and the principle of cost recovery for water services, including scarcity and environmental costs (ibid, articles 3 and 77). It also creates a water resource charge for the activities of water withdrawal, effluent discharge, sand removal and occupation of state-owned land or water surfaces. The revenues from the water resource charge must be used to promote water use efficiency, water resources quality and the improvement of water bodies and ecosystems and to finance the necessary infrastructures and administrative system. The water resource charge is a step forward in the internalization of scarcity-related opportunity costs and environmental costs. The implementation of cost recovery regarding the investment, operation and maintenance costs is left for the water tariff policy set by the water utility (ibid., article 82). Naturally, water tariffs must reflect the scarcity and environmental costs internalized by the water resource charge paid by the water utilities to the State[4]. Because cost recovery is surely impossible without the proper knowledge of the costs incurred, article 83 determines that it is the National Water Authority's task to perform economic analysis of water resource use at the river basin level.

Unlike the water resource charge set up in 1994, but which never saw the light of day due to the lack of subsequent legislation concerning its implementation, the new charge has already been in place since July 2008, after the publication of the Decree-Law 97/2008 of June 11, which establishes the new economic and financial regime for water resources. The cost recovery principle (including scarcity and environmental costs) is assumed from the outset, within the spirit of the new Water Law and the WFD. Three instruments are established to meet the goals of sustainable water management through the promotion of water use efficiency, water conservation and water quality standards set up in the Water Law: the aforementioned water resource charge; water tariffs; contracted funding programs. The document not only determines the actual calculation procedure for the water resource charge, but also the division of the

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[4] Our analysis of cost recovery in this paper is limited to its financial aspects as we do not consider scarcity and environmental costs.

revenue generated between the National Water Institute, the recently created River Basin Authorities and a water resources protection fund to be created in a subsequent Decree-Law with the aim of promoting the rational use and protection of water resources. The articles concerning the water tariffs (chapter III, articles 20-23) set up the principles of cost recovery, financial sustainability of the water utility, water use efficiency and transparency in billing, but the details are referred to a later Decree-Law which will bring a new regime for water tariff setting, on which the Regulating Authority for Water and Waste (IRAR) has been working with the Ministry of Environment. Finally, the contracted funding programs' aim is to support investment in information and management technologies for water supply and pollution control, infrastructure building and the maintenance of water courses and adjacent shores (MAOTDR, 2008, article 25).

3. METHODOLOGY

The data on which we rely for this paper was mainly provided by the Portuguese National Water Institute – INAG, which makes available on request its database from the National Inventory of Water Supply and Wastewater Systems (INSAAR). INSAAR periodically collects data on costs, revenues, investments, tariffs, volumes of water supplied and wastewater drained and management type. We have data for the years 1998, 2000, 2002 and 2005 (information on the type of management is for the last two years only, while the investment series has annual information starting in 1987). INSAAR is expected to be updated annually in the future.

Our work will only focus on mainland Portugal, for which reliable data was available at the time of our study[5]. However, there was still a significant amount of missing data, so we gathered additional information, namely on the volumes supplied and drained and the number of customers served, by directly requesting this information from the more than 300 Portuguese water and wastewater utilities.

Our analysis is made separately for WS systems and for WWDT systems, although the water utility providing them is often the same in each municipality. The analysis also separates retail and bulk water services, using the amount of water supplied/drained to allocate some of the costs faced by the water utility, when necessary.

The reference year for this paper is 2005. This paper updates results published for 2002 by Monteiro (2007). The main methodology followed there is maintained. Namely, the analysis of

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[5] Mendes et al. (2006, p. 38) reports the later expansion of INSAAR to the Madeira and Azores archipelagos.

the evolution of the several indicators considers only those utilities with enough information for the period being analysed.

The calculation of annual investment costs involves the computation of the corresponding annuities from a deflated time-series of investments[6], using a 30 year maturity term and a 5% discount rate, which is the value recommended by the European Commission (EC, 2008, p. 14 and 33) for the discount rate to be used in cost-benefit analysis of long-term investment in infrastructures. This value is close to the 5,3% estimated by Evans and Sezer (2005) for the social discount rate in Portugal and similar to the 1987-2005 real profitability rates of long-term Portuguese Treasure bonds. Alves and Pinto (2004) also used a 5% discount rate for the economic part of the National Water Plan.

For reasons of statistical secrecy, regional analysis is performed at the NUTS III sub-regional administrative level.

4. BRIEF DESCRIPTION OF WATER AND WATEWATER UTILITIES

The 2005 INSAAR update altered the number of utilities covered by the inventory from 610 (515 with WS services and 326 with WWDT services) to just 319 utilities (293 with WS and 299 with WWDT). The excluded utilities were of very small size, consisting of civil parishes (freguesias) or self-organized neighbourhoods, which seldom reported information anyway. All water utilities responsible for supplying water or draining and treating wastewater in each of the 278 municipal counties of mainland Portugal were kept, as well as all relevant bulk water and wastewater players. Nevertheless, this change makes the results from this paper not strictly comparable with those from Monteiro (2007).

4.1. Nature of the service

Most Portuguese utilities present in INSAAR 2005 simultaneously provide WS and WWDT services (Figure 1). Only 6% were exclusively dedicated to WS and 8% dealt with WWDT only. As expected, 91% of these water utilities provide services directly to the consumer (households, industrial, commercial or agricultural businesses, public entities, among others), while the rest are focused on bulk water provision or wastewater drainage and treatment (6% doing it exclusively and 3% operating on both markets).

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[6] The investment series from INSAAR does not include investments in the construction of dams.

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Exclusively WS
6%

Exclusively WWDT
8%

WS + WWDT simultaneously
86%
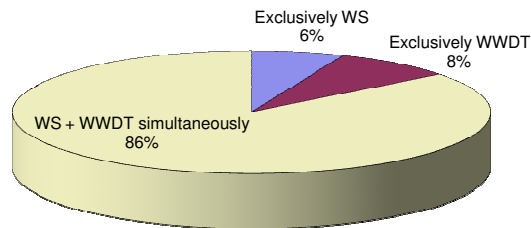
Figure 1 - Classification of utilities by the nature of the service provided (2005)

4.2. Type of utility

Water utilities have been classified into 7 different types according to their ownership and management (Figure 2). In 2005, 70% of the Portuguese water utilities were municipalities, which have traditionally been providing the service in most cases. This figure is nevertheless down from 74% in 2002, reflecting the slow, but steady tendency for municipalities to create autonomous entities to run the service or to concede it to private operators. This can be also seen from the increasing proportion of municipal companies (3% in 2002, 5% in 2005) and private companies (4% in 2002, 6% in 2005). The increasing number of public companies is mainly due to the creation of bulk water companies by the state-owned holding AdP, together with the municipalities involved.
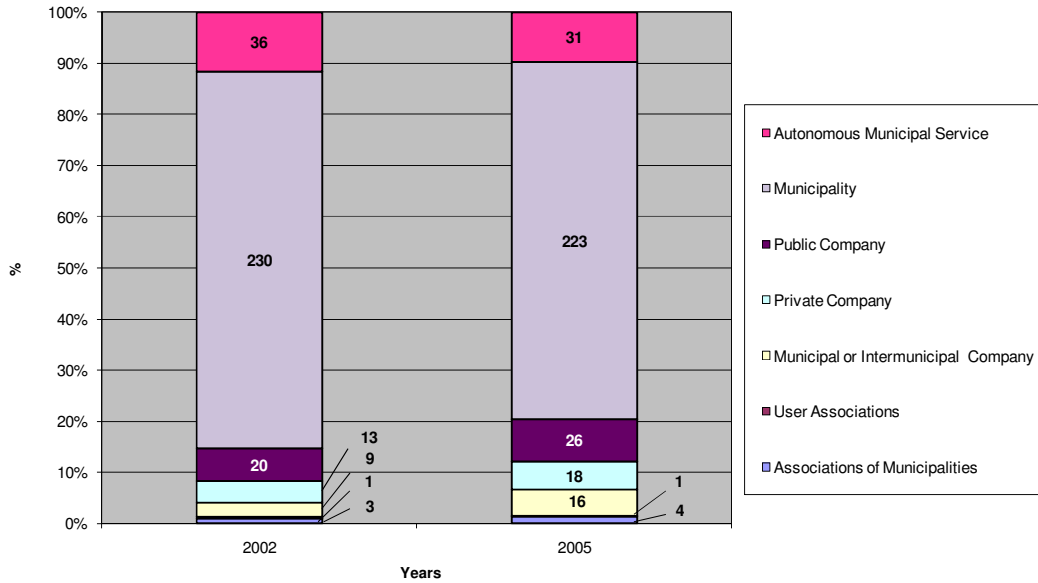
Figure 2 - Type of water utility/management (2002-05)

The different types of water utilities can be found in different locations across the country serving municipal counties with very different population sizes. In a careful analysis, one must, therefore, also look at their relative importance concerning the number of customers[7] and the amount of water supplied/drained. The relative weight of municipalities for example, greatly diminishes in all kinds of services once such criteria are taken into account. They are responsible for WS and WWDT services all over the country, but it's in the smaller rural municipal counties that this type of management arrangement is almost universal. In larger, more urbanized municipal counties, the types of water utilities and management systems are more varied (Figure 3, Figure 4, Figure 5 and Figure 6).

Autonomous municipal services (which have an autonomous management within the municipality, although they are not an independent juridical entity), municipality-owned companies, private and public companies, on the other hand, have a greater importance in retail service if we look at other indicators besides the number os companies of each type, like the number o f customer or the volumes supplied/drained. Although this reflects the growing importance of professional management in the industry, it hasn't yet implied a trend towards

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[7] INSAAR uses the concepts of "meter" in WS and "customer" in WWDT to reveal the number of consumers served (mostly because wastewater is practically never metered). From this point forward, we will consider them equivalent definitions and use the word "customer" only.

greater privatisation (private companies represented only for 4% of retail WS utilities and 3% in retail WWDT, serving 9% and 8% of customers, respectively).

In bulk WS and WWDT the situation is quite different. Public companies dominate the market. They are usually formed with a majority capital share from AdP, the state holding company, and a minority share from the municipalities they are intended to serve. In the ensuing cost analysis to be presented, average values are always weighted by the volume supplied/drained by each water utility.
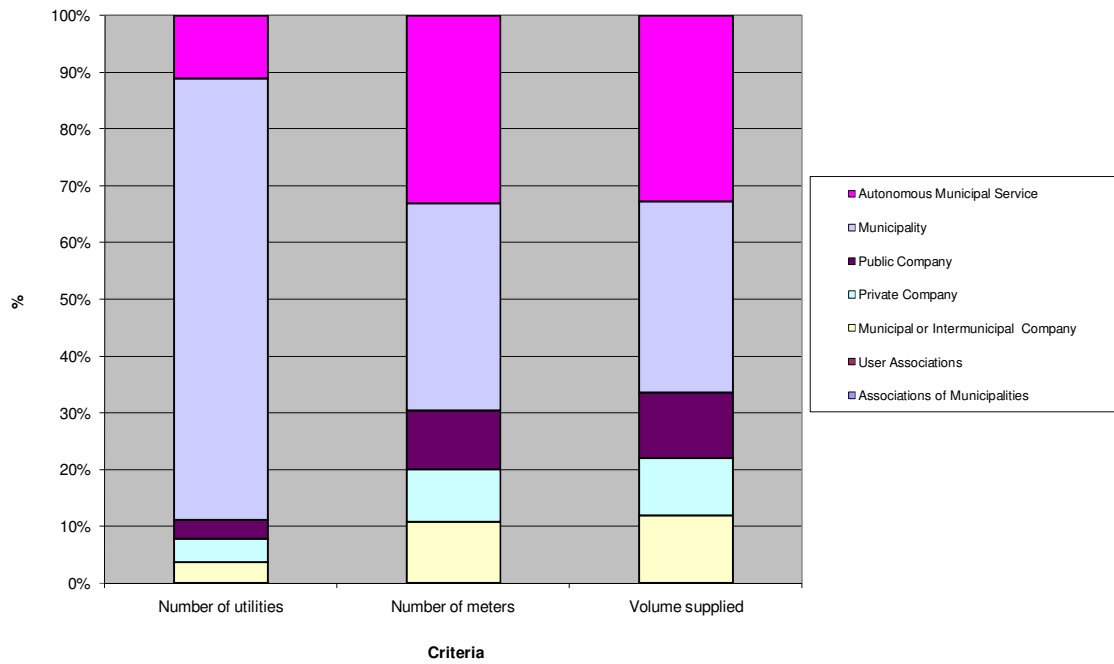
Figure 3 - Distribution of retail WS utilities by type (2005)
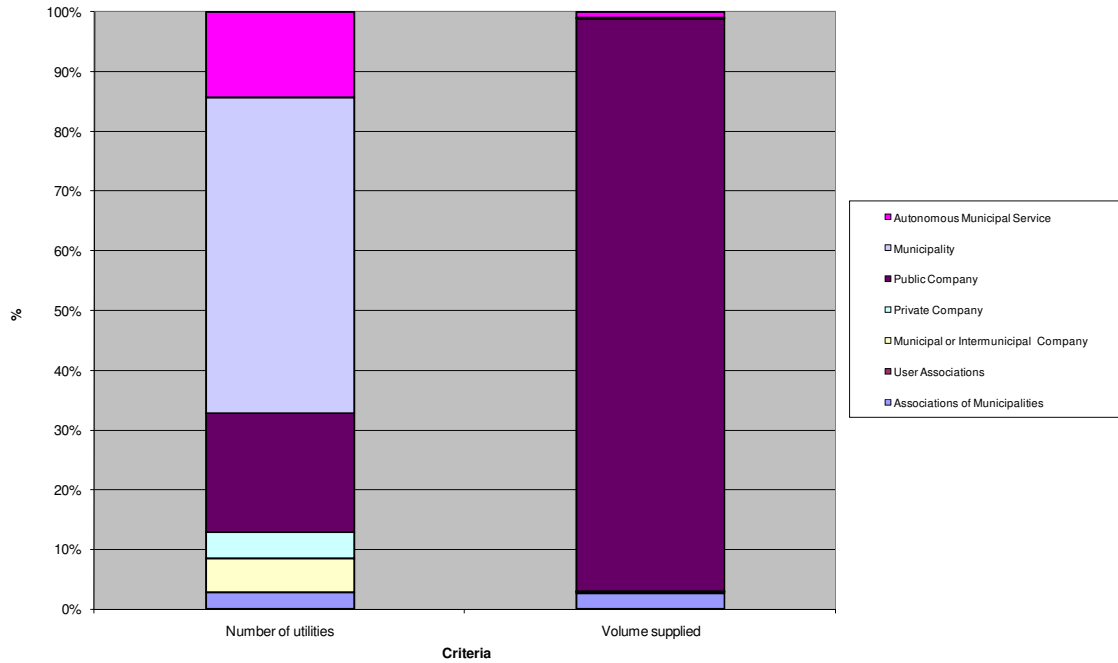
Figure 4 - Distribution of bulk WS utilities by type (2005)
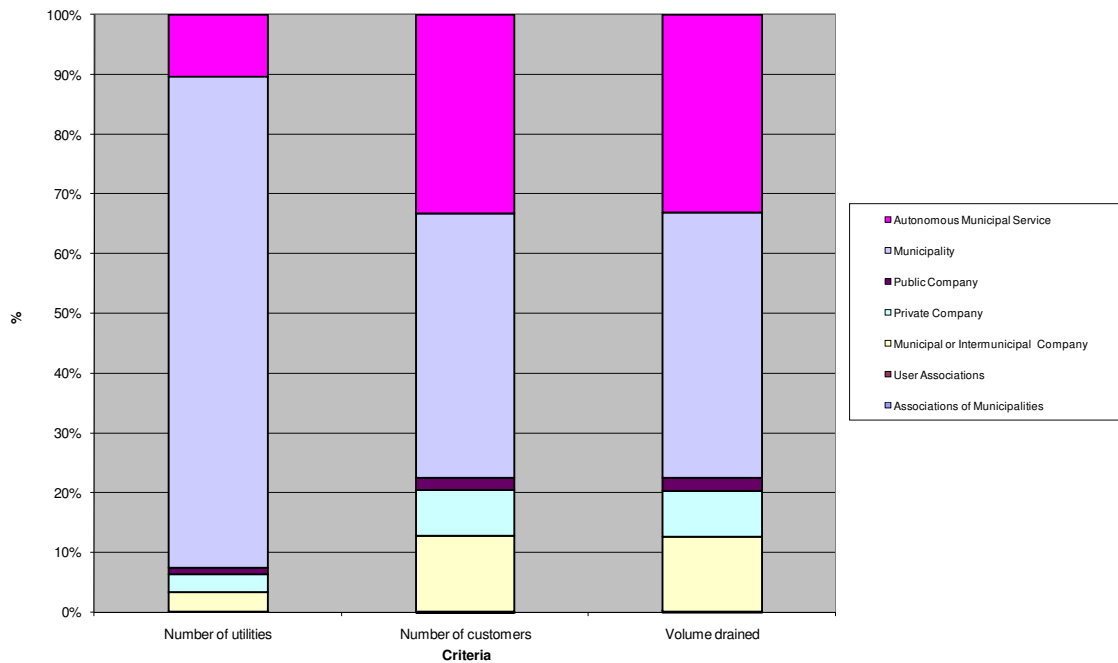
Figure 5 - Distribution of retail WWDT utilities by type (2005)
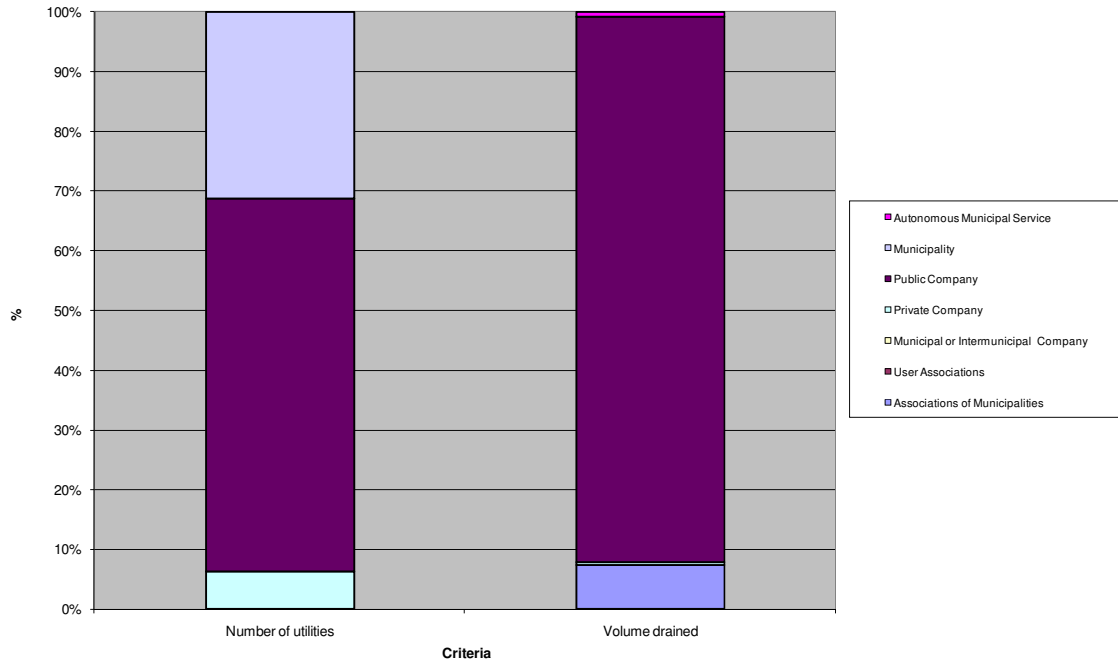
Figure 6 - Distribution of bulk WWDT utilities by type (2005)

4.3.   Geographical distribution

We now look at how the different types of retail water and wastewater utilities are located across Portugal. Map 1 and Map 2 show that the great majority of the country is served by municipalities. It's in the more populous urban west coastline (or in some medium-sized inland cities, like district capitals, or in the Algarve, in the south) that we find alternative management arrangements. The traditional alternative was the autonomy of the municipal services within the municipality itself (without creating a distinct juridical entity) with the creation of specific management boards, usually separated from the city council members. In recent years, some municipalities, especially in the more densely populated cities have chosen to create municipal companies to run the services or even to concede it to private operators. This trend is visible in the maps below, even though they only show a 3 year difference. We also find some cases where the water utility is a state-controlled public company, but they have no regional pattern. We found no case of associations of municipalities operating at the retail level. This was expected, because these entities are created to deal with bulk water/wastewater. Recently, the government has been trying to create incentives (through the AdP holding and the management of contracted funding programs) for intermunicipal companies or associations to operate at the retail level, in order to seize economies of scale, but the impact of this policy will only be

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noticed in the future. It is important to note that some water systems are not confined to the municipal borders, so that Map 1 and Map 2 always consider the predominant operator. Some water utilities supply two municipalities which have been divided after the system was created. Some systems may supply some population in adjacent counties. Finally, some inframunicipal operators exist, like tourist resorts, user associations, small neighbourhood organizations or civil parishes working under contracts for task decentralization with the municipality.
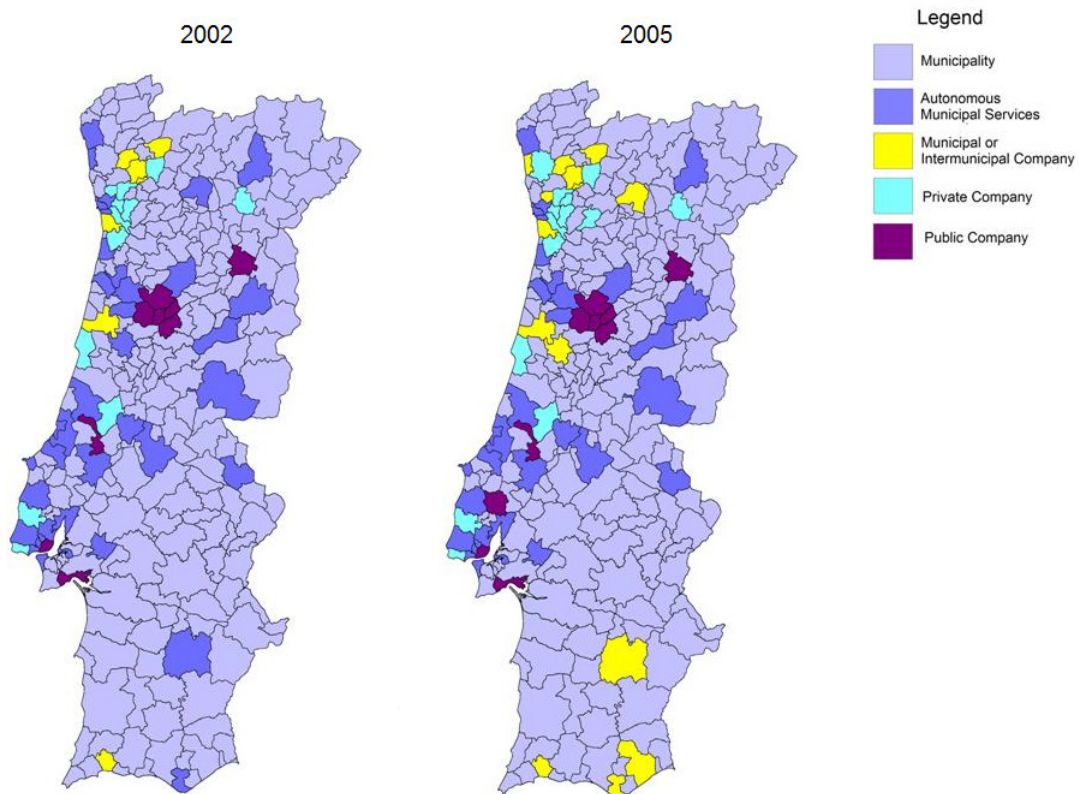
Map 1 - Geographical distribution of the main retail WS utilities in each municipal county (2002 and 2005)
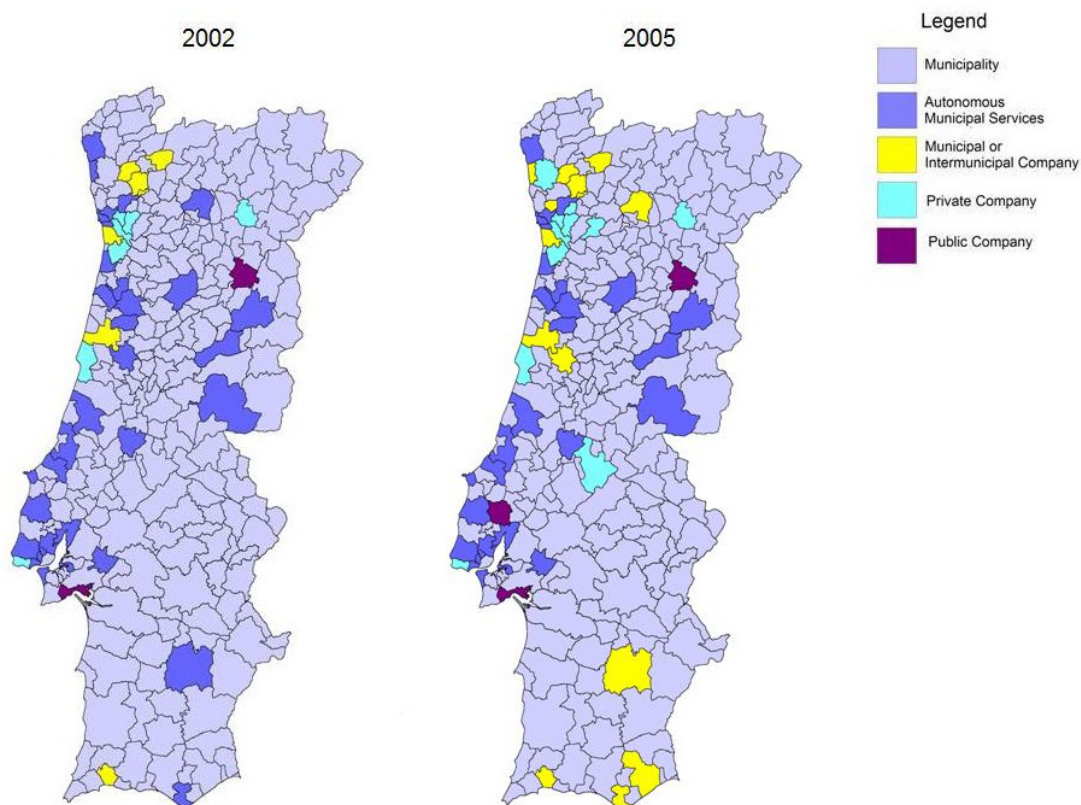
**Map 2 - Geographical distribution of the main retail WWDT utilities in each municipal county
(2002 and 2005)**

5. COSTS

In this section we look at the water utilities' cost amount and structure for WS and WWDT systems. Cost information comes from INSAAR 2005, as does the base information for the weights used (number of meters/customers and volumes supplied/drained). As noted earlier, additional information was gathered for the weight variables, in order to reduce the amount of missing data, through direct contacts with all retail water and wastewater utilities. We separate long-term investment costs from operation costs and also consider separately the costs of bulk water purchase/ wastewater drainage, financial outlays and general administrative costs. The data is treated separately for WS and WWDT and for retail and bulk water activities[8]. Data is for the years 1998, 2000, 2002 and 2005 for all variables, excluding investments, which come

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[8] Volumes supplied/drained are used as weights to allocate costs between bulk and retail activities when they are both present for the same utility.

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from an annual time-series for the period 1987-2005. Where missing data might represent a problem, results are given considering only those utilities with enough information for the indicators at hand and for the relevant period being analysed and reporting the proportion of the volume supplied/drained they represent[9]. All monetary values use constant 2005 prices[10].

5.1. Total costs

The costs of WS and WWDT systems in Portugal in 2005 amounted to 1566 million Euros. Figure 7 and Table 1 report the distribution of the different types of costs by the four types of systems (WS and WWDT, bulk and retail).
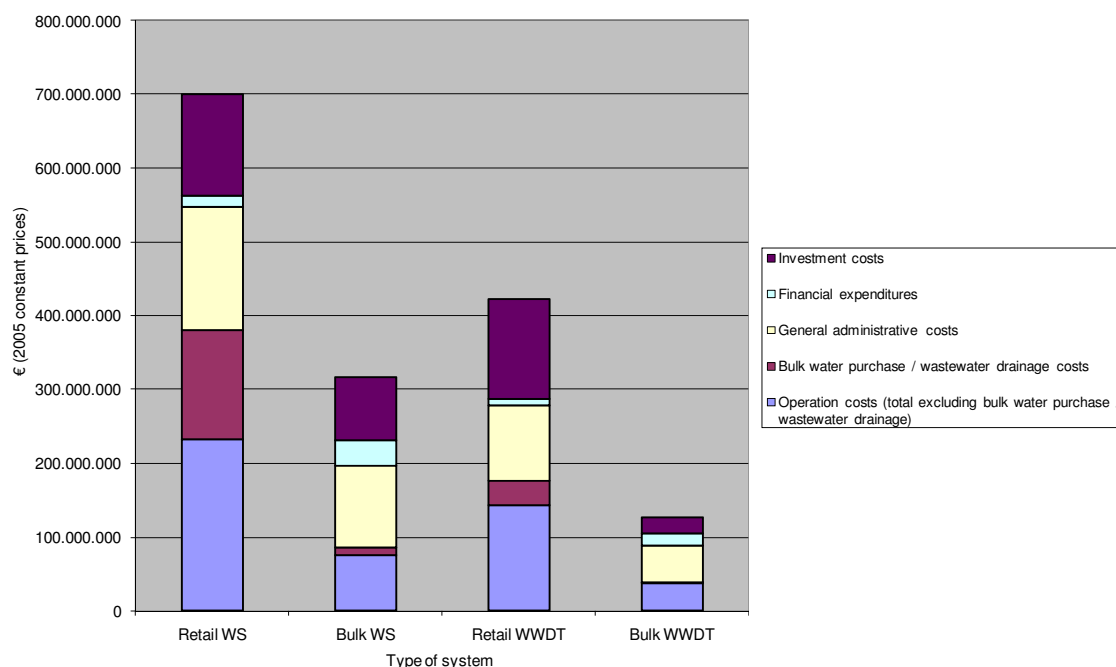
Figure 7 - Total costs declared for WS and WWDT systems (2005)

The retail level was responsible for the large majority of the costs declared to INAG (72%) especially in WS (Table 1). WS represented 65% of the costs, while WWDT accounted for the remaining 35%. Two reasons may explain this difference: the delay in wastewater system

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[9] This procedure avoids, for example, the distortion that would be introduced by the fact that small utilities have lower data reporting levels for the first years under study. The missing data is much less of a problem in the data for customers and volumes than for costs and revenues.

[10] We used the deflator for Portuguese GDP at market prices, unit Euro/ECU, supplied by AMECO – Annual Macroeconomic Database of Directorate General for Economic and Financial Affairs (DG ECFIN) of the European Commission.

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expansion and the fact that not all water supplied is returned as wastewater to the sewage system (although in Portugal the lack of separate sewage systems for urban wastewater and rain water runoff means that it is possible that more water arrives at the wastewater treatment plant than the amount of water supplied).

Investment costs have a significant weight on the cost structure (24%), but the value is not as high as it could be expected (probably due to the fact that dam construction is excluded from the investment data) in an industry which is a flagship for the concept of natural monopoly, due to its capital-intensive nature. Nevertheless, if we add financial outlays like interest rate payments and general administrative costs (which can be considered for the most part as fixed costs), we reach the figure 57% of total costs. Operation costs account for the remaining costs, and it is noticeable that bulk water purchases represent 21% of all costs for retail WS, while wastewater drainage by bulk utilities represent only 8% of the costs of retail operators, reflecting the delay in the implementation of a bulk wastewater system in Portugal. In fact, bulk WS systems represented already 20% of the industry's costs (31% considering only WS), while bulk WWDT accounted for only 8% (23% considering only WWDT. This delay is also a feature of retail WWDT systems.

Table 1 - WS and WWDT systems' costs in 2005

€10³	Retail WS	Bulk WS	Retail WWDT	Bulk WWDT	Total
Operation costs (total excluding bulk water purchase / wastewater drainage)	232.645	75.202	142.840	38.971	489.658
Bulk water purchase / wastewater drainage costs	147.766	11.085	33.5545	40	192.445
General administrative costs	166.820	109.738	102.021	49.478	428.057
Financial expenditures	14.946	35.565	9.204	16.256	75.971
Investment costs	138.277	85.192	134.442	22.244	380.155
Total	700.455	316.782	422.061	126.989	1.566.287
% of total by system type	**Retail WS**	**Bulk WS**	**Retail WWDT**	**Bulk WWDT**	**Total**
Operation costs (total excluding bulk water purchase / wastewater drainage)	33,2%	23,7%	33,8%	30,7%	31,3%
Bulk water purchase / wastewater drainage costs	21,1%	3,5%	8,0%	0,0%	12,3%
General administrative costs	23,8%	34,6%	24,2%	39,0%	27,3%
Financial expenditures	2,1%	11,2%	2,2%	12,8%	4,9%
Investment costs	19,7%	26,9%	31,9%	17,5%	24,3%
Total	100,0%	100,0%	100,0%	100,0%	100,0%

% of total by cost type	Retail WS	Bulk WS	Retail WWDT	Bulk WWDT	Total
Operation costs (total excluding bulk water purchase / wastewater drainage)	47,5%	15,4%	29,2%	8,0%	100,0%
Bulk water purchase / wastewater drainage costs	76,8%	5,8%	17,4%	0,0%	100,0%
General administrative costs	39,0%	25,6%	23,8%	11,6%	100,0%
Financial expenditures	19,7%	46,8%	12,1%	21,4%	100,0%
Investment costs	36,4%	22,4%	35,4%	5,9%	100,0%
Total	44,7%	20,2%	26,9%	8,1%	100,0%

5.2. Operation costs

The INSAAR 2005 data made available by INAG enable us to look into the structure of operation costs, although the proportion of those whose disaggregation was not reported by the water utilities is quite significant (Figure 8). Bulk water purchases represent a large proportion of operation costs for retail WS systems (39%). In retail WWDT, on the other hand, bulk operations still stand for only 19% of operation costs. The bulk systems' cost structure is somewhat different as this kind of expenditures are much less significant, with all other categories like outsourcing services, personnel or electricity having their weight on costs proportionally increased. It is interesting to notice that, even for bulk WS systems, the costs of buying water from other water utilities account for a non-negligible 13% of costs, which may be reflecting the impacts of local/regional water scarcity.
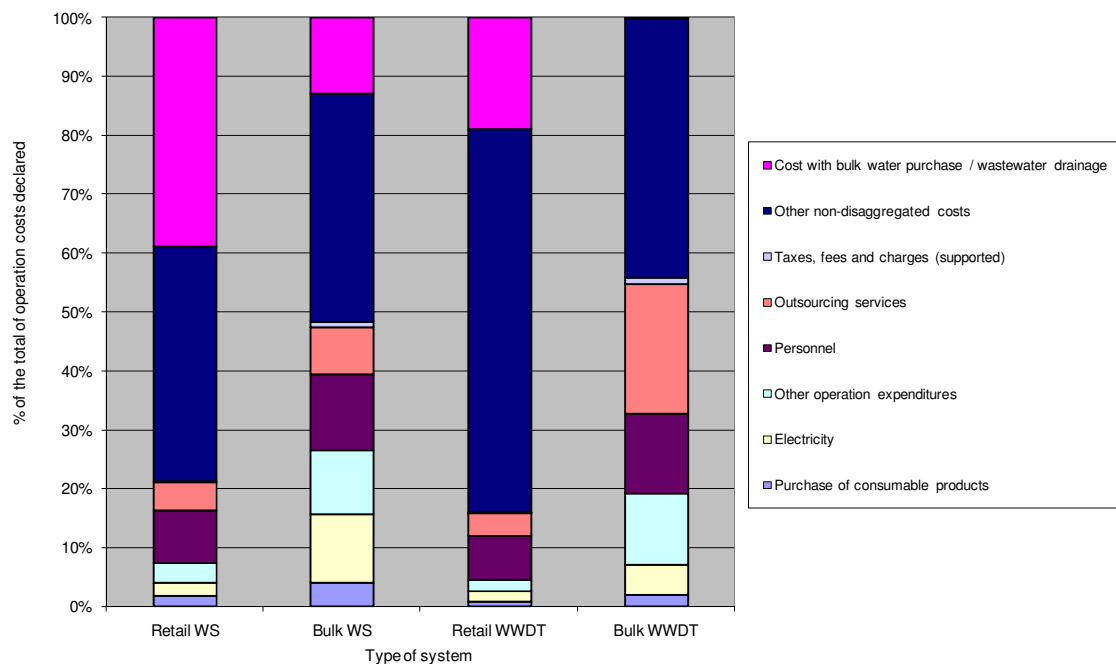
Figure 8 - Distribution of operation costs reported in WS and WWDT (2005)

5.3. Investment costs

The investment time-series and their annual investment costs counterparts (obtained by calculating the corresponding annuities using a 30 year maturity term and a 5% discount rate) show a clear upward trend (Figure 9 and Figure 10). It is hard to point out the exact cause of the temporarily sharp decline in more recent years. It may be due to lack of reporting by the utilities for the years between surveys, but the fact that WS investment is already seen declining for 2002 (a survey year) may suggest that there may be a real cause (beyond the statistical one) for the decline in investment. It may be due to the transition between European structural funds support framework programmes. The 3rd period of European fund support for Portugal terminated in 1999 and the subsequent one was meant for the period 2000-2006, so the decline in investment in the first years of a support framework programme may be something to be expected given the bureaucracy and delays usually associated with the setting up of the program and all the process of opening and deciding applications. In spite of all caution to be taken with these values, the upward trend matches the knowledge of increased public investment in the

Portuguese water industry in recent years [11] spurred by large investment programs like PEAASAR 2000-2006[12].

Figure 9 - Evolution of investment costs in WS (1987-2005)

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[11] The upward trend of the investment costs series is mathematically necessary given the 30-year maturity term considered and the less than 30-year length of the series.

[12] PEAASAR - Plano Estratégico de Abastecimento de Água e Saneamento de Águas Residuais [Strategic Plan for Water Supply and Wastewater Sewage is a government backed plan to support infrastructure building by the industry, within the overall Community Support Framework seizing European structural funds for the period]. A new plan (PEAASAR II) has already been designed and is being implemented for the period 2007-2013 (MAOTDR, 2006).
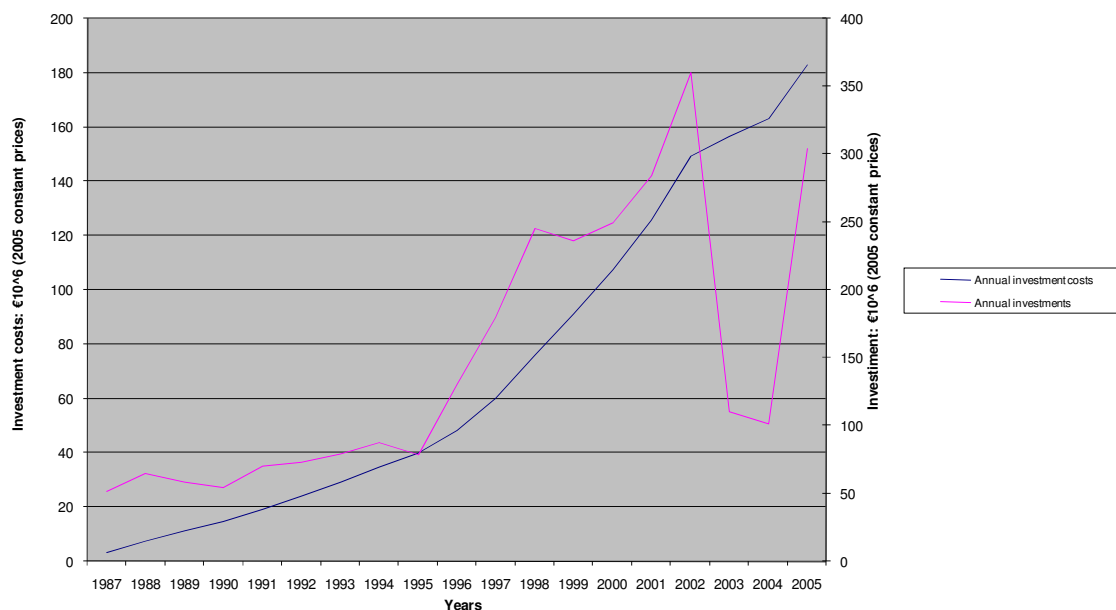
Figure 10 - Evolution of investment costs in WWDT (1987-2005)

The distribution of investment between WS and WWDT systems has changed significantly since 1987. In 1987, WS systems received 63% of the investment in the industry, while in 2005 the situation was more balanced with WWDT already comprising 51%. The proportion of the corresponding investment costs in WWDT increased from 38% to 42% during the period.

5.4.   Costs per utility and unit costs

We now turn our attention to the cost per utility and the unit costs[13] in WS and WWDT systems. We will look into the costs per customer and per cubic meter of water supplied/wastewater drained.

We can see from Figure 11 that, as expected, bulk operators face rather larger costs than retail utilities, with €7,5 million on average for WS and €5 million for WWDT. Wastewater systems face an average total annual cost which is about 2/3 of the corresponding water supply system.

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[13] The concept of unit cost used here is equivalent to the economic concept of average cost. We calculate average (unit) costs per customer and per m^3. We do not calculate marginal costs.
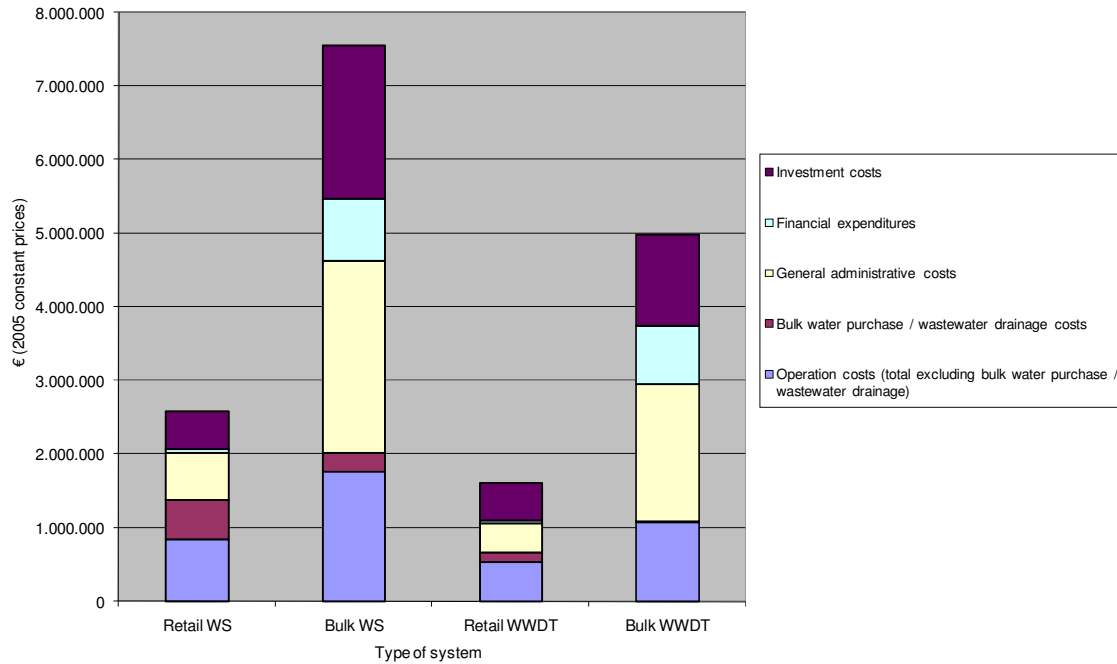
Figure 11 – Average cost per utility in WS and WWDT systems (2005)

Figure 12 shows that the cost of providing the retail WS and WWDT service to a customer is on average €261,6/year (€153,7/year for WS and €107,9/year in WWDT). The difference is probably due to the fact that the population coverage is still insufficient in WW drainage and even lower in WW treatment. According to INAG (2008, p. 22, 44 and 47) while 91% of the population was served by WS in 2006, only 77% had a wastewater drainage system and only 72% were served by wastewater treatment plants.
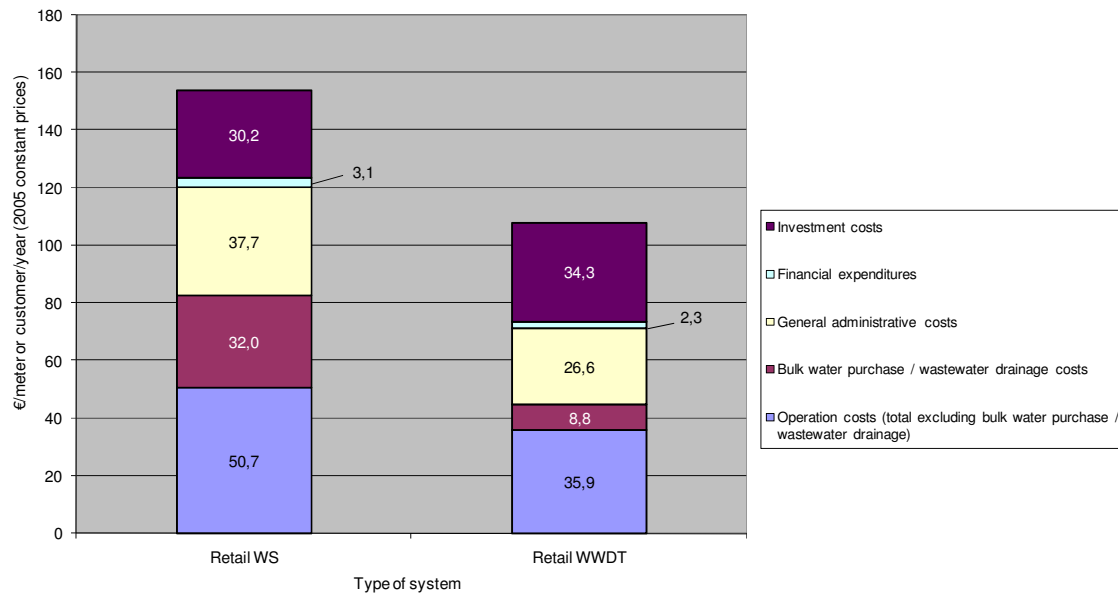
Figure 12 – Annual unit cost per customer in retail WS and WWDT systems (2005)

In 2005, in Portugal, supplying 1 m^3 of drinking water had an average cost of €1,22, while the drainage and treatment of 1 m^3 of wastewater cost €0,91. For WS, the cost for bulk water is significantly lower (€0,79/ m^3), which is something to be expected, given the economies of scale that a larger water utility can take advantage of while supplying water to a number of retail operators. Bulk water providers are also expected to maintain a smaller network length, not having to reach every single final customer. Retail operators, on the other hand, buy bulk water and have additional distribution costs on top of that. The situation is more balanced for WWDT where draining and treating 1 m^3 of bulk wastewater costs nearly the same (€0,92/ m^3) as for retail wastewater. This may be a statistical effect of averaging those retail operators that still have insufficient coverage and treatment levels with the ones which are more advanced in completing the system. As required treatment levels are upgraded for all WWDT utilities we can expect the unit cost of retail WWDT to increase.

The 2006 Annual Report on Water and Waste Industry in Portugal (RASARP) cites "international research, according to which the average service providing cost for 1 m^3 of water is around €1, the cost of sewage for 1 m^3 of wastewater being significantly lower" (IRAR, 2007, vol.1, p. 32). Our results are similar, only differing in the fact that it is the WS cost which is found to be higher. The higher unit cost for WS may be due to the small size of WS systems in Portugal, something that the government has been trying to change in recent years.

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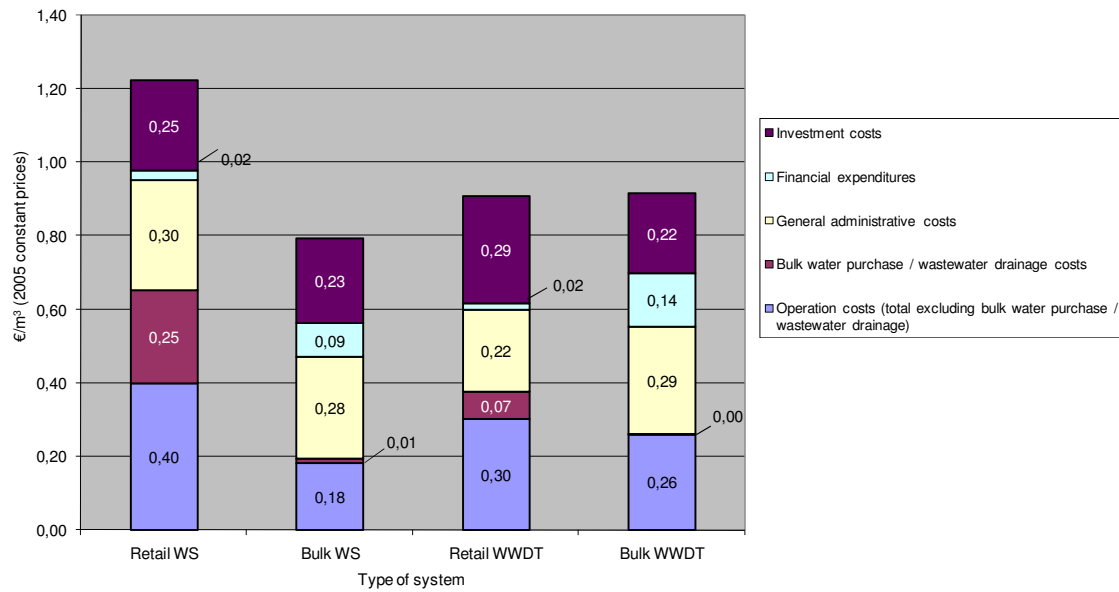
Figure 13 – Average unit cost per m³ in WS and WWDT systems (2005)

We can look now at the geographical distribution of unit costs at NUTS III level. The regional distribution of costs per utility follows closely the distribution of the population as expected. The water/wastewater utilities facing the greatest costs are located mainly in the west and south coasts, especially around the two metropolitan areas of Lisbon and Oporto (Map 3).
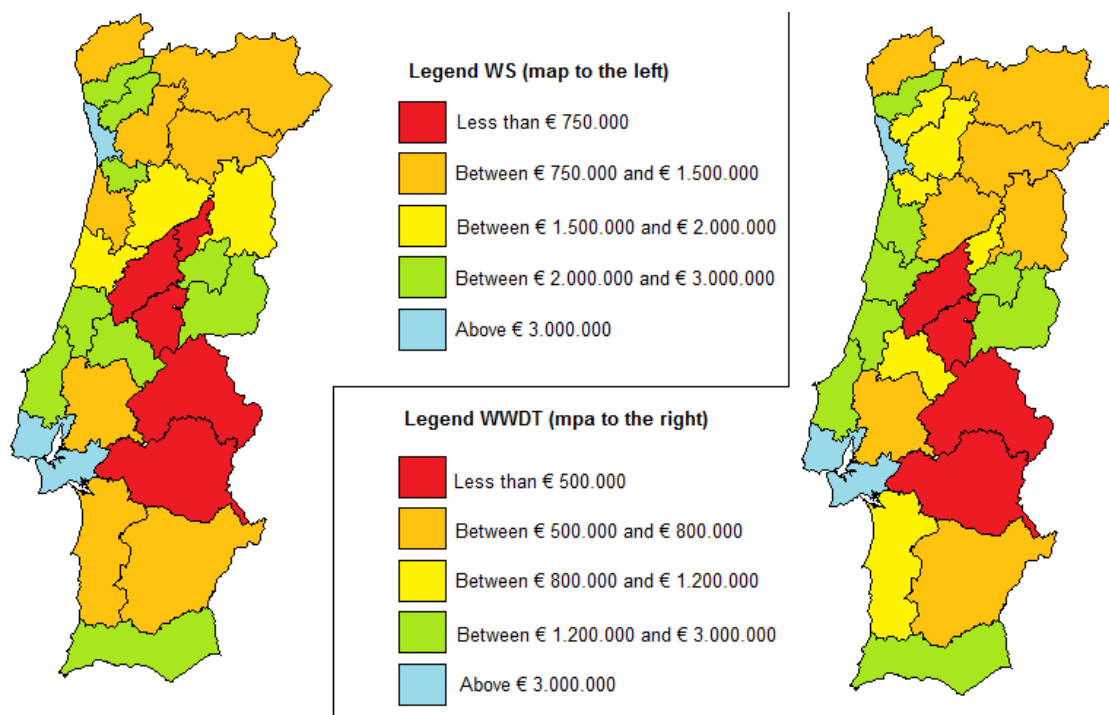
Map 3 – Average cost per utility in retail WS and WWDT by NUTS III (2005)

Analysing unit costs per customer can be more complex, because lower unit costs can be due to greater efficiency in the service or to the existence of scale economies, but can also be a product of a lower investment in the quality of the service provided, for example in the treatment of drinking water or wastewater before being released into the environment[14]. Map 4 shows no evident regional pattern.

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[14] IRAR's annual reports (IRAR, 2007) provide detailed information on water quality (for all WS utilities) and water service quality (for concessions). Our suspicion seems to be confirmed by the statement that "Utilities' performance, regarding sampling frequency failures and mandatory quality parameters failures, still reflects the Portuguese regional development inequalities. Indeed, it's in the inland regions, with greater lack of human, technical and financial resources, that failures to comply are concentrated, something that hapens mainly in supply zones with less than 5000 inhabitants" (ibid., vol. 4, p. viii). APDA (2006) also reports data on sampling frequency failures and mandatory quality parameters failures.

Legend WS (map to the left)

- Less than € 100/customer/year
- Between € 100 and € 120/customer/year
- Between € 120 and € 160/customer/year
- Between € 160 and € 180/customer/year
- Above € 180/customer/year

Legend WWDT (map to the right)

- Less than € 80/customer/year
- Between € 80 and € 90/customer/year
- Between € 90 and € 100/customer/year
- Between € 100 and € 130/customer/year
- Above € 130/customer/year
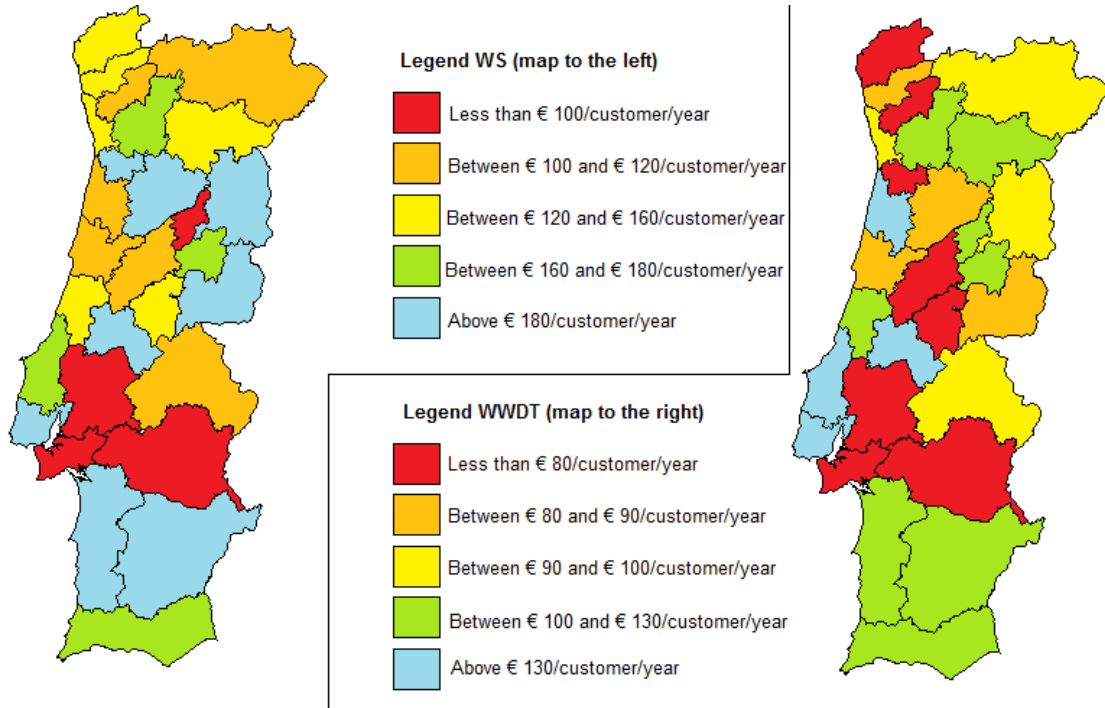
Map 4 – Average unit cost per customer in retail WS and WWDT by NUTS III (2005)

The same can be said about Map 5, regarding the possible confusion between efficiency and low service quality as reasons for lower costs. Nevertheless, a patter can be found, because unit cost per m^3 seems to be higher in the northeast inland part of the country, probably due to the more rugged terrain that can be found in that region or the more diffuse nature of population settlings. Those are hardly the reasons to explain the fact that unit costs are also high in south Alentejo, a plain land with low population density, but with population being concentrated in few villages and cities.

Legend WS (map to the left)

■ Less than € 0,9/m3
■ Between € 0,9/m3 and € 1,0/m3
■ Between € 1,0/m3 and € 1,5/m3
■ Between € 1,5/m3 and € 2,0/m3
■ Above € 2,0/m3

Legend WWDT (map to the right)

■ Less than € 0,75/m3
■ Between € 0,75/m3 and € 1,00/m3
■ Between € 1,00/m3 and € 1,25/m3
■ Between € 1,25/m3 and € 1,75/m3
■ Above € 1,75/m3
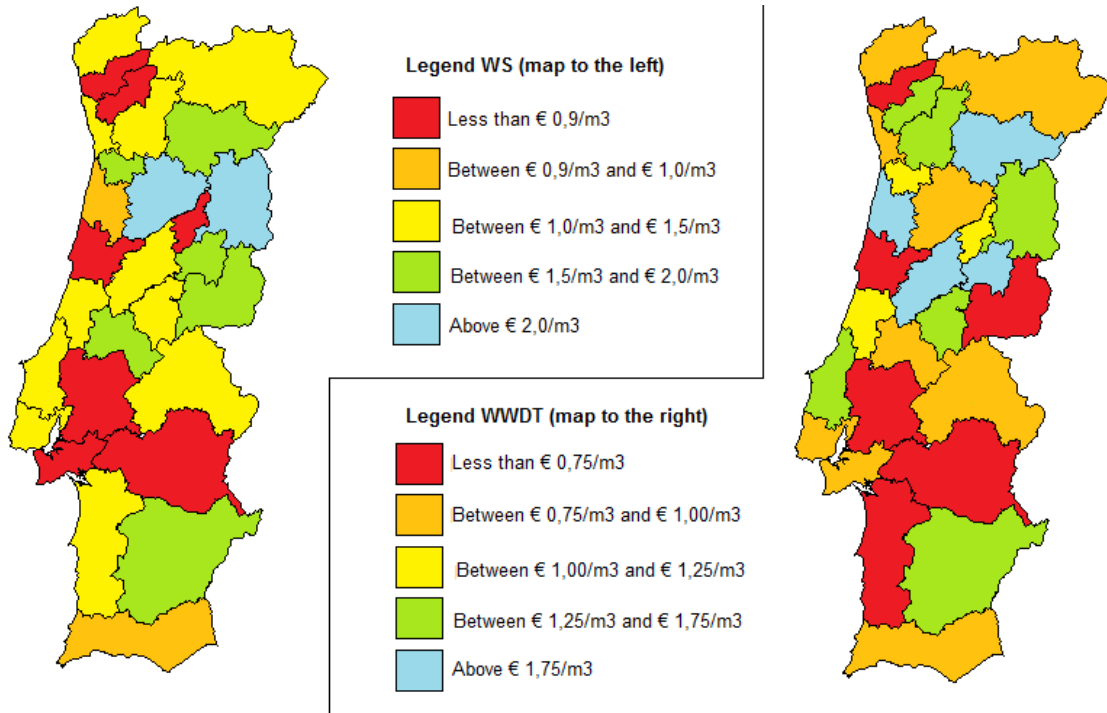
Map 5 – Average unit cost per m³ in retail WS and WWDT by NUTS III (2005)

Map 6 shows the regional distribution of the popuation density (map to the left) and the difference between the maximum and the minimum altitude in each region. I t shows that the greater population density in the west coast of Portugal and the plainer landscape in the west and in the south could be reasons for lower unit costs in these regions.
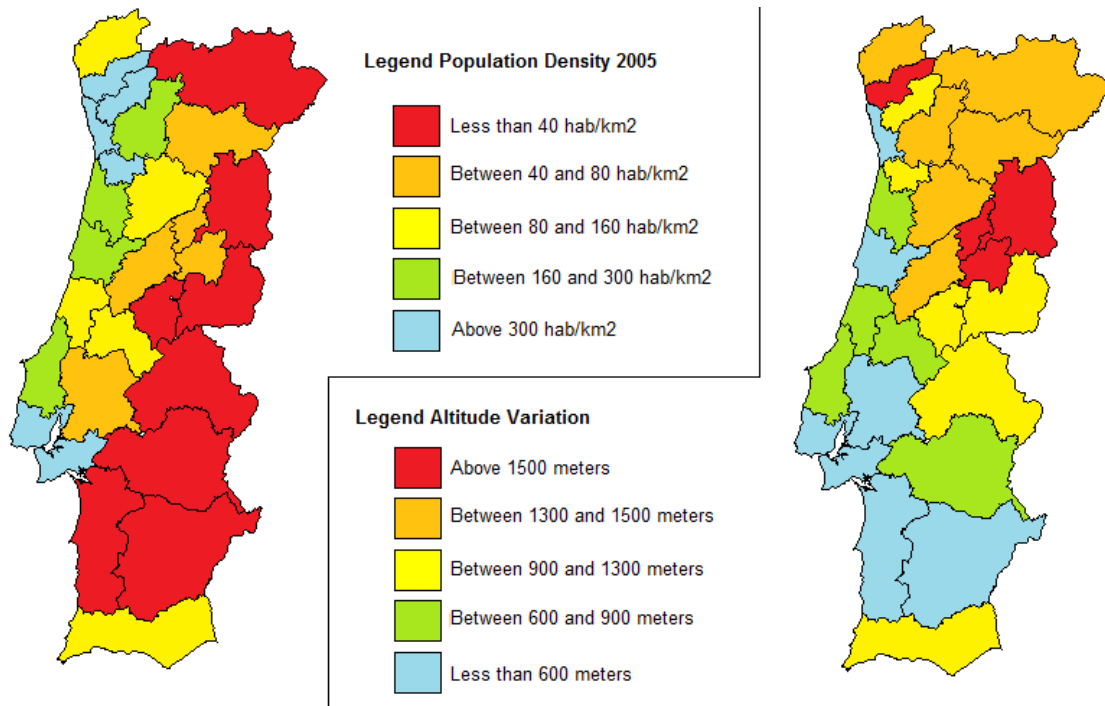
Map 6 – Population density and altitude variation by NUTS III (2005)

Map 7, on the other hand, presents data from IRAR on water quality indicators and shows that the they are lower in the northern inland part of the country (and in the south of Alentejo), which could result from lower investments in water quality in these regions. These two conflicting trends may explain the mixed results in Map 4 and Map 5.

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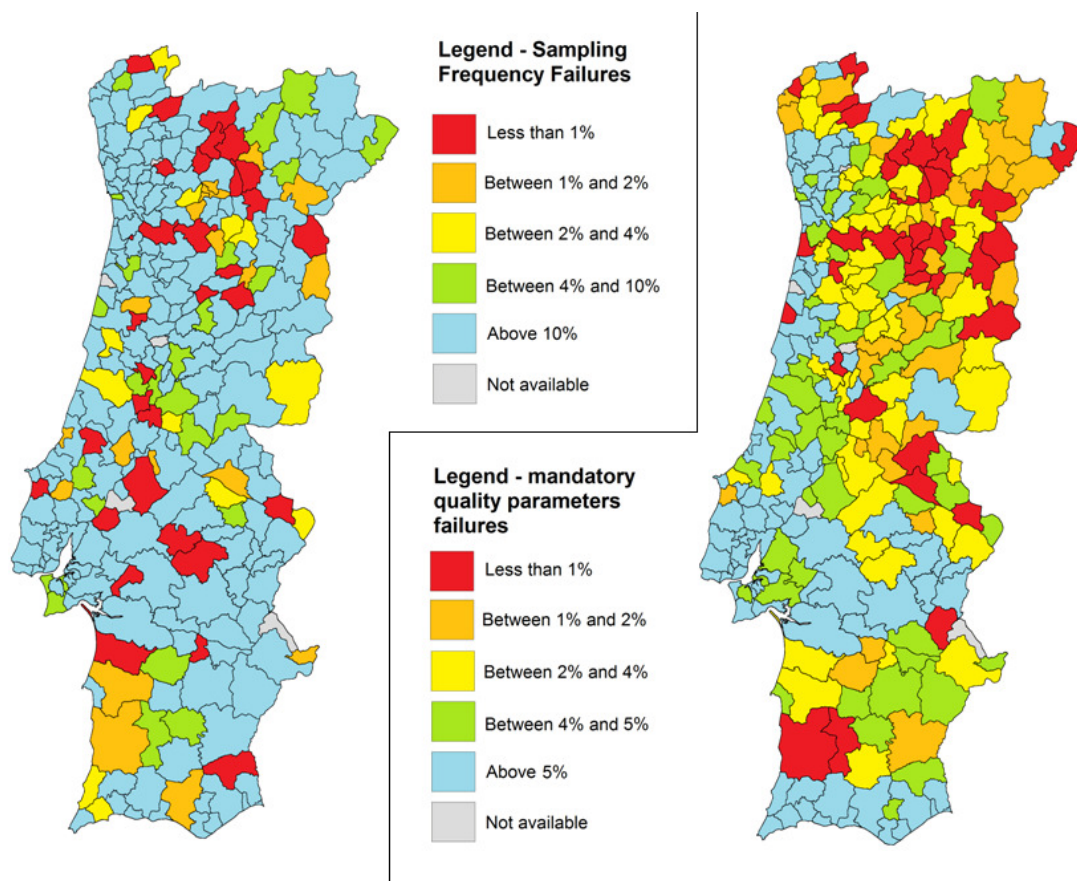
Map 7 – Water quality indicators: sampling frequency failures and mandatory quality parameters failures by municipality (2005)

We now take a look at the distribution of unit cost by type of utility/management (Table 2). Municipalities are the type of water utilities with fewer costs on average because they are responsible for providing the services of WS and WWDT all over the country, not just in the big cities. They are the predominant type of utility in less densely populated and less urbanized regions. The other types of utilities, which are more commonly found in urban areas are several times larger and therefore face higher total costs.

Municipalities and municipal companies have the lowest unit costs per customer (together with the autonomous municipal services in WWDT), which is something that we would not be expecting if we considered only the possible economies of scale[15]. However, autonomous municipal services show high unit costs. This prevents us from making any final judgement on

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[15] We do not rigorously assess here if there are economies of scale or not, nor do we try to estimate an optimal size for the water/wastewater utilities. That kind of analysis for Portugal was done by Martins et al. (2008), who conclude "the industry seems to exhibit economies of scale. There are, therefore, pro-aggregation arguments, especially for small and medium sized local water supply systems" (ibid., p. 23).

the issue of whether a transition towards more professional management and more privatisation of services leads to higher costs or not (and to a correspondingly higher service quality).

Table 2 – Unit cost by type of utility in retail WS and WWDT (2005)

	Average cost per utility (2005) (€)		Average unit cost per customer (2005) (€/customer/year)		Average unit cost per m^3 (2005) (€/m^3)	
	Retail WS	Retail WWDT	Retail WS	Retail WWDT	Retail WS	Retail WWDT
Municipal or Intermunicipal Company	4.999.084	3.768.359	141,8	106,9	0,86	0,74
Private Company	7.526.761	4.628.116	237,5	121,6	1,68	0,89
Public Company	9.156.634	3.310.183	158,5	137,4	1,10	0,66
Municipality	960.250	853.225	115,0	105,2	1,03	0,92
Autonomous Municipal Services	9.262.797	6.015.463	180,9	105,6	1,46	0,98
Total	2.575.230	1.611.120	153,7	107.9	1,22	0,91

5.5. Rates of change in costs

The INSAAR data on costs and revenues is somewhat affected by a non-negligible amount of missing data which requires the calculation of rates of change to be made and interpreted with some caution. For the case of cost totals one must take into account the fact that some years may be lacking more information than others, so that simple rates of change would reflect the entrance and departure of utilities from the database at least as much as the actual change in costs. To prevent this effect we calculate the rates of changes between any two years considering only those utilities which reported data for the two years at hand for the cost category being analysed. The results are qualitatively similar to those obtained if we considered only the utilities which had information for all 4 years, but the amount of utilities/information discarded is much less.

Table 3 presents the results. The overall main result that stands out is the significant real cost increases in all types of systems throughout the period (in 2005 constant prices), reflecting the expansion of the systems that occurred. This can also be seen by the increase in investment

costs[16] and financial expenditures[17] (subsidies only support part of the investment). In general, the expansion of the bulk water/wastewater systems is already being reflected in the increase in cost with water purchases / wastewater drainage for retail operators. With few exceptions, the several cost categories show very significant real growth.

Table 3 – Average annual rate of change in costs in WS and WWDT 1998-2002

Type of system	Type of costs by system	Average annual rate of change (a)		
		98-00	**00-02**	**02-05**
Retail WS	Operation costs (total excluding bulk water purchase / wastewater drainage)	4,5% (41%)	1,8% (49%)	-2,2% (92%)
	Bulk water purchase / wastewater drainage costs	6,5% (48%)	7,9% (67%)	9,1% (46%)
	General administrative costs	6,5% (89%)	79,5% (92%)	13,1% (92%)
	Financial expenditures	21,0% (27%)	-4,9% (29%)	43,7% (88%)
	Investment costs	11,4% (94%)	10,3% (97%)	0,9% (98%)
	Total costs (b)	**11,7% (40%)**	**12,7% (48%)**	**3,4% (91%)**
Bulk WS	Operation costs (total excluding bulk water purchase / wastewater drainage)	82,5% (14%)	5,1% (56%)	-4,4% (93%)
	Bulk water purchase / wastewater drainage costs	12,9% (89%)	15,3% (96%)	-8,6% (15%)
	General administrative costs	52,5% (86%)	290,0% (94%)	13,5% (95%)
	Financial expenditures	-19,4% (8%)	1,3% (49%)	50,7% (97%)
	Investment costs	35,7% (87%)	15,8% (95%)	0,8% (95%)
	Total costs (b)	**61,1% (12%)**	**13,2% (54%)**	**5,3% (91%)**

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[16] It is possible that the investment costs' growth rates are somewhat overestimated due to the fact that the length of the time series is inferior to the maturity term considered in the calculation of the corresponding annuities.

[17] The following cost categories have a significant amount of missing data: Bulk water purchase / wastewater drainage costs; General administrative costs; Financial expenditures. For this table we only considered the information explicitly reported by the water/wastewater utilities. To keep missing data from preventing the calculation of cost recovery ratios, the rest of the document will follow the assumption that missing data is due to a lack of reporting of null values for these three cost categories and will interpret them as such. We do not follow this procedure here because this would overestimate growth rates for these specific categories of costs. The same procedures are followed in the section for revenues.

Type of system	Type of costs by system	Average annual rate of change (a)		
		98-00	00-02	02-05
Retail WW	Operation costs (total excluding bulk water purchase / wastewater drainage)	16,5% (46%)	11,8% (55%)	-7,1% (92%)
	Bulk water purchase / wastewater drainage costs	23,6% (11%)	7,8% (11%)	3,0% (21%)
	General administrative costs	37,5% (88%)	67,8% (88%)	14,5% (92%)
	Financial expenditures	2,4% (23%)	58,8% (26%)	109,5% (78%)
	Investment costs	19,9% (88%)	15,7% (89%)	2,1% (98%)
	Total costs (b)	**19,9% (43%)**	**27,4% (50%)**	**1,6% (91%)**
Bulk WW	Operation costs (total excluding bulk water purchase / wastewater drainage)	-1,6% (84%)	-15,4% (60%)	-2,4% (70%)
	Bulk water purchase / wastewater drainage costs	-	-	-
	General administrative costs	27,7% (99%)	6,2% (66%)	40,2% (70%)
	Financial expenditures	-	-	121,1% (70%)
	Investment costs	11,8% (99%)	11,6% (66%)	-1,5% (70%)
	Total costs (b)	**0,3% (84%)**	**0,2% (60%)**	**12,0% (70%)**

(a) The calculated rates of change only consider those utilities for which there is information on the cost category for the two years under consideration (the % of volume supplied/drained in the latter year by the utilities being considered in shown in parenthesis)

(b) The utilities considered for the calculation of rates of change for total costs were those which had information on operation and investment costs for the two years under consideration. For the following cost categories we followed the assumption that missing data is due to a lack of reporting of null values interpreted them as such: Bulk water purchase / wastewater drainage costs; General administrative costs; Financial expenditures.

Table 4 and Table 5 show a significant real increase in unit costs throughout the period (with occasional exceptions for WWDT in specific years). This happened in spite of some economies in unit operational costs, especially in more recent years. Investment costs have increased in the beginning of the period, but show a slight decrease in 2002-05 due to the decline in investment in those years (which picked up in 2005). General administrative costs seem to have suffered a

widespread increase for all operators. It is also noticeable that the costs with bulk water purchases / wastewater drainage show a steady growth. The representativeness of the results may vary according to the missing data in the database. Overall, the utilities used in the calculation represent a very satisfactory proportion of the market in terms of volumes supplied/drained, but because this may not happen in some specific cost categories in specific years, we show the representativeness of the results (% of volume supplied/drained in the latter year by the utilities being considered) in parenthesis in the tables.

Table 4 – Average annual rate of change in per customer unit costs in WS and WWDT 1998-2005

Type of system	Type of costs by system	Average annual rate of change (a)		
		98-00	**00-02**	**02-05**
Retail WS	Operation costs (total excluding bulk water purchase / wastewater drainage)	0,4% (41%)	-1,8% (49%)	-4,7% (92%)
	Bulk water purchase / wastewater drainage costs	3,3% (48%)	4,6% (67%)	6,3% (46%)
	General administrative costs	2,7% (89%)	73,9% (92%)	10,2% (92%)
	Financial expenditures	16,6% (27%)	-8,2% (29%)	39,9% (88%)
	Investment costs	7,4% (94%)	6,8% (97%)	-1,7% (98%)
	Total unit cost per customer	**7,2% (40%)**	**8,8% (48%)**	**0,7% (91%)**
Retail WW	Operation costs (total excluding bulk water purchase / wastewater drainage)	11,7% (45%)	7,3% (54%)	-9,7% (91%)
	Bulk water purchase / wastewater drainage costs	20,7% (11%)	5,0% (11%)	1,3% (21%)
	General administrative costs	32,1% (87%)	60,9% (87%)	11,6% (91%)
	Financial expenditures	-1,3% (22%)	53,3% (26%)	117,0% (77%)
	Investment costs	15,3% (87%)	11,9% (88%)	-0,7% (97%)
	Total unit cost per customer	**15,1% (42%)**	**22,4% (49%)**	**-1,1% (91%)**

(a) The calculated rates of change only consider those utilities for which there is information on the cost category for the two years under consideration (the % of volume supplied/drained in the latter year by the utilities being considered in shown in parenthesis)

(b) The utilities considered for the calculation of rates of change for total unit costs were those which had information on operation and investment costs for the two years under consideration. For the following cost categories we followed the assumption that

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missing data is due to a lack of reporting of null values interpreted them as such: Bulk water purchase / wastewater drainage costs; General administrative costs; Financial expenditures.

Table 5 – Average annual rate of change in per m³ unit costs in WS and WWDT 1998-2005

Type of system	Type of costs by system	Average annual rate of change (a)		
		98-00	**00-02**	**02-05**
Retail WS	Operation costs (total excluding bulk water purchase / wastewater drainage)	0,6% (41%)	-0,9% (49%)	-3,4% (92%)
	Bulk water purchase / wastewater drainage costs	3,2% (48%)	6,0% (67%)	7,2% (46%)
	General administrative costs	1,4% (89%)	76,0% (91%)	11,7% (92%)
	Financial expenditures	16,6% (27%)	-8,1% (29%)	41,9% (88%)
	Investment costs	6,1% (94%)	8,0% (96%)	-0,4% (97%)
	Total unit cost per m³	**7,5% (40%)**	**9,8% (48%)**	**2,1% (91%)**
Bulk WS	Operation costs (total excluding bulk water purchase / wastewater drainage)	42,7% (14%)	-5,7% (56%)	-3,6% (93%)
	Bulk water purchase / wastewater drainage costs	-10,8% (89%)	4,9% (96%)	-10,0% (15%)
	General administrative costs	19,3% (86%)	258,0% (93%)	14,2% (91%)
	Financial expenditures	-26,8% (8%)	-8,2% (49%)	50,7% (92%)
	Investment costs	6,7% (86%)	6,6% (94%)	2,1% (91%)
	Total unit cost per m³	**21,5% (12%)**	**0,8% (54%)**	**7,1% (91%)**
Retail WW	Operation costs (total excluding bulk water purchase / wastewater drainage)	6,8% (46%)	7,1% (55%)	-10,9% (92%)
	Bulk water purchase / wastewater drainage costs	12,0% (11%)	7,4% (11%)	2,0% (21%)
	General administrative costs	24,8% (88%)	60,7% (88%)	10,1% (92%)
	Financial expenditures	-3,9% (23%)	47,9% (26%)	99,1% (78%)
	Investment costs	8,9% (88%)	10,7% (89%)	-1,4% (98%)
	Total unit cost per m³	**9,6% (43%)**	**22,7% (50%)**	**-2,9% (91%)**
Bulk WW	Operation costs (total excluding bulk water purchase / wastewater drainage)	-4,5% (84%)	-8,5% (60%)	-10,0% (70%)

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Type of system	Type of costs by system	Average annual rate of change (a)		
		98-00	00-02	02-05
	Bulk water purchase / wastewater drainage costs	-	-	-
	General administrative costs	4,0% (84%)	10,7% (64%)	33,5% (70%)
	Financial expenditures	-	-	92,1% (62%)
	Investment costs	-1,0% (84%)	16,1% (64%)	-4,8% (69%)
	Total unit cost per m^3	**-2,7% (84%)**	**8,4% (60%)**	**9,0% (69%)**

(a) The calculated rates of change only consider those utilities for which there is information on the cost category for the two years under consideration (the % of volume supplied/drained in the latter year by the utilities being considered in shown in parenthesis)

(b) The utilities considered for the calculation of rates of change for total unit costs were those which had information on operation and investment costs for the two years under consideration. For the following cost categories we followed the assumption that missing data is due to a lack of reporting of null values interpreted them as such: Bulk water purchase / wastewater drainage costs; General administrative costs; Financial expenditures.

Even though the unit costs are seen to be raising above the inflation rate (probably due to more stringent quality requirements and new investments) the growth rates for unit costs are more moderate than the ones for total costs as can be seen if we compare Table 3 with Table 4 and Table 5. This reflects some possible economies of scale being seized as the systems expand their coverage and provide higher volumes.

6. REVENUES

In this section we analyse the revenues of Portuguese water and wastewater industry, from the data reported to INSAAR for the period 1998-2005. We will use the same division of the systems into bulk and retail and WS and WWDT. Revenues will be divided into non-tariff and tariff revenues from services provided to the final customers or from transactions between

water/wastewater utilities. Investment subsidies will also be taken into account[18]. Non-tariff revenues (excluding investment subsidies) are exclusive features of retail water operators in the INSAAR database. Unlike the situation for the cost analysis, here all revenues have a clear association with one of the 4 types of systems considered, so that no weighting criterion was needed to distribute them between retail and bulk systems in the cases where the same utility has activity in both.

6.1.   Total revenues

The revenues in the WS and WWDT industry in 2005 amounted to €1035 million (Figure 14), a figure well below the one reported for the total costs (Figure 7) as we will see in the section for cost recovery ratios. For now, we will look more carefully into the revenue structure of the industry, which according to INSAAR is mainly comprised of tariff revenues. The weight of non-tariff revenues and investment subsidies in the revenue totals is rather small, although we do suspect that investment subsidies are very understated in the database due to lack of reporting[19].

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[18] Although the INSAAR database does include investment subsidies and we do consider them as revenues in our analysis, the amounts reported to INSAAR by the water utilities are virtually negligible and do seem to be very far away from the actual level. Investment subsidies are treated here as revenues in the same fashion of investment costs, i.e., they are calculated annuities from the actual investment subsidies time-series using a 30-year maturity term and a 5% discount rate.

[19] For example, the total amount of subsidies reported to INSAAR (at current prices) for the period 2000-2005 is around €250 million, while Roseta-Palma et al. (2006) report that € 506,7 million were planned in the Cohesion Fund alone to be applied in the industry's investments between 2000 and 2006 (ibid., p. 17, table 3). To this value we must add the €621,8 million from the European Regional Development Fund to get a total of €1128,5 million of planned European funds to be applied as investment subsidies in the industry in this period (Portuguese governmental funs would had to these values). We must note that, for the Cohesion Fund, by 2004, although €405,4 million of funding had already been approved, only €86 million had been executed. Nevertheless, if we take into account the fact that the amount of investments reported to INSAAR for the period 2000-2005 reaches €3113 million (current prices) and that the share of European funding on supported investments reached 67% on average (IRAR, 2007, vol. 1, p. 88, table 14), we must take some caution with the data on subsidies reported to INSAAR.
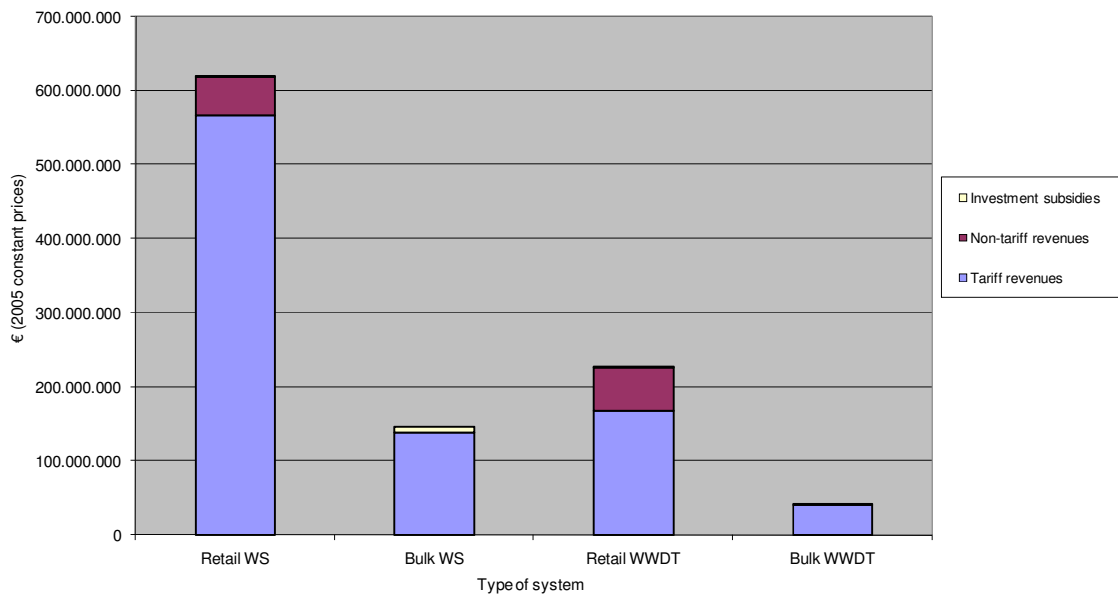
Figure 14 – Revenues in WS and WWDT systems (2005)

The great majority of the revenues are raised in the WS systems, which account for 74% of all revenues. Retail WS receives 60% of revenues and bulk WS the remaining 14%. On the other hand, WWDT systems receive only 26% of all revenues, 22% in the retail activities and 4% in bulk wastewater. WWDT systems receive 27% of the retail revenues and 23% of the bulk water/wastewater revenues. These are lower proportions for WWDT than we found for the costs, especially in retail activities, which is a first evidence of the existence of cross-subsidization between both activities.

Focusing on the division between retail and bulk water/wastewater activities, we see that the latter account for less than 1/5 of the revenues (18%). The proportion is smaller for WWDT, whose bulk activities represent 16% of the total WWDT revenues while the figure for bulk WS is 19%.

6.2.   Tariff revenues

The fixed component of the tariff has a very significant weight on the tariff revenues, especially for WWDT (Figure 15), due to the importance of investment costs for the industry (Table 1

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shows that investment costs amount to between 18% and 32% of all costs, according to which system we are looking at).

This is in accordance with the position of the Portuguese regulator for the industry (IRAR) which states that "water and waste services imply large investment and maintenance costs, usually long-term highly sunk assets, therefore their tariffs should be composed of an availability part and another one for the use. The latter depends on actual consumption (volume of water supplied or wastewater and waste collected), covering the variable costs associated with the service use level, while the former intends to support mainly the fixed costs originated by the continuous availability of the service which do not depend on the level of utilization" (IRAR, 2008). There was some controversy prior to the publication of Law 12/2008 of February 26, due to the fact that it prohibits charging a rent for the water meter (it was a usual practice in Portugal to name the fixed component of the tariff as a water meter rent, which was a property of the water company). Some thought this would mean forbidding the existence of a fixed component in the tariff (permitted by the article 22 of the Decree-Law n. 207/94 of August 06) [20], but the law that was published does allow for the fixed component to exist because, although it prohibits charging for minimum consumption levels it does say in article 8 n. 3 that "for the purpose of the present article, fees and tariffs due to construction and maintenance of public water, sewage and solid waste systems are not considered minimum consumptions" (Assembleia da República, 2008).

In Portugal, most water utilities use both a fixed and a variable component in the tariffs for water for the several types of customers. For example, 97,5% of the water utilities included both components in the tariffs for residential customers in 2005 (for wastewater it is more common to use only one of the two components). Monteiro and Roseta-Palma (2007) provide a more detailed analysis of water and wastewater tariffs in Portugal.

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[20] Decree-Law n. 207/94 of August 06 contains the legal regime for creating and exploring public and private systems of water distribution and wastewater drainage. Article 22 regulates billing procedures.
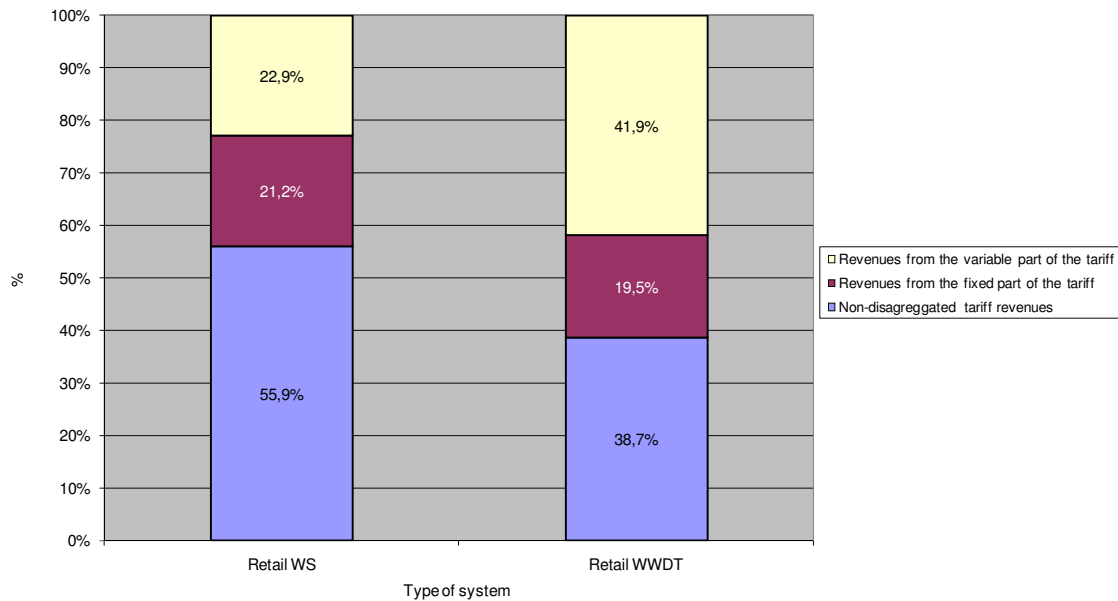
Figure 15 – Distribution of retail WS/WWDT tariff revenues (2005)

6.3. Non-tariff revenues

Figure 16 shows the several types of non-tariff revenues collected in the WS activity. More than 1/3 consists of payments for the execution of connection extensions. If we add the fees for the connection of private networks to the public connection extensions we already account for more than half of the non-tariff revenues (except for the year 2005, but that is due to a lower level of disaggregation in the data reported). Other revenues in this category are the charges for the establishment of contracts, the final payments to terminate them, payments to install or remove meters, for repairs, inspections or registration of contracted technicians.
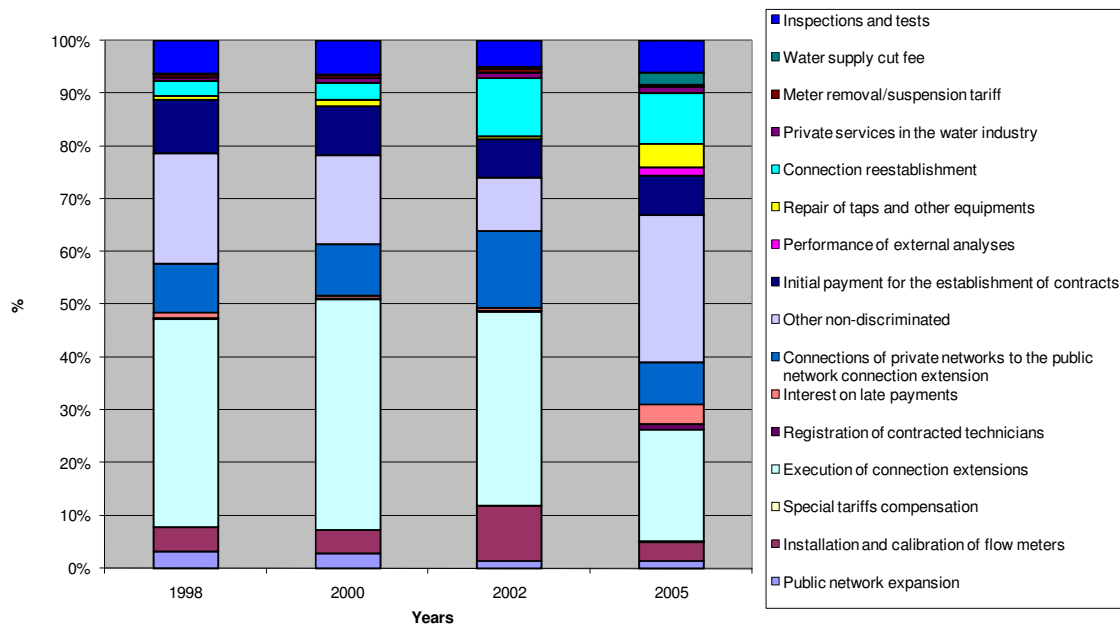
Figure 16 - Disaggregation of non-tariff revenues in WS (1998-2005)

Figure 17 shows the disaggregation of WWDT non-tariff revenues. Little more than half of them have been disaggregated in INSAAR. The revenues we find are again payments for the execution of public connection extensions or to connect private networks to them, payments for the establishment or the termination of contracts and inspections. We also find revenues originated from the activities of clearance of sewer networks, or cleaning private septic tanks and other collectors.
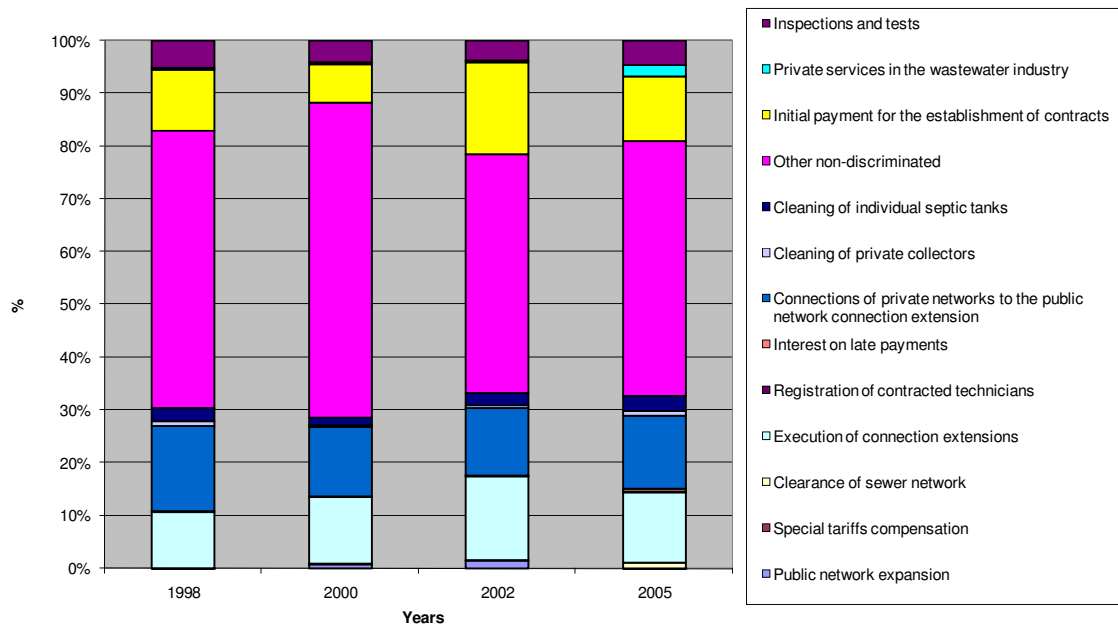
Figure 17 - Disaggregation of non-tariff revenues in WWDT (1998-2005)

6.4.   Revenues per utility and unit revenues

The average amount of revenues from bulk WS activities accruing to a water utility was €3,9 million, while the figure for WWDT was €3,2 million (Figure 18). The average amount of revenues per utility was, as expected, much lower for retail activities, €2,3 million for WS and €0,9 million for WWDT. We confirm the finding that, not only are bulk operators larger than retail ones, but also that WS systems collect significantly more revenue than the systems for WWDT, especially at the retail level where on average a WWDT utility collects more than 60% less revenue than the corresponding retail WS utility. The revenues declared to INSAAR are mainly composed of tariff revenues in any of the four types of systems considered.
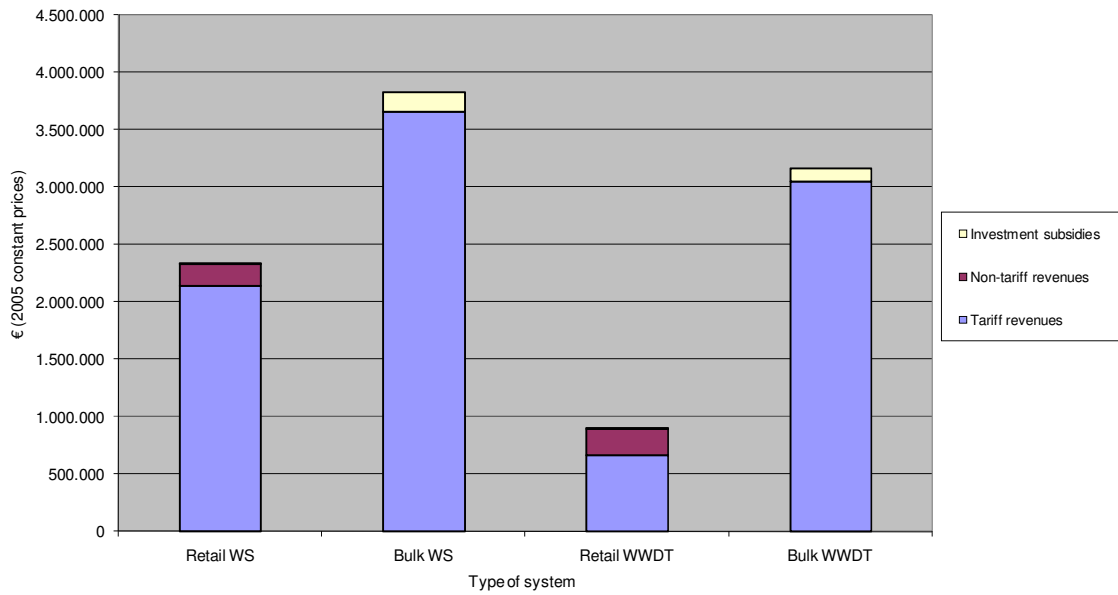
Figure 18 – Average revenue per utility in WS and WWDT systems (2005)

These facts can also be seen from the unit revenues collected per customer in retail WS and WWDT systems. While for WS the annual revenue per customer collected is €139,6/customer/year, the number for WWDT is only €60,9/customer/year (Figure 19). These values are insufficient to cover the costs reported in Figure 12 as we will conclude in the section regarding cost recovery levels.
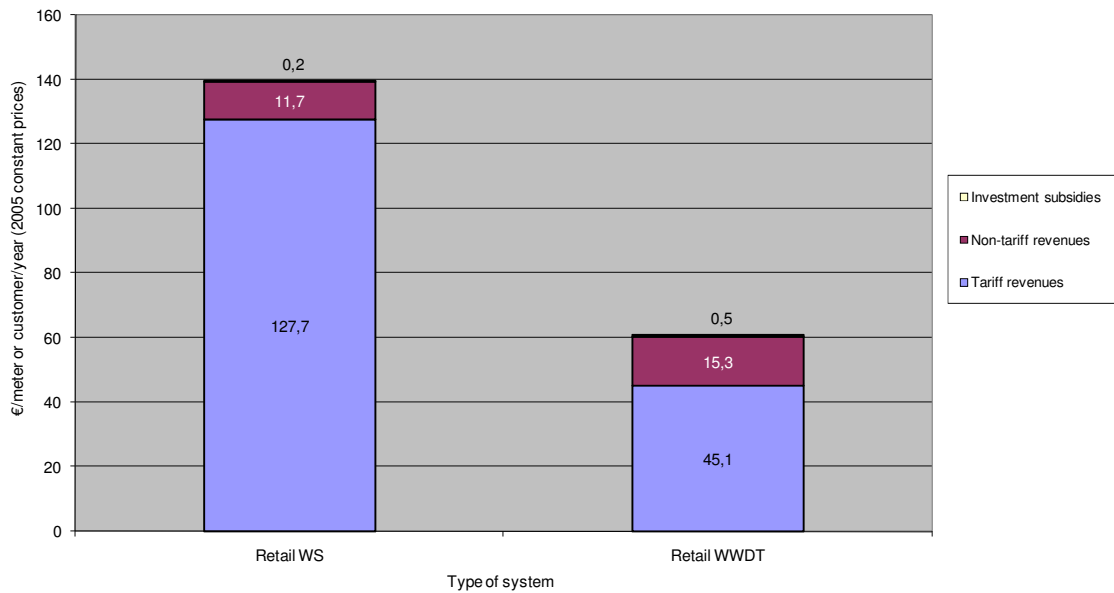
Figure 19 - Annual unit revenues per customer in retail WS and WWDT systems (2005)

The amount of revenue collected from each m^3 of retail water supplied was on average €1,09, while the revenue collected for each m^3 of retail wastewater drained was only €0,50 (Figure 20). The numbers for bulk activities were €0,39/m^3 in WS and €0,43/m^3 in WWDT. The lower values for bulk activities are to be expected because a minimum requirement for revenue collected at the retail level is that it covers the amounts paid to bulk operators for supplying water/draining wastewater to/from retail operators. To this requirement we have to add the need to cover the retail activities' own water distribution/wastewater collection costs.
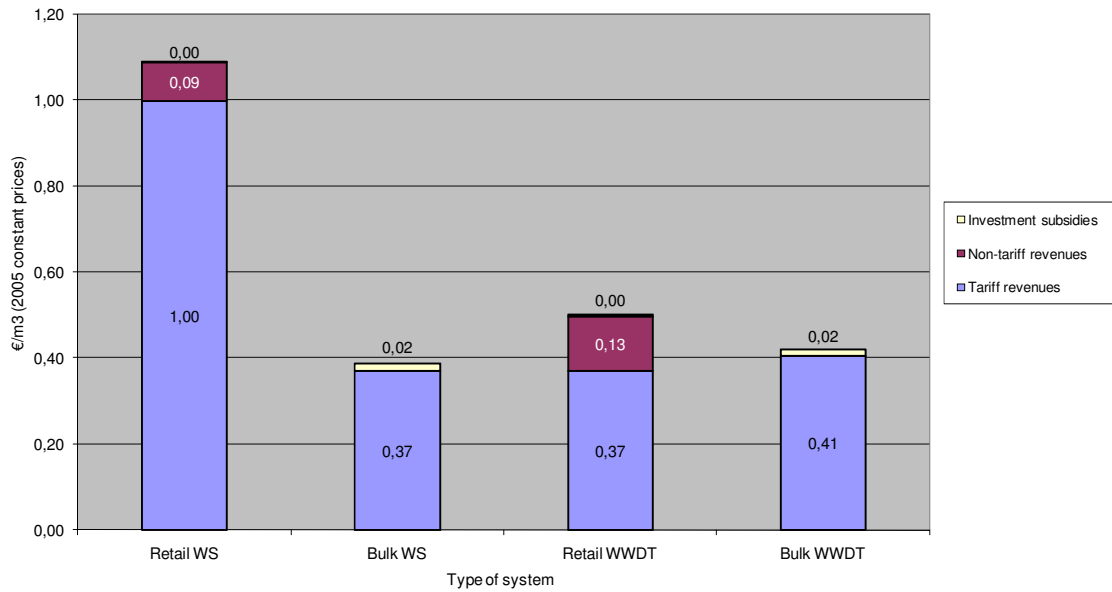
Figure 20 - Average unit revenue per m3 in WS and WWDT systems (2005)

The regional distribution of utilities' turnover in WS and WWDT follows closely the population distribution, as expected, due to the association between retail operators and the country's municipal administrative divisions (Map 8). The larger utilities are therefore located in west and south seacoasts, with the largest ones concentrating in the two metropolitan areas around Lisbon and Oporto.

Legend WS (map to the left)

▮ (red)	Less than € 500.000
▮ (orange)	Between € 500.000 and € 1.000.000
▮ (yellow)	Between € 1.000.000 and € 1.500.000
▮ (green)	Between € 1.500.000 and € 3.000.000
▮ (blue)	Above € 3.000.000

Legend WWDT (map to the right)

▮ (red)	Less than € 100.000
▮ (orange)	Between € 100.000 and € 200.000
▮ (yellow)	Between € 200.000 and € 500.000
▮ (green)	Between € 500.000 and € 2.000.000
▮ (blue)	Above € 2.000.000
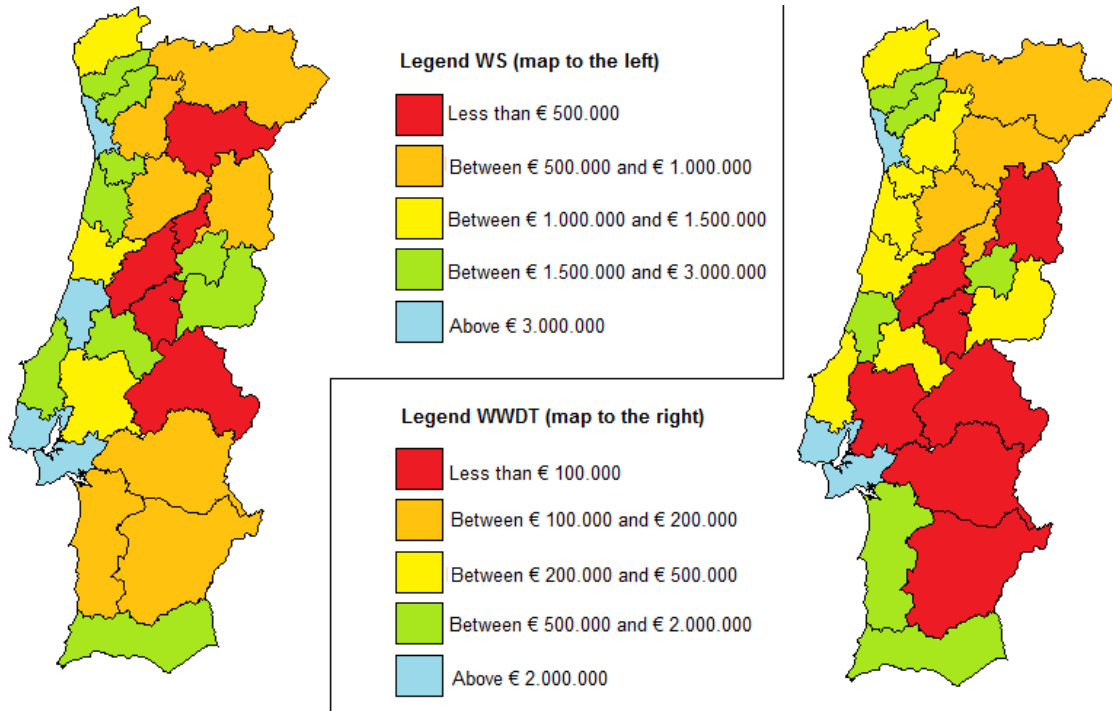
Map 8 – Average revenue per utility in retail WS and WWDT by NUTS III (2005)

Unlike the results for the geographical distribution of costs per customer (Map 4), we do find a clear pattern in the regional distribution of revenues per customer (Map 9). The highest values are found in the more densely populated regions in the west seacoast, especially around the largest cities. In fact, there does not seem to be a clear correspondence between higher costs (due to differences in altitude or in the investments in water and service quality) and higher revenues. Revenues per customer seem to be more related with population density (see Map 6) and income levels (Map 10)[21], which are higher in the more densely populated west coast regions, than with unit costs. This conclusion is suitable for both WS and WWDT systems, but one should notice the difference in scale in Map 9, because WWDT revenues are much lower than in WS.

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[21] Purchasing power index shown in Map 10 were obtained from the National Statistics Institute (INE), while the household disposable income per capita si obtained from the data provided by the Ministry of Finance and Public Administration on household taxable income and taxes collected.

Legend WS (map to the left)

- Less than € 80/customer/year
- Between € 80 and € 100/customer/year
- Between € 100 and € 120/customer/year
- Between € 120 and € 140/customer/year
- Above € 140/customer/year

Legend WWDT (map to the right)

- Less than € 10/customer/year
- Between € 10 and € 20/customer/year
- Between € 20 and € 35/customer/year
- Between € 35 and € 50/customer/year
- Above € 50/customer/year
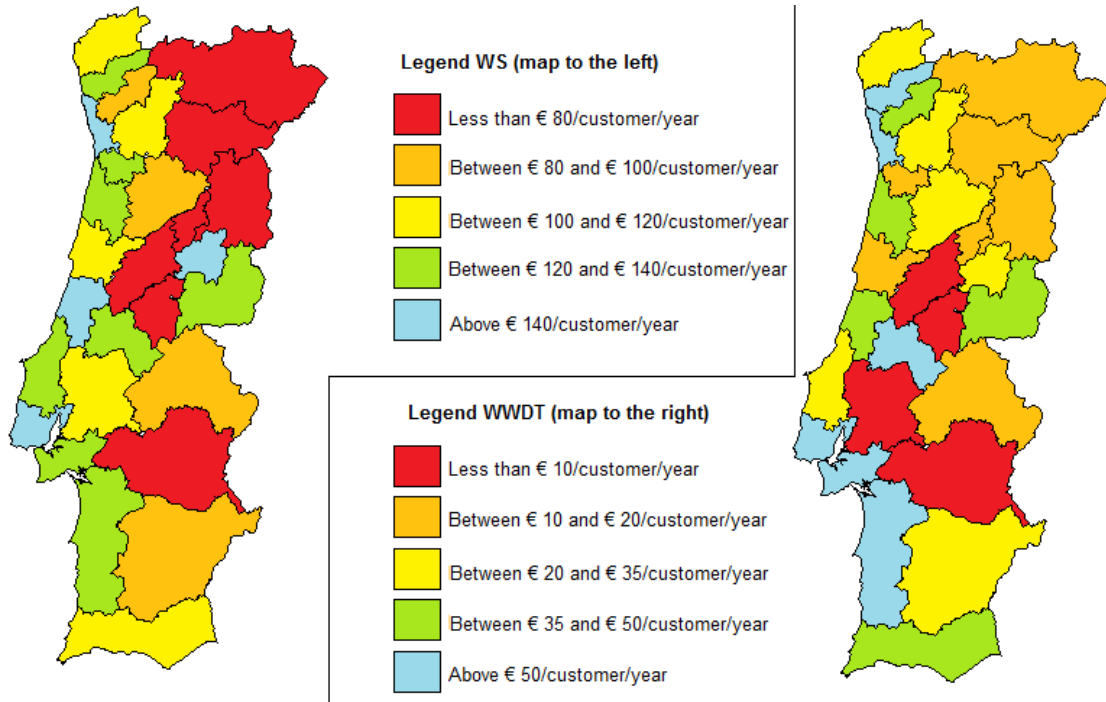
Map 9 – Average unit revenue per customer in retail WS and WWDT by NUTS III (2005)

Legend Purchasing Power Index 2005 (Portugal = 100)

- Less than 70
- Between 70 and 80
- Between 80 and 90
- Between 90 and 110
- Above 110

Legend Household disposable income per capita (€10^3/year)

- Less than 3
- Between 3 and 4
- Between 4 and 5
- Between 5 and 7,5
- Above 7,5
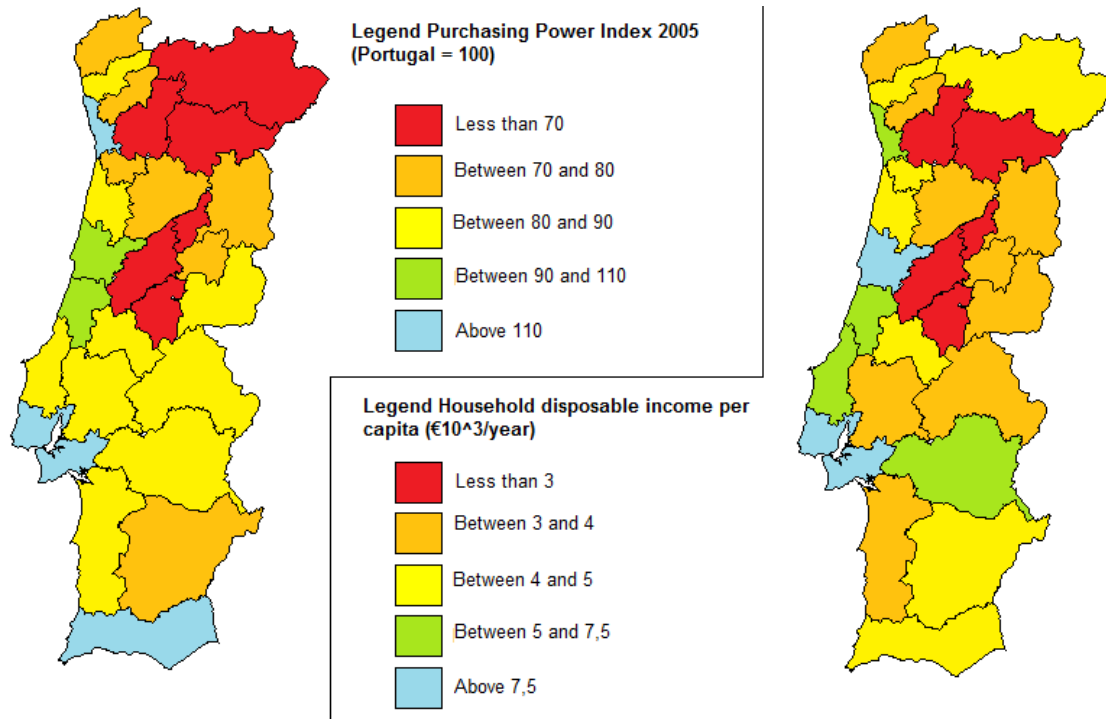
Map 10 – Purchasing power index and household disposable income per capita (2005)

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The same can be said about the unit costs per m^3, which are much lower in WWDT than in WS. The use of the WS scale in Map 11 for WWDT would turn most of the country to red in the right hand map, clearly showing the difference in the collection of revenue between both systems, but preventing the regional analysis in WWDT unit revenues. For this reason, we chose to have different scales for each type of retail system. From Map 11 we can see that, in general, there is a division between the west coastal regions where revenue collection per m^3 is higher and the inland regions where it is usually insufficient.
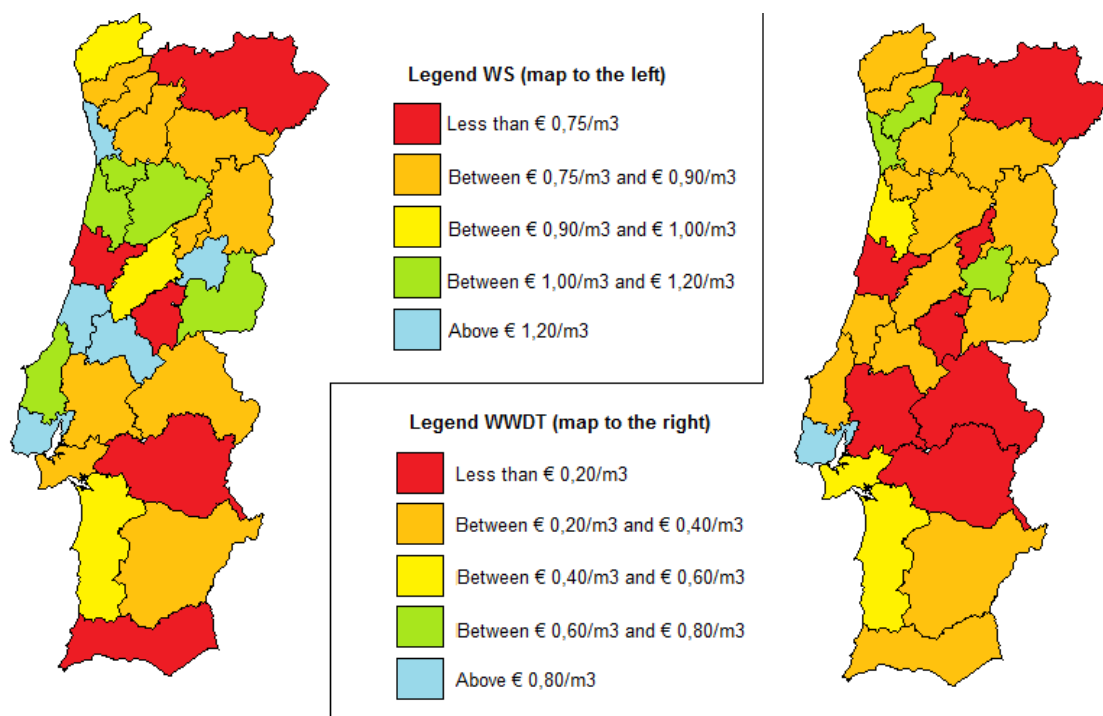
Map 11 – Average unit revenue per m^3 in retail WS and WWDT by NUTS III (2005)

Similar to the case for costs, we do not find a clear association between the revenue collection amounts and the type of water utility. Table 6 shows the unit revenues in retail WS and WWDT systems disaggregated by type of utility. Municipalities are confirmed to have on average a size which is several times smaller than all the other types, both in WS and in WWDT, reflecting their predominance throughout the country, while the alternative management arrangements are more commonly found in the urban centres. The types of utilities with higher average revenues are the public companies (this is a result of the influence of Lisbon, where EPAL[22] manages the

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[22] EPAL – Empresa Pública de Águas Livres is a Public Limited Company, whose share capital is held entirely by AdP- Águas de Portugal, the public holding company for the industry.

WS systems, in a type which exists in few municipal counties) and the autonomous municipal services (because they are mainly found in large cities).

Results are not so clear regarding the unit revenues per customer and per m^3. Private, public companies and autonomous municipal services are the types of utilities with higher unit revenues in WS, while municipal companies and municipalities show lower levels of revenue collection. On the contrary, for WWDT, municipalities have some of the highest figures. Public companies show high unit revenues per customer but low unit revenues per m^3 in WWDT, while autonomous municipal services on the other hand show low unit revenues per customer, but not so for m^3. Overall, we do not find an ordering we can clearly associate to a transition from public to private, or from the public service type of management to a more business-like type of management.

Table 6 – Unit revenues by type of utility in retail WS and WWDT (2005)

	Average revenue per utility (2005) (€)		Average unit revenue per customer (2005) (€/customer/year)		Average unit revenue per m^3 (2005) (€/m^3)	
	Retail WS	Retail WWDT	Retail WS	Retail WWDT	Retail WS	Retail WWDT
Municipal or Intermunicipal Company	4.816.430	1.997.263	136,6	56,2	0,79	0,39
Private Company	5.545.739	2.263.946	175,0	59,5	1,21	0,42
Public Company	11.249.743	2.187.172	194,7	90,8	1,34	0,43
Municipality	762.564	506.590	91,3	63,2	0,78	0,54
Autonomous Municipal Services	8.704.821	3.168.946	170,0	55,3	1,38	0,51
Total	2.338.926	900.929	139,6	60.4	1,09	0,50

6.5. Rates of change in revenues

The revenues have experienced significant real growth rates in all four types of systems (Table 7). The evolution of total revenues is naturally determined by the evolution of tariff revenues, because of their weight on total revenue. With the exception of bulk water, the computed average annual growth rates for revenues fall short of their counterparts for costs. This anticipates an eventual decline in the cost recovery levels, which we will look into in the following section.

Table 7 – Average annual rate of change in revenues in WS and WWDT 1998-2002

Type of system	Type of revenues by system	Average annual rate of change (a)		
		98-00	00-02	02-05
Retail WS	Tariff revenues	2,9% (80%)	2,2% (89%)	0,7% (94%)
	Non-tariff revenues	4,4% (56%)	15,4% (66%)	9,5% (77%)
	Investment subsidies	-28,9% (8%)	-0,4% (9%)	2,3% (11%)
	Total revenues (b)	**3,3% (80%)**	**2,9% (89%)**	**1,7% (94%)**
Bulk WS	Tariff revenues	18,3% (89%)	6,7% (96%)	-0,7% (93%)
	Non-tariff revenues	-	-	-
	Investment subsidies	17,8% (5%)	0,7% (6%)	0,1% (7%)
	Total revenues (b)	**18,3% (89%)**	**6,4% (96%)**	**-0,7% (93%)**
Retail WW	Tariff revenues	8,5% (77%)	3,0% (84%)	4,7% (90%)
	Non-tariff revenues	-21,2% (39%)	14,9% (61%)	-1,6% (74%)
	Investment subsidies	14,5% (12%)	3,2% (12%)	0,8% (13%)
	Total revenues (b)	**14,3% (77%)**	**6,9% (84%)**	**4,0% (90%)**
Bulk WW	Tariff revenues	16,9% (84%)	4,3% (64%)	31,1% (69%)
	Non-tariff revenues	-	-	-
	Investment subsidies	-	-	0,0% (7%)
	Total revenues (b)	**11,4% (84%)**	**4,3% (64%)**	**32,2% (69%)**

(a) The calculated rates of change only consider those utilities for which there is information on the cost category for the two years under consideration (the % of volume supplied/drained in the latter year by the utilities being considered in shown in parenthesis)

(b) The utilities considered for the calculation of rates of change for total revenues were those which had information on tariff revenues for the two years under consideration. For non-tariff revenues and investment subsidies we followed the assumption that missing data is due to a lack of reporting of null values interpreted them as such.

Table 8 and Table 9 show that unit revenues for WS systems have even declined in real terms (after inflation is taken into account) during the period 1998-2005, due to a decrease in the real value of the tariff revenues, which reveals that tariff updates have been insufficient on average to prevent the erosion effect of inflation on tariffs. The gap between revenues and costs for WS systems is thus expected to have increased during the seven-year period being analysed.

WWDT revenues, on the other hand have been increasing at a rate greater than the inflation rate. This effect benefits in part from the fact that some utilities which did not use to charge for the WWDT service have begun to do so. If we compare with the growth rates for unit costs from Table 4 and Table 5 we see that even these increases in unit revenues have been insufficient to keep up with the large increase in unit costs for the case of retail WWDT. For bulk WWDT, the situation in inverted, and the very significant growth in revenues does enable the gap between revenues and costs to be partially diminished.

Table 8 – Average annual rate of change in per customer unit revenues in WS and WWDT 1998-2005

Type of system	Type of revenues by system	Average annual rate of change (a)		
		98-00	**00-02**	**02-05**
Retail WS	Tariff revenues	-0,7% (80%)	-1,1% (89%)	-1,9% (94%)
	Non-tariff revenues	0,7% (56%)	12,0% (66%)	6,8% (77%)
	Investment subsidies	-32,3% (8%)	-3,9% (9%)	0,7% (11%)
	Total unit revenue per customer	**-0,4% (80%)**	**-0,4% (89%)**	**-1,0% (94%)**
Retail WW	Tariff revenues	4,4% (76%)	-0,5% (83%)	1,8% (89%)
	Non-tariff revenues	-24,3% (39%)	11,3% (61%)	-4,2% (74%)
	Investment subsidies	9,4% (12%)	-0,5% (12%)	-0,8% (13%)
	Total unit revenue per customer	**10,0% (76%)**	**3,2% (83%)**	**1,1% (89%)**

(c) The calculated rates of change only consider those utilities for which there is information on the cost category for the two years under consideration (the % of volume supplied/drained in the latter year by the utilities being considered in shown in parenthesis)

(d) The utilities considered for the calculation of rates of change for total revenues were those which had information on tariff revenues for the two years under consideration.

For non-tariff revenues and investment subsidies we followed the assumption that missing data is due to a lack of reporting of null values interpreted them as such.

Table 9 – Average annual rate of change in per m³ unit costs in WS and WWDT 1998-2005

Type of system	Type of revenues by system	Average annual rate of change (a)		
		98-00	**00-02**	**02-05**
Retail WS	Tariff revenues	-1,7% (80%)	0,1% (89%)	-0,6% (94%)
	Non-tariff revenues	-0,5% (56%)	13,6% (66%)	8,5% (77%)
	Investment subsidies	-37,7% (8%)	1,3% (9%)	0,2% (11%)
	Total unit revenue per m³	**-1,4% (80%)**	**0,8% (89%)**	**0,3% (94%)**
Bulk WS	Tariff revenues	-6,0% (96%)	-1,0% (96%)	-0,6% (93%)
	Non-tariff revenues	-	-	-
	Investment subsidies	-52,8% (5%)	-18,5% (6%)	-3,6% (7%)
	Total unit revenue per m³	**-6,5% (89%)**	**-1,3% (96%)**	**-0,6% (93%)**
Retail WW	Tariff revenues	-1,1% (77%)	-1,7% (84%)	0,4% (90%)
	Non-tariff revenues	-27,3% (39%)	11,5% (61%)	-5,1% (74%)
	Investment subsidies	0,1% (12%)	-1,2% (12%)	-5,1% (13%)
	Total unit revenue per m³	**4,1% (77%)**	**1,9% (84%)**	**-0,6% (90%)**
Bulk WW	Tariff revenues	8,1% (84%)	10,4% (64%)	18,7% (69%)
	Non-tariff revenues	-	-	-
	Investment subsidies	-	-	-50,2% (7%)
	Total unit revenue per m³	**8,1% (84%)**	**10,4% (64%)**	**19,7% (69%)**

(a) The calculated rates of change only consider those utilities for which there is information on the cost category for the two years under consideration (the % of volume supplied/drained in the latter year by the utilities being considered in shown in parenthesis)

(b) The utilities considered for the calculation of rates of change for total revenues were those which had information on tariff revenues for the two years under consideration. For non-tariff revenues and investment subsidies we followed the assumption that missing data is due to a lack of reporting of null values interpreted them as such.

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7. COST RECOVERY LEVELS

In this section we take the information on revenues and costs, described in detail in the previous sections, and compute the cost recovery ratios for the retail and bulk WS and WWDT systems in mainland Portugal. We only show the results for the years 2002 and 2005, where we consider that the available information is enough to perform the analysis. For the previous two years, the information available is much poorer, representing less than 50% of the volume supplied/drained by the utilities in most of the types of systems. For the latter years of 2002 and 2005, the amount of data reported improves significantly and the utilities on whose data the results can be calculated represent always more that 72% of all volume supplied/drained.

Table 10 shows the results for the several types of systems considered. There are three main conclusions to be taken. The first is that cost recovery falls short of 100% in all types and all periods. The revenue collected, mainly through the tariffs is insufficient to cover the costs of the activity. Financial sustainability of the WS and WWDT systems implies the reduction of unit costs, or alternatively the increase in unit revenues. In Portugal there may be efficiency gains that can be seized for example from increasing the scale of the systems by merging neighbouring utilities (see Martins et al., 2008, on the existence of economies of scale for the Portuguese water industry). However if the possible cost reductions are insufficient and if we exclude the possibility of subsidization to the legal requirements described in the Section 2 (the user pays-principle in short), we have to conclude then that tariff levels must surely rise to meet the WFD and Water Law requirements of cost recovery in the industry.

Table 10 – Cost recovery levels for mainland Portugal by type of system (2002-2005)

(a)	Retail WS	Bulk WS	Retail WWDT	Bulk WWDT
2002	96% (95%)	63% (98%)	52% (93%)	58% (100%)
2005	91% (93%)	51% (99%)	56% (92%)	63% (72%)

(a) The calculated cost recovery ratios only consider those utilities for which there is information on the all cost and revenue categories for the two years under consideration (the % of volume supplied/drained in the latter year by the utilities being considered in shown in parenthesis). For non-tariff revenues, investment subsidies, bulk water purchase / wastewater drainage costs, general administrative costs and financial expenditures we followed the assumption that missing data is due to a lack of reporting of null values interpreted them as such.

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The second conclusion is that the situation is less severe in retail WS. This may, however, be an evidence of cross subsidization between the activities of WS and WWDT which are usually managed by the same utility at the retail level.

The third result is that, for the 3-year period (2002-2005) for which an analysis is possible, while the situation for WWDT has improved, the contrary has happened for WS. On the one hand, this may reveal a decrease in the cross-subsidization levels, but on the other hand we do not see any evidence that water/wastewater utilities came any closer to full cost recovery as we approach the 2010 deadline set by the WFD (see also Table 12).

Table 11 adds more information about the level of cost recovery in the Portuguese water and wastewater industry, namely regarding the % of utilities which have levels of cost recovery greater than or equal to one.

Table 11 - % of water/wastewater utilities and corresponding volumes supplied/drained with cost recovery ratios above and below unity in WS and WWDT (2002-2005)

	Retail WS		Bulk WS		Retail WWDT		Bulk WWDT	
	2002	2005	2002	2005	2002	2005	2002	2005
% of the water/wastewater utilities with a cost recovery ration ≥ 1	27,8%	33,1%	18,3%	4,9%	6,2%	6,7%	12,5%	14,3%
% of the water/wastewater utilities with a cost recovery ration < 1	72,2%	66,9%	81,7%	95,1%	93,8%	93,3%	87,5%	85,7%
% of the volume supplied/drained reported by the utilities with a cost recovery ratio ≥ 1	53,3%	50,2%	2,7%	0,0%	23,6%	25,6%	31,2%	8,8%
% of the volume supplied/drained reported by the utilities with a cost recovery ratio < 1	46,7%	49,8%	97,3%	100,0%	76,4%	74,4%	68,8%	91,2%

We can see that in 2005 only 33,1% of all retail WS utilities collected an amount of revenues sufficient to cover their costs, according to the data reported to INSAAR. Nevertheless they

represented 50,2% of the volume supplied. This seems to indicate some degree of association between the size of the utility and the level of cost recovery.

This is also true of retail WWDT, where only 6,7% of the wastewater utilities recover their costs trough the revenue, but they represent 25,6% of the volume drained. The same can not be said of bulk activities where this association is not always so clear. This result is in accordance with Martins et al., 2008, which claims that economies of scale for the Portuguese water industry are mostly found in small and medium-sized utilities.

Overall the conclusions remain that only for WS do we find some evidence of possible financial sustainability of the systems (we must bear in mind our suspicion regarding the underreporting of investment subsidies) and that there is no evidence that the situation has improved.

Our study is not strictly comparable to the official cost recovery calculations performed by INAG (2005, 2007 and 2008), because they may have different assumptions or focus on different aspects of the problem (for example, INAG calculates cost recovery levels for residential customers, while we disaggregate between retail and bulk activities[23]). It is nevertheless instructive to look at the official results.

INAG start off by including the results for cost recovery levels in the river basin regions reports required by article 5 of the WFD (INAG, 2005) and has subsequently reported them in the regular INSAAR reports (INAG 2007, 2008). Table 12 shows the results for WS and WWDT separately and in conjunction.

Table 12 – Cost recovery levels in mainland Portugal in WS and WWDT (2002-2006)

%	WS	WWDT	WS+WWDT
2002	99	54	82
2005	87	57	76
2006	89	46	74

Source: INAG (2005, 2007, 2008)

We find here the same three conclusions drawn before: cost recovery levels fall short of 100%, the situation is worse for WWDT and cost recovery levels have been deteriorating instead of improving. The overall measure computed for the industry sums up the worrisome proof that the Portuguese water and wastewater industry came no closer to meeting the WFD of cost recovery

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[23] One possible explanation for some of the differences between our study and the INAG reports regarding the computed cost recovery ratios may be in our separation between retail and bulk activities. For our purposes, it is relevant to consider the costs/revenues from bulk water/wastewater transactions between retail and bulk operators. For INAG, on the contrary, these categories cancel themselves out due to the aggregate nature of their problem for WS or WWDT. It is, thus, expectable that both studies report the same qualitative conclusion but with differences in the exact measure of the deficits found.

in the past few years. On the contrary, the gap between revenues and costs has increased from 18% to 26% in four years.

The people who intervene in the industry are aware of the problem. Take for example the statement of a former president of the National Water Institute and current president of AdP: "the tariffs for the several water services (drinking water supply, sewage, irrigation and industry) do not reflect totally the costs involved. In many cases, the difference between tariffs and costs is immense, up to the point where the financial sustainability of the service is not assured, despite the fact that the investments in infrastructures have been financed with government subsidies" (Serra, 2001, p. 284).

Map 12 and Map 13 reveal the regional differences in the cost recovery ratios for retail WS and WWDT respectively, for the years 2002 and 2005. The lowest values for the cost recovery ratios are found in the northeast inland part of Portugal and more recently also in the southern inland part of Alentejo. We have shown previously that, while for the northern regions, the rugged terrain and the dispersion of population settlings may partly explain this results, it is mainly the low revenue collection that is responsible for the low ratios. Political reasons regarding the concern with the income levels of the population in these regions may be the reason for the low levels of the water and wastewater tariffs. The cost recovery levels are higher for the west and south coastal regions, which are more urbanized, more densely populated and have in general greater income levels.

Cost recovery levels are to a great extent lower in the WWDT systems, where only the Lisbon area is found to have a ratio of cost recovery greater than one on average. The overall scenery is dreadful, with a large number of regions presenting cost recovery rations lower than 0,2. This is natural if we think that one third of the utilities in Portugal did not charge for wastewater at all (Monteiro and Roseta-Palma, 2007). Wastewater activities benefit from the fact that the same utility usually manages both systems, so that cross subsidization of the WWDT activity is possible.
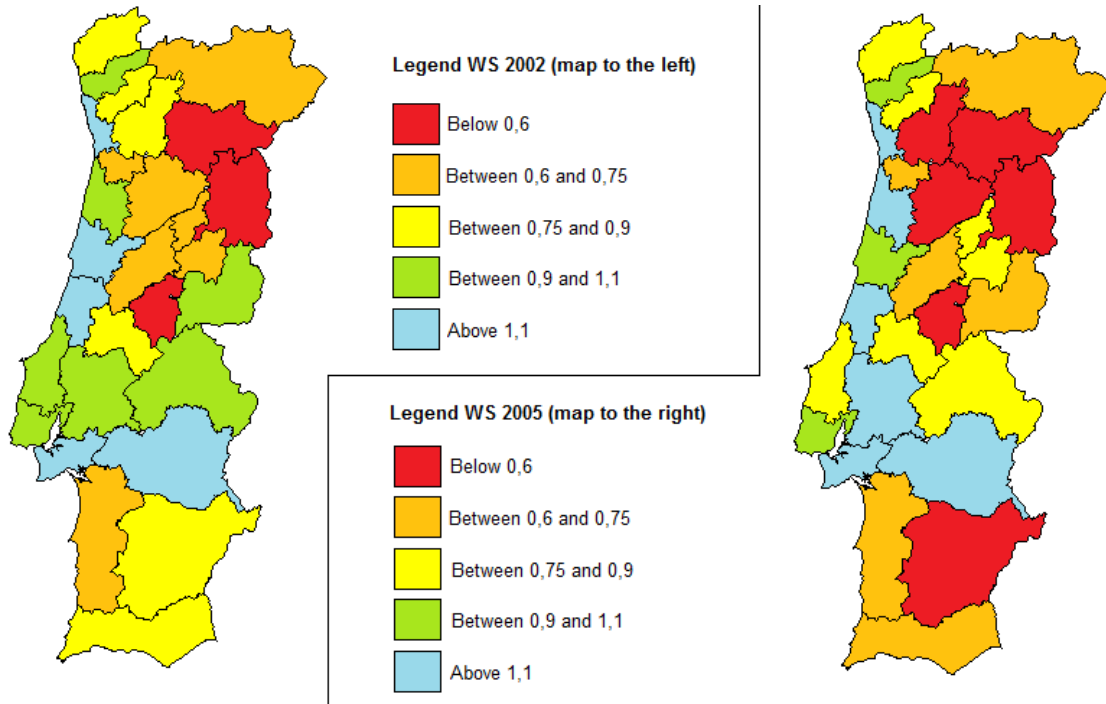
Map 12 – Cost recovery ratios in retail WS by NUTS III (2002-2005)
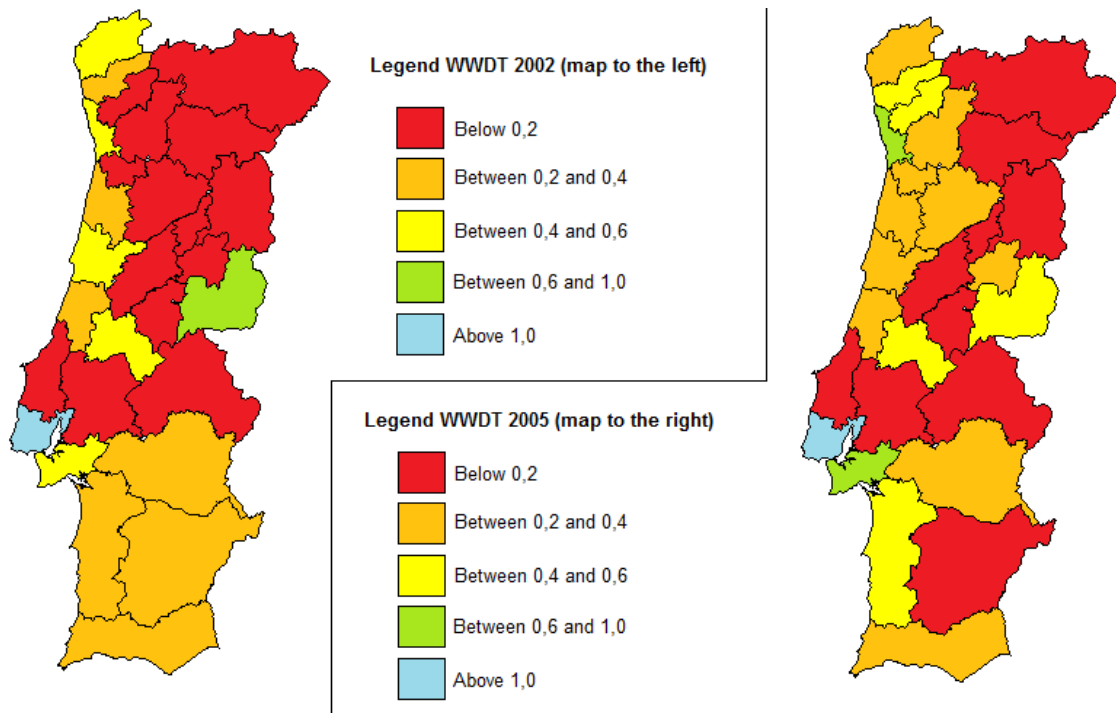
Map 13 – Cost recovery ratios in retail WWDT by NUTS III (2002-2005)

If the cost recovery principle from article 9 of the WFD (already reflected in the new Water Law and in the recent Economic and Financial Regime for the Water Resources) is to be complied with then revenue collection must surely rise in the great majority of the municipal counties for retail activities and also in bulk water and wastewater systems. This means that average tariffs will certainly have to increase, something that is even truer of the systems and utilities located in the less densely populated and poorer inland parts of the country. The fact that this may contribute to the worsening of the regional imbalances, has led to the inclusion in PEAASAR II (Strategic Plan for Water Supply and Wastewater Sewage 2007-2013) of the possibility of creating a Tariff Balancing Fund, which would try to keep tariffs of multi-municipal systems supplying bulk water within a price band considered reasonable, through the subsidization of the systems with greater costs[24]. Although the objectives of economic cohesion can have their merit, this type of instrument must be used cautiously to say the least, because this kind of cross-subsidization between different territorial systems can cause losses of efficiency, something that is recognized in PEAASAR II which states that "the existence of an equalization mechanism of this kind can work as a disincentive to the optimization of each system individually considered" (MAOTDR, 2006, p. 79).

Looking into the cost recovery levels by type of utility (Table 13), once again we find no evidence of an association between a more private/public ownership or a more or less business-like management and cost recovery ratios. Public companies have the highest figures for this indicator (except for WW in 2002), followed by the autonomous municipal services and the municipal companies in WS and by the municipalities in WWDT. On the other hand private companies show low levels of cost recovery in both types of activities. The types of utilities associated with the municipalities have different results in WS and in WWDT. Municipalities themselves have low ratios in WS but have some of the highest in WWDT (even though they are still very low). The autonomous municipal services and the municipal companies have high ratios for WS and low ratios for WWDT. Overall no conclusion can be taken from these results regarding the advantages and disadvantages of business-like management and private ownership.

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[24] PEAASAR takes advantage of art. 9, n. 1, of the WFD which states that "Member States may (…) have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected" to attempt some convergence in the tariffs, "without nevertheless intending to equalize tariffs in the all country" (MAOTDR, 2006, p. 79). It's stated in PEAASAR that "efficiency is not, however, the only value at stake, nor is «full cost recovery» the only principle that can be applied. Equity, regional and individual, is another value to defend and universality and accessibility are also objectives to be achieved" (ibid.).

Table 13 – Cost recovery ratios by type of utility in retail WS and WWDT (2005)

	Cost recovery ratio in retail WS		Cost recovery ratio in retail WW	
	2002	**2005**	**2002**	**2005**
Municipal or Intermunicipal Company	1,07	0,96	0,41	0,53
Private Company	0,81	0,74	0,43	0,49
Public Company	1,16	1,23	0,50	0,66
Municipality	0,78	0,79	0,57	0,59
Autonomous Municipal Services	1,02	0,94	0,51	0,53
Total	0,95	0,91	0,52	0,56

8. CONCLUSION

In this document we updated the results of Monteiro (2007) regarding the analysis of costs and revenues for the Portuguese water and wastewater industry for 2005, halfway between the publication of the WFD and the 2010 deadline for the implementation of adequate cost recovery levels and efficient water pricing, and assessed their evolution between 1998 and 2005. We also presented a brief historical overview of the presence of the cost recovery principle in the Portuguese law regarding the industry.

Overall four main conclusions stand out. First, the need to collect revenues from the users to cover the costs of the service has been present in the Portuguese law for decades and the introduction of the cost recovery principle is prior to the transposition of the WFD through the more recent Water Law. Nevertheless, it always lacked practical implementation. The novelty from the new legislation is more the inclusion of scarcity and environmental costs in the set of costs to be recovered through revenue collection and not so much the cost recovery principle in itself. Second, the level of revenues collected by the WS and WWDT utilities is still currently, on average, insufficient to meet the financial costs of their activities (we do not assess here the scarcity and environmental costs). Third, the situation is worse in the case of WWDT than in WS revealing evidence of cross-subsidization within the utilities which manage both systems. Fourth, the situation has worsened in recent years.

The lower levels for cost recovery ratios are found in the northeast inland part of the country and in the southern part of Alentejo. While in the former reasons can be found in the rugged terrain and the disperse nature of the population settlings to justify higher unit costs, the same cannot be said of the latter. Nevertheless the main reason for the deficits found is mainly the lack of enough revenue collection through the tariffs in both cases. Political concerns with the

low levels of income in these regions may be behind the low levels of tariffs for water and wastewater.

If the cost recovery principle from article 9 of the WFD (already reflected in the new Water Law and in the recent Economic and Financial Regime for the Water Resources) is to be complied with, then revenue collection must surely rise and average tariffs will have to increase. This is even truer of the systems and utilities located in the less densely populated and poorer inland parts of the country. Caution should be used in the resort to instruments such as the Tariff Balancing Fund mentioned in PEAASAR II to promote regional economic cohesion, as it distorts incentives to optimize the systems and generates efficiency losses.

We find no clear evidence of an association between the cost recovery levels (or the unit costs or revenues) and the type of utility. The results do not seem to favour neither public nor private ownership, nor do they shed light on the best management model (public service vs. business-like management).

The new Water Law and the corresponding Economic and Financial Regime of Water Resources transposed the full cost recovery principle (including scarcity and environmental costs) from the WFD. The new water resource charge, in force since July 2008, is a step forward towards the internalization of the scarcity and environmental costs and will have to be reflected in the tariffs consumers face. For adequate cost recovery to be achieved by 2010, additional tariff increases will have to happen, so that unlike previous legislation, the new legal regime for water resources should be applied this time.

9. REFERENCES

Alves, António and Bernardino **Pinto** (eds.) (2004), *Economia da Água do Plano Nacional da Água*, [Water Economics in the National Water Plan] Lisbon: INAG – National Water Institute.

APDA (2006), *Água e Saneamento Em Portugal: O Mercado e Os Preços*. [Water and Sewage in Portugal – The market and the Prices] Lisbon: APDA – Associação Portuguesa de Distribuição e Drenagem de Águas - Comissão Especializada de Legislação e Economia [Portuguese Association of Water Supply and Drainage – Specialized Commission for Legislation and Economics].

Assembleia da República (2008), Law nº 12/2008 of February 26. [Legislation regarding the protection of the customers of essential public services]

Assembleia da República (2007), Law nº 2/2007 of January 15. [Local/Municipal Finance Law]

Assembleia da República (2005), Law nº 58/2005 of December 29. [Water Law]

Baptista, Jaime Melo, Dulce Álvaro **Pássaro** and Rui Ferreira Dos **Santos** (2006), *A Nova Lei Da Água e Os Serviços de Abastecimento Público de Água e de Saneamento de Águas Residuais Urbanas* [The New Water Law and the Public Urban Water Supply and Wastewater Sewage Services], Lisbon: IRAR – Regulating Authority for Water and Waste.

Bithas, Kostas (2008), "The sustainable residential water use: Sustainability, efficiency and social equity. The European experience", *Ecological Economics*, 68(1): 221-229.

Dahan, Momi and Udi **Nisan** (2007), "Unintended Consequences of Increasing Block Tariffs Pricing Policy in Urban Water", *Water Resources Research*, 43(3): 1-10.

European Commission (2008), *Guide to Cost-Benefit Analysis of Investment Projects: Structural Funds, Cohesion Fund and Instrument for Pre-Accession, Final Report,* Directorate General Regional Policy, European Commission.

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European Union (2000), "Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the community action in the field of water policy – EU Water Framework Directive", Official Journal (OJL 327, 22-12-2000, pp. L327/1-L327/72).

Foster, Vivien and Tito **Yepes** (2006), "Is Cost Recovery a Feasible Objective for Water and Electricity? The Latin American Experience", *World Bank Policy Research Working Paper* No. 3943.

Evans, D. and H. **Sezer** (2005), "Social discount rates for member countries of the European Union", *Journal of Economic Studies*, 32(1): 47-59.

INAG (2008), *Relatório do Estado do Abastecimento de Água e de Saneamento de Águas Residuais - Campanha INSAAR 2006*, [Report on the State of Water Supply and Wastewater Sewage] Lisbon: INAG – National Water Institute, Ministry of Environment, Spatial Planning and Regional Development.

INAG (2007), *Relatório Sobre o Estado dos Sistemas Públicos de Abastecimento de Água e de Drenagem e Tratamento de Águas Residuais - INSAAR 2005*, [Report on the State of Water Supply and Wastewater Drainage and Treatment Public Systems] Lisbon: INAG – National Water Institute, Ministry of Environment, Spatial Planning and Regional Development.

INAG (2005), *Relatório Síntese sobre a Caracterização das Regiões Hidrográficas Prevista na Directiva-Quadro da Água*, [Synthesis Report on River Basin Characterization referred in the Water Framework Directive] Lisbon: INAG – National Water Institute, Ministry of Environment, Spatial Planning and Regional Development.

INAG (2002), *INSAAR – Glossário*, Lisbon: INAG – National Water Institute, Ministry of Environment, Spatial Planning and Regional Development.

Komives, Kristin, Quentin **Wodon**, Vivien **Foster**, Roohi **Abdullah** and Jonathan **Halpern** (2006), "The Distributional Incidence of Residential Water and Electricity Subsidies", *World Bank Policy Research Working Paper* No. 3878.

IRAR (2008), *Nota sobre a nova legislação relativa a serviços públicos essenciais*. [Comment on the new legislation regarding essential public services] Lisbon: IRAR – Regulating Authority for Water and Waste.

IRAR (2007), *Relatório Anual Do Sector de Águas e Resíduos Em Portugal – 2006*. [Annual Report on Water and Waste Industry in Portugal] Lisbon: IRAR – Regulating Authority for Water and Waste.

Martins, Rita, Fernando **Coelho** and Adelino **Fortunato** (2008), "Water Losses and Hydrographical Regions Influence on the Cost Structure of the Portuguese Water Industry", *Estudos do GEMF*, 06/2008, Monetary and Financial Research Group, School of Economics, University of Coimbra.

Mendes, Adérito, João **Avillez**, Pedro **Mendes**, Fernanda **Gomes**, Simone **Martins**, Patrícia **Cardoso**, Sónia **Cardoso**, Djamila **Costa**, Sara **Mendes**, Gisela **Robalo** and Sónia **Silva** (2006), "Inventário nacional de sistemas de abastecimento de água e de águas residuais" [National Inventory of Water Supply and Wastewater Systems], *Tecnologia da Água*, I, March 2006, pp. 34-42.

MAOTDR (2006), *PEAASAR II – Plano Estratégico de Abastecimento de Água e Saneamento de Águas Residuais 2007-2013*. [Strategic Plan for Water Supply and Wastewater Drainage] Ministry of Environment, Spatial Planning and Regional Development.

MAOTDR (2008), Decree-Law nº 97/2008 of June 11. Ministry of Environment, Spatial Planning and Regional Development [Economic and Financial Regime for Water Resources]

Monteiro, Henrique and Catarina **Roseta-Palma** (2007), "Caracterização dos tarifários de abastecimento de água e saneamento em Portugal" [Portuguese Water Supply and Sewage Tariffs Report], *Working Paper* n. 07/58, Dinâmia – Research Centre on Socioeconomic Change.

Monteiro, Henrique (2007), "Recuperação de custos no sector de abastecimento de água e drenagem e tratamento de águas residuais em Portugal" [Cost Recovery in the Portuguese Water

Supply and Wastewater Drainage and Treatment Industry], Working Paper n.º 2007/57, Dinâmia, Research Centre on Socioeconomic Change.

OECD (2006), "Water: The Experience in OECD Countries", *Environmental Performance Reviews*, Paris, OECD - Organisation for Economic Cooperation and Development.

UNDP (2006), *Human Development Report 2006 – Beyond scarcity: Power, poverty and the global water crisis*, United Nations Development Programme.

Ribeiro, Ana Katila (2007), "A recuperação dos custos e a Lei da água" [Cost recovery and the Water Law], Master's thesis in Civil Engineering, *Specialization in Hydraulics, Water Resources and Environment*. Civil Engineering Department, School of Science and Technology, University of Coimbra.

Ribeiro, Ana Katila, Pedro Cunha **Serra** and Maria da Conceição **Cunha** (2006), "Os antecedentes do princípio da recuperação de custos na DQA" [The background of the cost recovery principle in the WFD], presented at the 5th Iberian Conference on Water Planning and Management held in Faro in December 2006.

Roseta-Palma, Catarina, Henrique **Monteiro**, Mónica **Meireles**, Francisco **Mestre** and Gustavo **Sugahara** (2006), "Strategic Evaluation of Environment and Risk Prevention – National Evaluation Report – Portugal", *Technical Report*, GHK for the European Commission.

Serra, Pedro (2001), "Water pricing policies in Portugal", in European Commission, *Pricing Water: Economics, Environment and Society - Conference Proceedings*, Sintra, 6 and 7 September 1999, European Commission, pp. 283-288.

WATECO (2003), "Economia e Ambiente, Metodologia de Aplicação da Directiva Quadro da Água: Documento de Orientação", Wateco Group, European Commission. Published by INAG (National Water Institute), Ministry of Cities, Spatial Planning and Environment

WWAP (2006), *Water: A Shared Responsibility. The 2nd United Nations World Water Development Report*, United Nations World Water Assessment Programme. United Nations Educational, Scientific and Cultural Organization (UNESCO) and Berghahn Books.

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