

Water services reform in Italy: its impacts on regulation, investment and affordability

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Abstract

The water and waste sector is one of the fastest growing Italian utility sectors, currently going through a period of unprecedented change, development and consolidation. The reform, introduced in 1994 with the Galli Law, provides for the organisation of water supply and sewerage through the aggregation of municipal utilities into Optimal Territorial Areas. Vertical and horizontal integration of water and sewerage services allows saving to be made according to economies of scale and scope. Moreover, the Italian legislator intends to achieve the industrialisation of a sector which until then was characterized by economic or municipal management. With the reorganisation forecast by the reform, a programme of investment developing over a period between 20 and 30 years is set out. One of the fundamental aspects of the reform is that, with an adequate long term plan it gives the chance to provide excellent planning for the required works in order to achieve optimum safety and quality in water services. As the restructuring takes its course, a debate is under way on the increase of investment that could cause problems of affordability for the new tariffs.

Keywords: Affordability; Integrated water services; Investment; Italy; Optimal Territorial Area; Reform; Revenue cap; Water regulation

1. Introduction

The recent history of the water industry structure in Italy begins with the Law of 5 January 1994 n.36 (so-called “Galli” Law, named after the member of parliament who first signed the proposed law), concerning water resource management reform, whose main objective is to concur the industrialisation of the sector. The law provides for the organisation of water supply and sewerage, through the aggregation of municipal utilities into optimal territorial areas (henceforth ATOs).

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At present, the water services are still very fragmented, from the point of view of both territory and management. With a few exceptions, water utilities are fragmented between thousands of municipalities and are operated by municipally owned enterprises.

Nevertheless in the last two years (2003 and 2004) there have been major shifts in ownership and responsibility in the water sector and the process of restructuring continues as providers seek to meet escalating challenges. The water and waste sector is the fastest growing utility sector, currently going through a period of unprecedented change, development and consolidation.

As the restructuring takes its course, a debate is under way on the increase of investment, the introduction of private management and the affordability of new tariffs. The main economic and water statistics, topics and actors in this debate will be presented in the coming sections.

In Section 1 we describe the existing water services situation in Italy, while Section 2 presents the main points of the reform (legal framework and regulation) and its advancement. Sections 3 and 4 describe the impact of the sector reorganization on investments and affordability. In Section 5 we offer a concluding summary.

Data in this paper is based on a number of sources and the statistics are intended to provide a picture of water resources for domestic use (water supply and sewage disposal in urban areas not considering agriculture and large industry). For international comparisons, it was decided to have recourse to *Purchasing Power Parities*¹ (PPPs), which agrees to convert the different currencies as well as keeping account of the different price levels among the various countries.

2. The state of water services in Italy

2.1. Water, sewage and wastewater supply system

The analysis of the first completed ATOs state of infrastructures and services, which concerns 52 ATOs (35 million inhabitants, representing around 61% of the Italian population), offers an overview of the major statistics of Italy's water industry.

As shown in [Table 1](#), the proportion of the population connected to a public water supply system is more than 95%. Network leakage, including the water supplied but unbilled, amounts to 42%. Per capita mains length, including total adduction, transmission and distribution mains, is 9.9 metres. The average age of infrastructures is approximately 30 years (see [Table 1](#)).

According to the same research, sewerage networks cover 84% of the total population. Most sewerage reticulation systems (71%) are of mixed type (i.e. they carry rainwater runoff as well as sewerage). The average age of infrastructures is similar to that of the water system (28 years) (see [Table 2](#)).

The picture for collection and treatment of wastewater is worse than that of the sewerage sector, because the population served is found to be only 73% of the total population. Wastewater treatment plants are numerous and generally of a small size as they tend to serve small communities (80% of plants are under 2,000 population equivalents) (see [Table 3](#)).

¹ For the methodology of purchasing power parity see OECD (2002a); for conversion factors see OECD (2004).

Table 1. Water systems indicators, Italy 2002.

Main indicators of water systems	Data	Data completeness (%)
Population coverage (%)	96	91
Infrastructure leakage (%)	42	72
Per capita mains length (m per capita)	9.9	86
Average age of infrastructure (years):		
• Intake constructions	32	70
• Transmission mains	32	80
• Distribution mains	30	74
• Pumping stations	22	68
• Treatment plants	14	72
• Storage tanks	30	78

Source: COVIRI (2003).

Table 2. Sewerage systems indicators, Italy 2002.

Main indicators of sewerage systems	Data	Data completeness (%)
Population coverage (%)	84	82
Per capita length mains (m per capita)	7.2	70
Average age of mains (years)	28	74
Structure of sewerage system (%):	100	86
• Storm sewerages		
• Storm and foul sewerages	71	
• Foul sewerages	21	

Source: COVIRI (2003).

Table 3. Wastewater plants indicators, Italy 2002.

Main indicators of wastewater plants	Data	Data completeness (%)
Population served (%)	73	77
Average age of Plants (years)	16	67
Plants for Population Equivalent (PE) class (No.):	6,735	
< 2,000 PE	5,361	80.4
2,000–10,000 PE	906	12.9
10,000–100,000 PE	411	5.9
> 100,000 PE	57	0.8

Source: COVIRI (2003).

2.2. The economic structure of the sector

Information about the analysis presented in this section comes from the 2002 Municipal Governments' Accounts ("*Certificati Conti Consuntivi Comuni*")²; in some cases data has been integrated through a sample survey by ISTAT (2003)³. The expense in the water sector, in 2001, amounts to 3,967 million euro. The unequal expense among the Italian regions, is illustrated in Table 4.

² Data processing by Institute for Social Research IRS, Milano.

³ Italian Central Institute of Statistics, Rome.

Table 4. Expenses in the water industry (million euro), 2001.

Region	Water	Sewerage and treatment	Total
North	1,246	574	1,820
Middle	482	257	739
South and Islands	914	494	1,408
Italy	2,643	1,324	3,967

Source: COVIRI (2004c).

Looking in detail at the number of employees, Table 5 shows the evolution of the workforce in the water sector for different regions between 1996 and 2001. The number of employees amounted to 55,107 people in 1996 and increased to 63,374 in 2001. The greatest growth is in the water system (from 33,462 to 40,671).

With regard to water management, the 1999 ISTAT census shows (Table 6) that in Italy there were 7,822 operators in the sector, almost as many as the number of municipalities, which amounts to a total of 8,102. Among the operators included are managers of the complete cycle of integrated water services as well as those who operate in a more limited way, involved with only some of the phases of the cycle (aqueduct, sewerage or purification).

As a whole, direct management by the municipalities of the water services prevails in all regions (82.6%). The presence of a joint-stock company is marginal.

The water sector is a capital intensive industry since it has to comply with increasingly stringent environmental quality standards and maintain (and in many instances rehabilitate) the ageing infrastructure. Therefore, provision of timely investment is essential. Experience has shown that the level of capital investment has been markedly worse in the last few years.

Table 5. Employees in the water sector, change from 1996–2001.

Region	Water system			Sewerage and treatment			Total		
	1996	2001	Change (%)	1996	2001	Change (%)	1996	2001	Change (%)
North	13,592	16,102	18.5	10,713	9,782	−8.7	24,305	25,883	6.5
Middle	5,790	8,262	42.7	3,884	3,833	−1.3	9,674	12,095	25.0
South and Islands	14,081	16,308	15.8	7,048	9,090	29.0	21,129	25,397	20.2
Italy	33,462	40,671	21.5	21,645	22,704	4.9	55,107	63,374	15.0

Source: COVIRI (2004c).

Table 6. Forms of water services management in Italy, 1999.

Region	Municipality	Municipal direct supply	Municipally owned enterprise	Joint-stock company	Other forms	Total				
North	4,542	3,755	79.8%	516	11.0%	139	3.0%	297	6.3%	4,707
Middle	1,003	724	81.3%	70	7.9%	45	5.1%	51	5.7%	890
South	2,557	1,983	89.1%	100	4.5%	30	1.3%	112	5.0%	2,225
Italy	8,102	6,462	82.6%	686	8.8%	214	2.7%	460	5.9%	7,822

Source: COVIRI (2004c).

In the period 1993–2001, the sum of investment in water services was equal to 6.8 milliard (a milliard equals 10^9) euro (of which 637 million euro in 2001), that is, on average, the equivalent of 120€ per capita investment (13.5€ annual per capita).

Figure 1 shows that investment has been decreasing (ISTAT, 2004): in real terms considering 100 as the level of investment in 1993, it has fallen to a level of 63 in 2001. This reduction has been considerable for water treatment.

The reduction in investment was probably caused by several factors. The tariff policy prior to the reform did not make adequate provision for ways of investing. Investment was funded mainly through public sector spending.

The decade before the reform saw a substantial fall in transfers from the state to the municipalities, which backed up the previous administration. Smaller transfers caused smaller funding in investment.

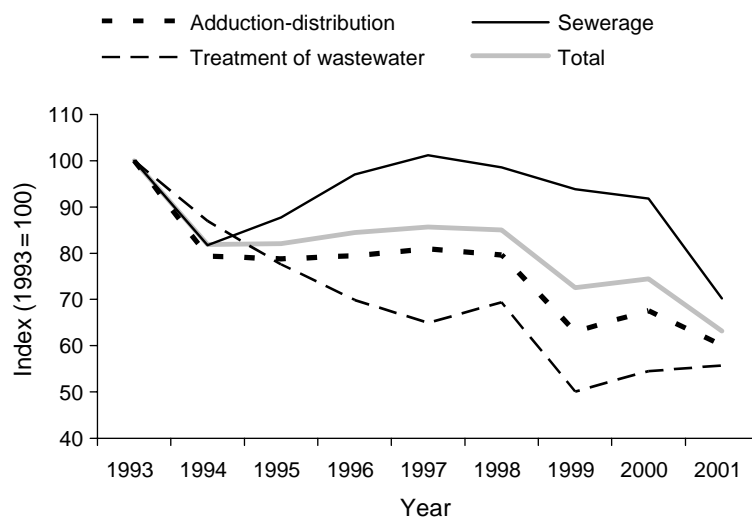
Table 7 shows the breakdown for 2002 of families average annual expense for water services and average water charge, ranked in descending order of population served.

The 2002 data show that there is considerable variation in average water bills from different water companies. The average yearly expenditure for water services for the average Italian family (consuming 200 m^3 per year) amounted to 202.59€. Water prices amount to around 1.01 €/m^3 . The highest prices are registered in Bari (1.52 €/m^3) and Ferrara (1.47 €/m^3) and the lowest price is in Milano (0.58 €/m^3).

3. Reform in the water sector: legal framework, regulation and advancement

Pursuing legislation enacted in 1994 (Law 36/94) the water sector in Italy is going through a profound reorganisation aimed at transforming a sector characterised so far by extreme fragmentation into an industrialised and integrated one.

The reform is aimed at solving the inadequacy of infrastructures and the low level of services characterising the sector. Briefly the purposes are:



Source: Data processing Institute for Social Research (IRS), ISTAT (2004).

Fig. 1. Investment in water services (1993 = 100).

Table 7. Average annual expense and average water charge in Italy in euro weighted with Purchasing Power Parities (PPPs).

Company	Population served	Family average annual expense for water services (consumption, 200 m ³ per year) (euro)	Average water charge (euro/m ³)
Bari (Ba) – Acquedotto Pugliese	4,397,999	304.66	1.52
Roma (Rm) – Acea Ato 2	3,000,000	156.84	0.78
Milano (Mi) – Cap	1,696,296	149.69	0.75
Milano (Mi) – Comunale	1,336,744	115.84	0.58
Torino (To) – Smat Spa	1,293,280	146.69	0.73
Napoli (Na) – Arin	1,000,470	226.11	1.13
Cagliari (Ca) – Esaf	773,611	214.50	1.07
Bologna (Bo) – Seabo	766,838	286.85	1.43
Brescia (Bs) – Asm	436,354	191.66	0.96
Reggio Emilia (Re) – Agac Spa	392,834	268.04	1.34
Genova (Ge) – Genova Acque S,P,A,	360,000	212.01	1.06
Venezia (Ve) – Aspiv	287,332	141.47	0.71
Modena (Mo) – Meta	276,781	202.15	1.01
Ascoli Piceno (Ap) – Ciip	269,137	177.47	0.89
Verona (Vr) – Agsm Spa	255,000	147.58	0.74
Ferrara (Fe) – Acosea	241,918	293.96	1.47
Dolo (Ve) – Acm	239,958	160.91	0.80
Padova (Pd) – Aps	239,900	168.52	0.84
Trieste (Ts) – Acegas	232,278	210.65	1.05
Ancona (An) – Gorgovivo Multiservizi	222,070	210.93	1.05
Parma (Pr) – Amps Spa	208,218	214.68	1.07
Rimini (Rn) – Amir	205,176	255.69	1.28
Total	18,132,194		
Average		202.59	1.01
Minimum		115.84	0.58
Maximum		304.66	1.52

Source: Peruzzi (2004).

- to ensure continuity in water supply throughout the country;
- to extend the sewerage and water service to the entire population, in respect of the European laws concerning quality of waste.

In order to achieve these aims, reformers have provided for a reorganisation of the sector based on:

- integration of the services to allow for economies of scope;
- overcoming fragmentation of management to allow for economies of scale;
- obtaining an entrepreneurial management of the water services;
- setting a tariff that ensures sufficient revenue to finance operating and capital expenditure;
- reorganisation of local entities to define the management.

The Galli Law affects the structure of the water industry and the behaviour of operators defining a new regime, through the entrepreneurial management of the Integrated Water Service administered by the Authority of Optimal Territorial Areas, abbreviated AATOs.

3.1. National and local laws

The pillars of the reform are the following:

- the creation of an integrated water service (IWS), which should provide abstraction, treatment and distribution of drinking water and collection and safe disposal of wastewater;
- the definition of the optimal territorial areas (ATO) based on both hydro graphic and political-administrative criteria in which to manage the IWS⁴;
- the identification of a form of cooperation between the local authorities in becoming the AATO body, entitled to plan, award and control locally the management of IWS;
- the assignment of IWS management to a single entrepreneurial subject (the operator) chosen by means of the sector normative currently in force⁵;
- the introduction of a tariff system to achieve both full recuperation of all operating and investment costs and definition of a unique IWS tariff for each ATO;
- The creation of a government body overseeing the reform and its implementation, the COVIRI (Supervising Committee on the Use of Water Resources) set up inside the Ministry of Environment.

How are the skills and responsibilities shared amongst these entities? Regional governments are vested with the responsibility of delimiting the ATO and identifying the most effective form of cooperation between the local authorities within the ATOs⁶.

To award the management of IWS and check the activities carried out by the management operator, AATO has to draw up a Technical and Financial Plan (“*Piano d’Ambito*”), including the state of the infrastructures and services, the new services standards and the investment necessary to achieve them, the minimum increases in productivity, the tariff and method of adjusting this in relation to the improvements in service obtained.

With regard to the assignment, the AATO has to follow the new rules introduced by articles 113 of legislative decree on 18 August 2000, n. 267 (Consolidated Act of the local Entities, C.A.L.E.), amended by article 14, financial law for the year 2004, and award it to:

- share capital companies identified through public tender procedures;
- public/private mixed companies in which the private shareholder has been chosen through a tender;
- wholly publicly owned companies⁷, under which the local entity exercises a control similar to the one exercised on its own services and which perform the most important part of their activity with the public entity or entities which control them (so called “in house” assignment).

The assets remain public property to be operated under contract for the supply of the service.

Relations between the AATO and the management operator are regulated by a specific contract (namely, “*Convenzione di affidamento*”), the framework of which (“*Convenzione – tipo*”) is drafted by

⁴ Vertical (IWS) and horizontal (ATO) integration of water and sewerage services permit costs savings according to economies of scale and scope.

⁵ Article 113 of legislative decree 18 August 2000, n. 267 (Consolidated Act of the local Entities, C.A.L.E.).

⁶ The forms allowed are foreseen by the L.142/90, now included in T.U. 267/2000.

⁷ A public company is that owned by public entities like municipalities.

each regional government. Recently many AATOs have set up a National Union, called ANEA, a non-profit association⁸.

As far as water price is concerned, the tariff is defined on the basis of a tariff system decided by COVIRI and approved by the Environmental Ministry. COVIRI in 1996 (D.M. 1/08/96) adopted a “normalised method”, based on revenue cap criteria establishing a reference tariff, such that allowed price increase is set up as a function of the initial price.

A revenue cap is designed to provide a fixed amount of revenue for the company, irrespective of demand and is used within an $RPI + K$ framework. This is achieved by estimating the allowed revenue and then dividing it by demand forecast (cubic metres of water), such as to obtain a price per unit ($\text{€}/\text{m}^3$), the so-called Medium Real Tariff (TRM).

The TRM increase limit (K) is the amount by which TRM can change each year. This change in amount is expressed as a percentage fixed by the normalised method according to the TRM of the previous year.

The revenue cap differs from the price cap, since if demand increases (or decreases) by more than above (or below) the forecast level, then a price review occurs: the level of demand will be adjusted in the following year, to ensure that only the allowed revenue is collected.

Under the revenue cap system the company should have incentives to outperform the efficiency assumption during the regulatory lag (three years according to normalised method). Consequently it happens that if the company costs are lower than assumed, it keeps the benefit of this out performance for three years (Bardelli, 2000).

TRM becomes the base tariff and needs to be well-constructed. First, the tariff is made up of a fixed quota (per property, payable by all households regardless of how much water they use) and of a variable quota (which depends on water consumption). Second, the variable tariff is refined so that the unit rate increase rises (the “rising block tariff”).

However, revenue cap introduction runs in parallel with the creation of each ATO. Pending the implementation of the system contemplated in the reform, the Inter-Ministerial Committee for Economic Planning (CIPE) has established a transitional measure.

3.2. The regulation forecast by the reform

An accurate assessment of the legal framework designed by the reform brings to light the presence of a Regulation by Contract (Bakovic et al., 2003). This kind of regulation can be developed in two ways, differing by whether or not there is an independent regulator present. In the first case the regulatory contract is totally self-contained and self-administered like a commercial agreement. In the second, the contract does not replace the regulator but substantially limits it.

Figure 2 illustrates the Italian water sector characterized by a complex system of agreements and rules emanating from various nationally and locally intertwined bodies.

Regulatory rules are defined at different levels: the Ministry of Environment, behind the COVIRI proposal, issues the decree concerning the national tariff system, Regions draft a standard contract and

⁸ The objectives of the association are the advancement of commission regulation through the study and discussion of subjects concerning the promotion of uniformity of regulation of water services and the promotion of coordinated action with the Environmental Ministry. Members of this association collaborate to share experiences, debate key issues and to develop policy positions, best practice approaches and to contribute to programme development for conferences, workshops and publications. The association is progressively growing as other AATOs become members.

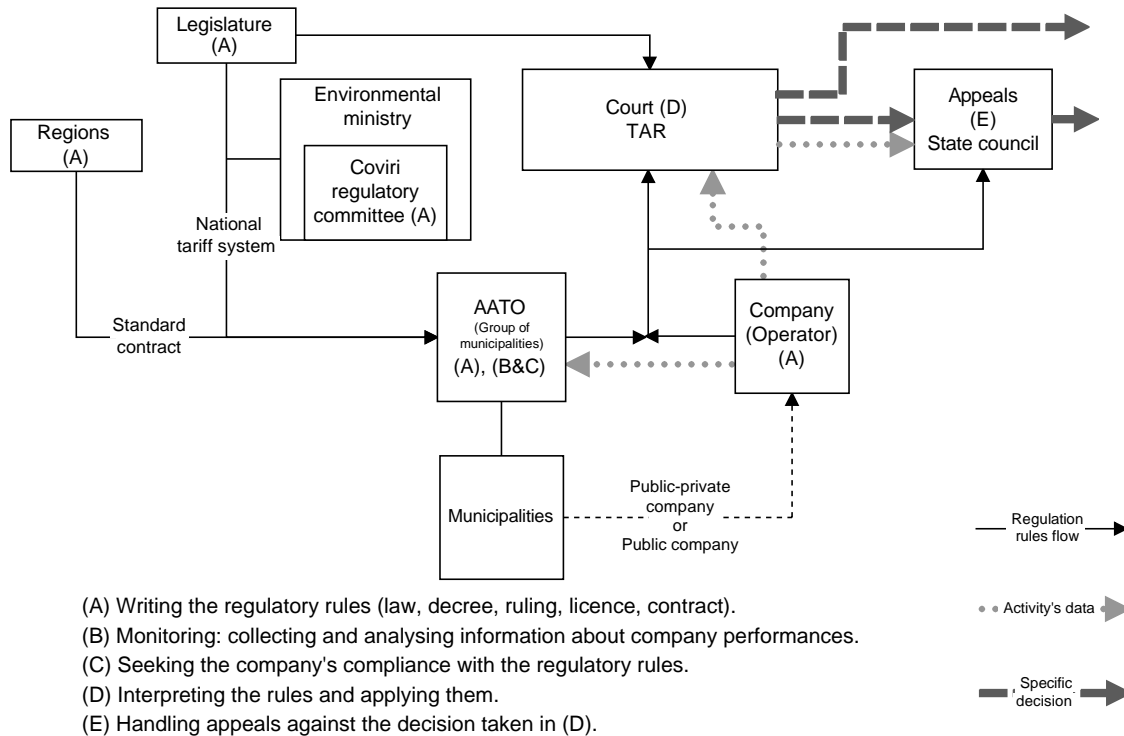


Fig. 2. Water services reform in Italy: a regulation by contract with a national tariff system.

finally the AATO has the task of granting, controlling and defining tariffs in its ATO. The control activity requires the implementation of an information system and procedures for data collection, which must be regularly delivered to the AATO by the operator. Competent appeal bodies for all kinds of disputes arising from the granting of IWS are in the first instance the Regional Administrative Tribunals (TARs) and in the second instance the State Council (appeals).

The lack of an independent authority and the presence of a unique national tariff system established by government characterizes the regulation of the Italian water sector. So, it can be defined as a new and specific form of regulation by contract, resulting in a combination of the above-mentioned definitions.

Quite clearly we are facing regulation by contract, the assignment contract being the basic document regulating the relationship between the AATO and the operator. Generally, the contract includes regulations for the revision of tariffs that refer to the adjustment of the tariffs to inflation, the periodic revision of the recovery to full efficiency together with the confirmation of the attainment of levels of service and application of any penalties. Looking more in detail it defines⁹:

- type of firm;
- economic and financial obligations upon management;

⁹ The definition of specific, general and technical levels for service and product quality is particularly relevant in public utilities deregulation and privatisation processes, as one of the main tasks of law-makers consists in protecting customers receiving services from a single provider.

- duration (not more than 30 years);
- control mechanism;
- degree of efficiency and reliability to be ensured;
- financial (including insurance) guarantees;
- tariffs for the duration of the contract;
- application criteria for the revision of tariffs;
- guarantees of quality of the services.

In order to define the contents of the contract, the “*Piano d’Ambito*” (henceforth the area plan) identifying the investment necessary to provide a stated minimum level of service is set up by the AATO. In the area plan once having analysed and assessed infrastructures, and having defined objective service levels, from comparison between the existing situation and the envisaged goals, AATO is then able to find critical or problem areas requiring action.

Once the area plan has been drafted and approved, it becomes part and parcel of the assignment contract with the operator. As far as quality factors are concerned, these may be subdivided, according to their features, into “technical” and “organisational” levels. The decrease in mains leakage and the increase in the percentage of connected population, and so on, are just a few examples of technical indicators linked to IWS aspects. AATO defines provisions on product and service quality by making special reference to norms actually in force concerning drinking water quality (D.Lgs 31/2001) and constraints for the discharge of sewage water (D.Lgs. 152/99).

The estimated time necessary to establish the connection with the water supply service and the response time for complaints or written requests, represents some examples of organisational levels. In order to ensure that the emphasis on efficiency and economy of the operator approach did not translate into a worsening quality of service for the customers, various standards were introduced in DPCM 29.04.99 which defines the minimum acceptable standard of service¹⁰. The objective of defining “organisational” standards has represented a useful starting point for the drafting of the IWS Charter¹¹, to be included in the agreement to be signed with the operator.

The agreement would also be accompanied by an annex regulating the effects of a contract breach by the operator. In order to assure compliance with contract provisions, AATO has to monitor operators’ activity. Data passing from the operator to AATO must be reviewed by independent auditors. In case of non-compliance with established standards, penalties have been envisaged which would fund concrete application in the tariff three-year review.

3.3. The current state of the reform

The time-consuming application of the initial phase has arisen because of:

- the choice involved in defining large territorial areas, in order to overcome the fragmentation of management bodies, to set up adequate management structures and to apply fair and sustainable tariffs;

¹⁰ Minimum acceptable standards are, for instance, a minimum available resource of 150 l/person/day, a minimum supply of 0.11, a minimum pressure of 5 m above the highest point of the property, etc.

¹¹ DPCM of 29 April 1999 covers the General Reference Framework for the setting up of the integrated water service charter.

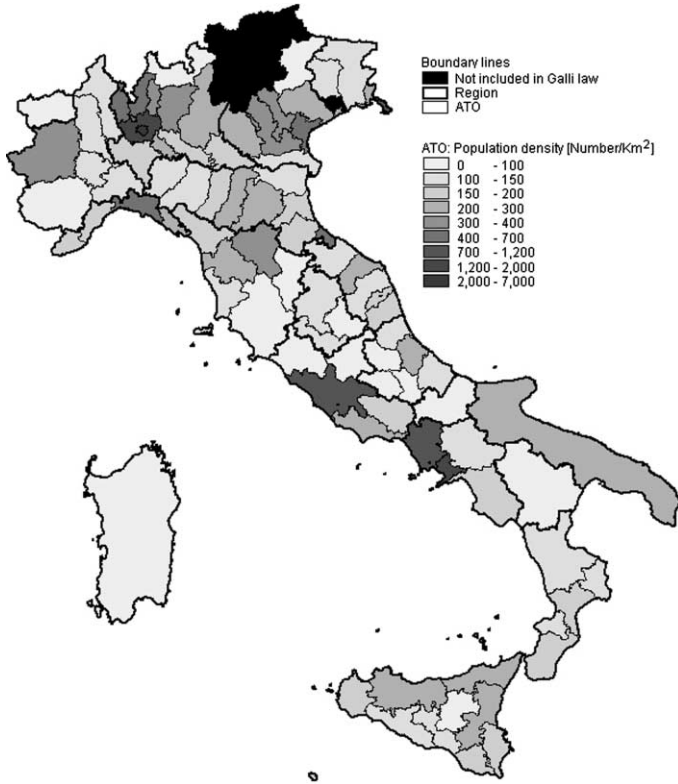


Fig. 3. TOs: boundary lines and population density.

- uncertainties in legislation initially in force concerning monopoly condition in which service providers operate;
- the need, at the same time, to organize local authorities' functions in such a way as to assure that different territorial needs are equally represented, as well as the resistance of involved bodies and agencies, which in some instances brought about the activation of substitute powers and administrative conflict.

In its latest “Annual Report to Parliament” (COVIRI, 2004c), in order to assure the compliance of streamlining principles for the IWS – COVIRI it illustrates the state of implementation of the reform. According to the Galli law’s provision, Italian regions¹² have passed the relative law implementing the reform locally. In total, regions have delimited 91 ATOs (see Figure 3).

Bearing the new principles of the reform in mind, the tables below illustrate the degree of development in reorganisation of the water sector. As far as the establishment of ATOs is concerned, Table 8 shows that of 91 the ATOs envisaged, 87 have already been set up, relative to 56,056,955 inhabitants. In particular, operating ATOs have increased since 2001, after the financial law was passed for the year 2001. Only in the north is the implementation not yet fully completed.

¹² Trentino Alto Adige is the only region excluded by the reform (sent. Corte Costituzionale 7/12/94 n.412).

Table 8. Provided and operating ATOs.

Region	Provided ATO by regional law		Operating ATO		ATO with plan		ATO with drawn up contract					
	(No.)	Population 2001	(No.)	Population 2001	(No.)	(%)	Population 2001	(%)	(No.)	(%)	Population 2001	(%)
North	44	24,635,734	40	23,004,257	17	39	10,112,993	41	11	25	9,917,377	40
Middle	19	10,906,626	19	10,906,626	17	89	10,280,641	94	16	84	9,870,566	91
South	28	20,514,595	28	20,514,595	27	96	20,193,994	98	11	39	8,855,048	43
Italy	91	56,056,955	87	54,425,478	61	67	40,587,628	72	38	42	28,642,991	51

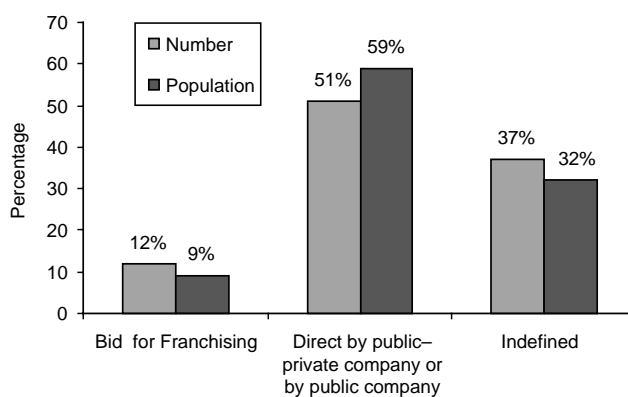
Source: COVIRI (2004b).

Over 95% of AATOs have a plan drawn up, involving a percentage of population equal to 72%, less than 40% have signed a contract with an operator. As far as management organisation type is concerned, Figure 4 provides a snapshot view of the forms of water services management selected by AATOs, both on a numerical and population basis. Figure 4 shows that only 12% (no. 11) of AATOs have applied to bid for franchising, whilst 51% have opted for a direct assignment to public–private company or to a public company (about 59% of population served).

4. Investment and tariffs in the first area plans

Within the regulatory system provided by the reform, the area plan represents a fundamental document, which guides all AATO's decision-making activities. The area plan, in general, includes the reconnaissance and functional evaluation of the existing works, installations and services, the new service standards and the investment necessary to achieve them, the schedule of planned investment, the efficiency improvements to achieve through the increasing management scale and the tariff.

Analysis of the first completed area plans, concerning 41 ATOs, offers an overview of planned investment and water charges. All plans have been developed on a long-term basis, on average 26 years.



Source: Data processing, COVIRI (2004b)

Fig. 4. Forms of water services management selected by AATO (number and population).

The study includes about 45% of the Italian population (25.8 million inhabitants); the average population of the plans is around 629,171 inhabitants and the average number of associated municipalities is 86 (145 in north, 60 in middle, and 85 in the south and islands) (see Table 9).

4.1. Investment

As already mentioned, maintaining the nation's high-quality drinking water and wastewater services will require a substantial increase in spending over the next two decades. In Italy there are many types of problems with existing water infrastructures, including collapsed storm sewers in various ATOs and an estimated 42% loss from leakage.

The summary of total investment carried out in IWS indicates an overall requirement referring to the 41 area plans examined by COVIRI, amounting to about 22.98 milliard euro, with an overall per capita investment of 891.18€. The average duration of the plans is 25.6 years, so that annual per capita investment amounts to 34.85€, of which 15.70€ is for the water supply system, 11.75€ for sewage, 6.88€ for treatment and 0.52€ for other investment.

New investment and replacement of infrastructure are issues receiving attention throughout the world as the industry looks into replacing old infrastructure as efficiently and cost effectively as possible. But the sum of money needed for future investment in water infrastructure is a crucial matter of some debate, especially for the water industry authorities that have to value both the amount of money that will be needed and the source of those funds (100% ratepayers' bills or through a mixture of bills and state or local taxes?).

Table 10 gives an indication of relative levels of investment in the United Kingdom (OFWAT, 2004), Italy (COVIRI, 2004a) and USA (GAO, 2003). For Italy, according to COVIRI, a projection at the national level of results referring to the 41 plans examined, shows a need for investment of about 51 milliard euro for the next 26 years (47.6 milliard weighted with PPPs).

COVIRI estimates that for the period 2000–2026, annual per capita investment will average 33€ and for the period 2000–2005 will be 36€. In USA, for the years 2000–2019, the annual per capita investment will be average between 74€ (source EPA) and 113 (source WIN). In the UK, OFWAT estimates 79€ per capita in the period 2005–2010.

These figures clearly show that the level of investment in Italy is far lower than corresponding investment in USA and UK. One of the explanatory factors can be that in Italy the price limit (K) is around 5% for a tariff 0.9€/m³ greater.

Table 9. Main ATO's characteristics of examined Area Plans.

	Total ATO (no.)	Population (no.)	Average Municipalities (no.)	Area (km ²)	Population (no.)	Population density (pop./km ²)
North	6	3,612,517	145	3,093	602,086	188
Middle	12	9,081,331	60	3,699	756,778	203
South and Islands	23	13,102,183	85	4,136	569,660	222
Italy	41	25,796,031	86	3,856	629,171	211

Source: COVIRI (2004a).

Table 10. Country comparison of recent estimates of the cost of drinking water and wastewater infrastructure needs in euros (PPPs weighted).

Country	Organization	Period covered	Years of period	Investment (total amount in the period) (euros in milliards)	Per capita investment (€)	Annual investment (euros in milliards)	Annual per capita investment (€)
United Kingdom (*)	OFWAT	2005–2010	5	21.2	397	6.5	79
Italy	COVIRI	2000–2026	26	47.6	849	1.8	33
Italy	COVIRI	2000–2005	5	10.2	181	2	36
USA	WIN	2000–2019	20	598.2	2,265	29.9	113
USA	EPA	2000–2019	20	392.1	1,484	19.6	74

Sources: OFWAT (2004), COVIRI (2004a), GAO (2003).

*England and Wales.

4.2. Water charges

In Italy, with the reform of water services, the tariff is the main source of funding operating and investment costs. In view of the anticipated level of investment to be raised, the tariff follows a progressive increase for the major part of the duration of the area plans. At the same time, this growth determines an increase in the average annual charge for the householder for water services.

The availability of an investigation (SMAT, 2003, 2004) into the tariffs currently used in some industrialised countries and the recent publication of COVIRI (2004a) has allowed us to compare, not only the level of the tariffs and average annual charge before and after the reform, but also those of the main developing countries.

With the application of this reform, the water services tariff has increased considerably. The tariffs that have been determined by the reform are still, in the main, below those applied in the countries in the OECD.

In more detail, the average charge before the reform, around 202 € per annum with the application of the first year of the area plans, rises to 245 € per annum, an increase of around 20%. Nevertheless, this average charge is well under (– 60%) that of other countries, which on average amounts to 385 € per annum (Table 11).

Table 11. Comparison of annual charge in euros (PPPs weighted).

	Average	Minimum	Maximum
Tariffs			
Before reform (2002)	1.01	0.58	1.52
After reform – I Year (1999–2002)*	1.23	0.85	1.83
OECD countries (2002)	1.93	0.78	4.87
Charge			
Before reform (2002)	202.59	115.84	304.66
After reform - I Year (1999–2002)*	245.51	169.27	365.52
OECD countries (2002)	385.27	156.32	973.51

Sources: Data processing: SMAT (2003), SMAT (2004), COVIRI (2004c).

*Initial year differs for some ATOs.

The same is valid for the average tariff which goes from 1.01 €/m³ before the reform to 1.23 (+20%) with the application of area plans but jumps to an average of 1.93 in other countries (Table 11).

What is eye catching on the graph, shown by its outline and different shades of grey, is the manner in which the average tariff increases according to figures before the reform and those projected by area plans as well as the international figures. It has allowed us to verify that the tariffs, which are significantly greater than previously, are still below those used in the majority of developed countries (Figure 5).

5. Affordability

Before such an increase, it is important to ascertain whether or not the cost is sustainable by family incomes. A measure of affordability is given through the relationship between the average annual charge for water services and the average annual income of the householder. We see that with the reorganisation forecast by the reform the tariff and the average charge will increase with respect to those managed previously.

But are these charges affordable to families? Recently, OECD has confronted the question by publishing research entitled *Social Issues in the Provision and Pricing of Water Services* (OECD, 2002b). Affordability can be considered in terms of current tariffs in relation to the available income of the consumer. Affordability of water services may vary according not only to family income but also to a particular territorial location or point of connection. For the same level of consumption and when being charged the same tariff, a poorer family may inevitably pay a higher portion of its income with respect to that of a richer family. If the poorer family is in a new water service supply location, its tariff could be higher in absolute value than that paid by a richer family that lives in the area of an already established water supply service, because of the necessity to cover the costs of the extension of the service.

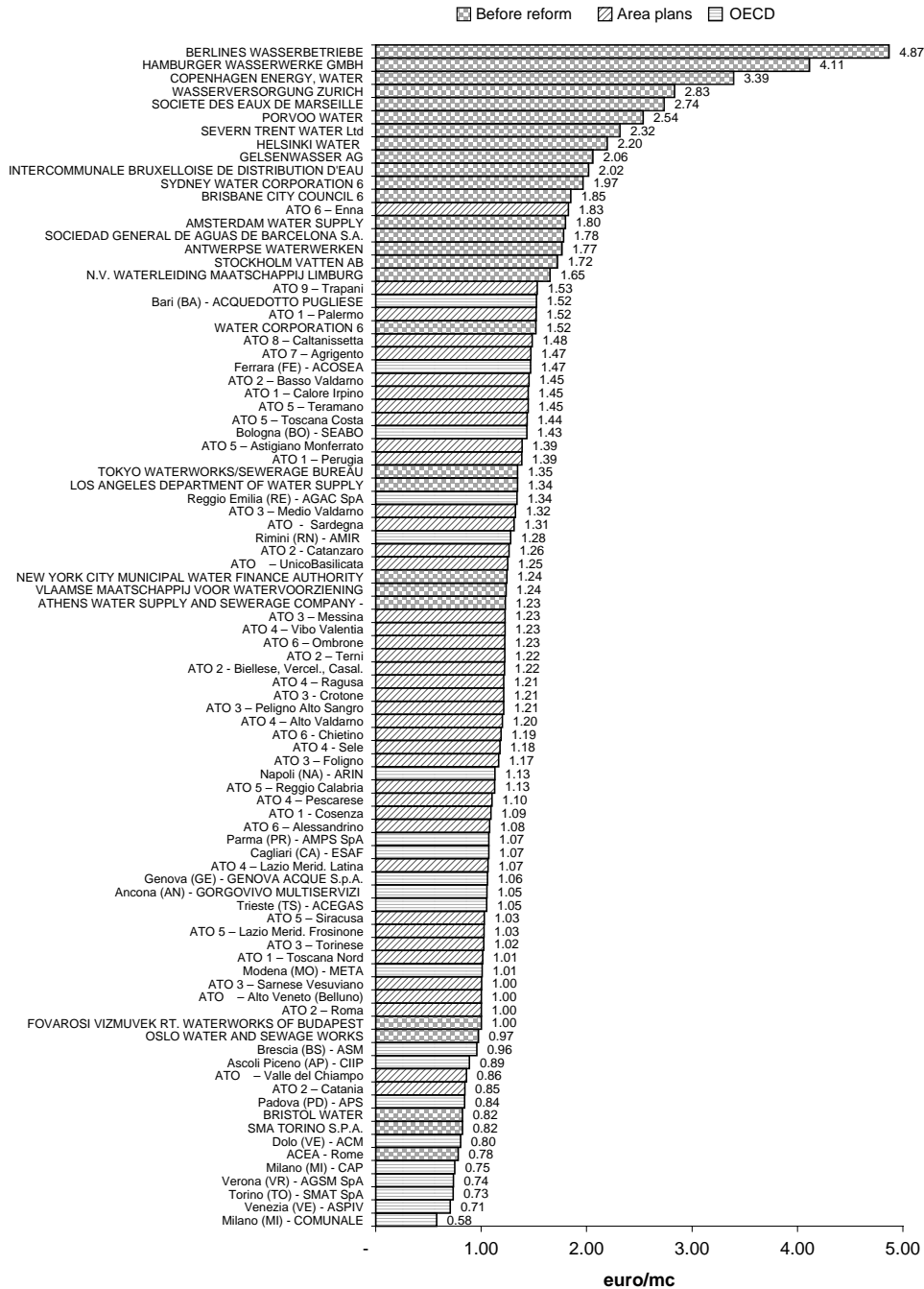
So then, how can the affordability of the tariff be gauged? OECD suggests some points for measuring the affordability of water services. First, is the relationship between the average annual charge sustained for water services and the average available family income. Second, is to propose reporting the average cost to the family income subdivided into different classes of growth in income, or else the average income subdivided by territorial areas.

Each of the indicators makes reference to family income whether it is that of the average, by class of income or by dividing into territorial areas.

5.1. Affordability in Italy

The availability of family income, splitting into class of income and by dividing into territorial areas for Italy (Banca d'Italia, 2002), allows us to compare the affordability of the tariff both before and after the reform. We are not dealing with totally homogenous data because some have been calculated using 10 classes of income, others using only four, five or six classes. It does, however, allow us to single out some significant points.

In Italy the average water service charge on the family income goes from 0.70% before the reform to 0.84% with the tariff from the area plans, an increase of about 21%. When the affordability is calculated



Source: COVIRI (2004c).

Fig. 5. Average tariffs. euro/mc, comparison before reform (2002), area plans (1999–2003), OECD (2002).

Table 12. Affordability of water services costs in Italy.

		% of income spent on bills		Average income earner below the relative poverty line (%)	Average income earner below the absolute poverty line (%)
		Average income earner (%)	Lowest decile income earner (%)		
Tariffs before reform (2002)	Average	0.70	1.27	1.97	2.81
	Minimum	0.40	0.73	1.12	1.60
	Maximum	1.05	1.91	2.96	4.22
Tariffs after reform – 1 st Year (1999–2002)*	Average	0.84	1.54	2.38	3.40
	Minimum	0.58	1.06	1.64	2.34
	Maximum	1.26	2.30	3.55	5.06

Sources: Data processing: COVIRI (2004c), Banca d'Italia (2002), ISTAT (2002).

*Initial year differs for some ATOs.

for lower income families¹³ the figures attained show a rise from 1.27% before the reform to 1.54% after the reform.

These figures rise further from 1.97% to 2.38% when affordability is calculated on the basis of the average family cost for those on the relative poverty line and worsens further when it is calculated on the basis of the average family income for those under the absolute poverty line¹⁴ rising from 2.81% before the reform to 3.40% after the reform (Table 12).

Affordability for families below the poverty line is given maximum attention when maximum tariffs are applied (from 2.96% to 3.55% for relative family incomes below the relative poverty line, and rises from 4.22% to 5.06% for family incomes below the absolute poverty line).

Utilising the development of the tariffs forecast by area plans it is possible, for instance, to calculate affordability¹⁵ in Years 1, 10 and 15 (Table 13).

¹³ In 2000 the average annual family income, net of income tax and national insurance contributions was 26,098 € (tav. B1) which amounts to 2,175 € per month (Banca d'Italia, 2002).

¹⁴ In Italy, using data from a study on family expenditure, ISTAT publish a report on poverty based on the number of families and relative components representing costs for the consumers below a certain income. This line, is the standard relative poverty line. For a family with two components this line is equivalent to the average per capita cost of the country, which in 2000 corresponded to 9,722.52 € per annum. Utilising this equivalent scale which takes into account the economics of an achievable range for the increase in the number of components, we obtain the relative poverty line of the average family with an average number of components that corresponds to the national one (2.7) which is equal to 11,928.87 €. Once the figure for the line is obtained, the ISTAT estimate of the degree of poverty can be used to measure just what percentage of the family expenditure is actually below the relative poverty line. In 2000 the figure was equal to 22.5%. In the same way we can calculate the average family income of those under the relative poverty line ($11,929.87 \times (1 - 0.225) = 9,245.65$ €). To obtain the average family income for those under the absolute poverty line we proceed in a similar way. ISTAT makes its calculations based on a shopping basket and essential services for an Italian family. In 2000 the absolute poverty line with a two component family was equal to 6,539.04 per annum. Using the equivalent scale we obtain the absolute poverty line for an average family (2.7 components) equal to 8,023.63 € per annum. Using the degree of poverty indicator, which in 2000 was equal to 19.3%, the average family income of those below the absolute line is obtained ($8,023.63 \times (1 - 0.193) = 6,475.07$ € (ISTAT, 2002).

¹⁵ In following calculations we assume that: incomes grow at an actual rate of 1% per annum; the distribution of registered incomes in the percentile groups for 2000 remain unchanged for the period in which the comparisons were made; the average income for those families below the relative poverty line remain constant; and that inflation has the same effect both on the cost and on the income.

Table 13. Affordability of water services costs in the 1st, 10th and 15th year of area plan.

% of income spent on bills		Tariffs area plan (1999–2002), 1st year	Tariffs area plan (2009–2013), 10th year	Tariffs area plan (2017–2018), 15th year
Average income earner (%)	Average	0.84	1.06	1.09
	Minimum	0.58	0.72	0.65
	Maximum	1.26	1.45	1.50
Lowest decile income earner (%)	Average	1.54	1.94	1.99
	Minimum	1.06	1.33	1.20
	Maximum	2.30	2.65	2.74
Average income earner below the relative poverty line (%)	Average	2.38	2.91	2.99
	Minimum	1.64	1.99	1.80
	Maximum	3.55	3.98	4.12
Average income earner below the absolute poverty line (%)	Average	3.40	4.23	4.35
	Minimum	2.34	2.89	2.61
	Maximum	5.06	5.78	5.99

Sources: Data processing: COVIRI (2004c), Banca d'Italia (2002), ISTAT (2002).

Data on affordability that can be taken in relation to the average family income, presents amounts that go from 0.84% in Year 1, to 1.06% in Year 10 and to 1.09% in Year 15. These amounts place Italy near to the minimum amounts quoted in OECD (0.5–2.4%).

The results are similar for affordability based on the first quintile family incomes (lower incomes). Figures rise respectively from 1.54% in Year 1, to 1.94% in Year 10 and to 1.99% in Year 15. Even if the figures do worsen on affordability they are still below those of OECD (2.3–3.9%).

When affordability is calculated with respect to the average cost of the family below the relative poverty line, the figures rise to 2.38%, 2.91% and 2.99%, respectively. The figures worsen however with respect to family incomes below the absolute poverty line, going from 3.40%, to 4.23% and up to 4.35%, respectively. These amounts cannot possibly be undervalued. When families find themselves facing high levels of costs, which are very high compared to their income, they are likely to try to limit their consumption of the service, even when it is considered to be essential. Also, in cases where they have difficulty in paying their bills, there will be an increase in the phenomenon of debt and of being cut off from the services for non payment of arrears.

5.2. Affordability in United Kingdom and Wales

A report of published research (DEFRA, 2004) from various government departments and independent institutes, provides data and regarding the affordability of tariffs in England and Wales. The British Parliament, in particular the House of Commons, has researched the affordability of water rates through a report by the Environment, Food and Rural Affairs Committee entitled *Water Pricing* (House of Commons, 2003).

The *Cross-Government Review of Water Affordability Report* (DEFRA, 2004) is the result of a review made by the government of the affordability of water rates and tariffs coordinated by DEFRA and in which OFWAT, HM Treasury, the Department for Work and Pensions, the Department of Trade and

Industry and the Welsh Assembly participated. The findings of the report are based on the decisions made by OFWAT in relation to defining the tariffs for the period 2004/05–2009/10. According to the report the weight of the water tariffs on the average available family income diminished during the previous review of 1999/2000–2003/04, but tended to increase in the following period of review. The affordability of the tariff represents more of a problem for specific consumer groups such as families with low incomes, the unemployed and for pensioners.

The results of the report indicate that in 2004/05 low income families spent a high proportion of their income, 3.2%, on water services. In particular, a family made up of a single person with an income equal to the minimum pension can spend up to 6.5% (south west) of its available income. The problem of affordability would seem therefore to be related to specific income and consumer groups (Table 14).

The document concludes by recommending policies that will improve conditions of affordability for these consumer groups: controls for the most vulnerable groups, tax deductions/allowances, improvement in consumer efficiency, spread of better practice, information for recovery of debt and improvement in tariff schemes and plans.

5.3. Affordability in USA

Affordability of water tariffs has also been the subject of reflection in the USA. In particular the Congressional Budget Office (CBO), in a recent study (CBO, 2002), posed the problem of the effect of the costs on the charges to families. The CBO has analysed the impact that the estimated levels of investment and the management and maintenance costs would have on the charge to the family without the intervention or support of general taxation. CBO considers that by the end of the 1990s the cost of water services to families represented 0.5% of their income. Taking into consideration the forecast of an increase in the tariff necessary to finance future investment as well as the anticipated rise in family income, in 2019 the average cost for water services would vary between 0.6% and 0.9% of family income, percentages that when compared with those of other countries would not appear to be particularly high.

However, the figures are very different when data on different levels of family income is introduced. The CBO found that by the end of the 1990s half of the families were spending less than 1% of their income on water services, meanwhile the other half were spending significantly more (Table 15).

One measure of affordability of the tariff that has received particular attention is the proportion of families spending more than 4% of their income on water services (Table 16).

CBO estimates that by the end of the 1990s these will represent 7% of the total number of householders. In 2019 CBO foresees this percentage varying between 10% and 20%.

Table 14. Percentage of income spent on water bills, United Kingdom and Wales.

Bill period	% of income spent on bills		
	Average income earner	Lowest quintile income earner	Pensioners
2001/02	0.98	2.79	–
2004/05	1.02	2.92	4.54
2009/10	1.10	3.14	4.87

Source: DEFRA (2004 – updated 28 February 2005).

Table 15. Percentage of income spent on water bills, USA.

Bill period	% of income spent on bills	
	Average income earner	Lowest sestile income earner
In the late 1990s	0.5	2.49
Under low-cost case 2019	0.6	–
Under high-cost case 2019	0.9	–

Source: CBO (2002).

Table 16. Percentage of householders billed more than 4% of income for water services, USA.

Bill period	Percentage of households who spent more 4% of their income
In the late 1990s	7
Under low-cost case, 2019	10
Under high-cost case, 2019	20

Source: CBO (2002).

The report concludes with some points on the support that the Federal Government could make towards investment in the infrastructure. One of the main concerns that emerges is that subsidies may risk distorting the cost of water services and consequently increase both management and investment costs. An alternative to subsidisation of investment proposed in the report is to channel the subsidies directly to low income families who may otherwise find it difficult to pay their water service bills, through a more general transfer plan, as happens for gas and electricity services.

6. Conclusion

The application of the reform is radically transforming the organisation of the management of water services. Businesses are being merged, passing from some thousand firms before the reform to little more than a hundred as the reform has progressed. This progress is favouring the growth in medium-sized businesses, probably allowing them to exploit the scale and scope of the growing economy linked to the incorporation and integration of services. One question that springs to mind is just how much of the advantage derived from them will be transferred to the consumers and how much will be changed into large profits for business monopolies? The process of reorganisation will most certainly bring some exploitation of the advantages of size and integration, but at the same time will modify the relationship between management and consumer to one that previously existed in which a citizen considered that the administrators of their local town were totally responsible for the cost and quality of the services, and whereby were influenced in which way to vote. Control and distribution of the benefits brought about by the reform plays its part in the capacity of the new system to establish and run an efficient system of regulation.

The model of regulation that emerges from the reform is near to that of regulation by contract whereby the contracting parties are, on one side the municipality brought together by AATO, and on the other a manager taking the form of either a mixed private/public company or a fully public company.

The presence of the municipality in the matter, preferring control of that to which it is entrusted, renders both positive and negative aspects to the management. Among the positive points is that regarding quality

of service (Hart, 2003; Schmitz, 2000) and that relating to the risks of regulation. One of the more complex aspects of regulation by contract is the definition of quality performance which must be guaranteed by the management running the service. A municipality's presence in a mixed enterprise could ensure a greater effort on the part of management to fulfil obligations in respect of the quality of service. Its presence could also limit any opportunistic malpractice, with particular reference to the tariff and in general to the management of the contract, having the official public capacity proposed by the control (ATO).

Among the negative points is the risk of obtaining the worst of both worlds (Jasinski, 1998; Boardman & Vining, 1991), and that of the municipality's behaviour which might favour the interests of the company shareholders. The first point refers to the conditions that the company makes on the objective aims of the management company and, in particular, whether they are turned more towards maximising profits rather than fulfilling social and political objectives. In this case, a mixed enterprise runs the risk of obtaining the worst of both worlds and consequently does not give enough signals to management to minimise costs and at the same time to curb public spending regarding the supply of the service. The second aspect arises at the moment that the municipality, in effect also a shareholder, looks positively forward to profits distribution and negatively forward to balancing the accounts of the managing company. In such a case the municipality could bias the subject proposed by the control by whether it is relevant to the tariff or to the management of the contract.

One thing posing a problem to the application of the reform is the subject of financing investment. Estimates of the investment required in order to make the plants more efficient, respecting the norms in place on the quality of wastewater and in order to reach better standards in all aspects of the water services show that high levels of financing are required, with return times linked to the length of the asset. In Italy's case, even though the figures represented are lower than those of the UK and the USA, the necessary investment sums, the limited public resources available and the insufficiency of the normal channels of finance undertaken by the domestic banking system leads one to think that private capital will have to play a role both in management and financing as well as in the realisation of investment.

With the reorganisation forecast by the reform, and above all, the outcome of the investment needing to be realised, the tariff and the average annual cost increased immediately and will rise further in respect of the previous ones. Even if in Italy the relationship between the average annual cost for water services and the average annual income tend to increase, the affordability of the tariff will present a problem only for particular consumer groups, as happens in England, Wales and the USA.

Identification and political development will enhance the conditions of affordability for families on low incomes; the unemployed and pensioners, representing the missing part of society needed to complete the reform in its entirety, should lead Italy towards a substantial modernisation of its water system.

References

- Banca d'Italia (2002). I bilanci delle famiglie italiane nell'anno 2000. *Supplementi al Bollettino Statistico: Note metodologiche e informazioni statistiche*, 12(6).
- Bakovic, T., Tenenbaum, B. & Woolf, F. (2003). *Regulation by Contract: A New Way to Privatize Electricity Distribution?* Working Paper no.14. World Bank, Washington DC.
- Bardelli, L. (2000). La regolazione tariffaria dei servizi idrici in applicazione della legge Galli. In *Osservatorio dei mercati dei servizi pubblici locali*. Confservizi Cispel, Roma.
- Boardman, A.E. & Vining, A.R. (1991). The behaviour of mixed enterprises. *Research in Law And Economics*, 14(1), 223–250.

- CBO (Congressional Budget Office) (2002). *Future Investment in Drinking Water and Wastewater Infrastructure*. CBO, Washington DC.
- COVIRI (Comitato per la vigilanza sull'uso delle risorse idriche) (2003). *Lo stato dei servizi idrici anno 2002*. COVIRI, Roma.
- COVIRI (2004a). *Secondo rapporto sui Piani di Ambito*. COVIRI, Roma.
- COVIRI (2004b). *Terzo rapporto sullo stato di avanzamento della legge 36/94, n.36*. COVIRI, Roma.
- COVIRI (2004c). *Relazione annuale al Parlamento sullo stato dei servizi idrici*. COVIRI, Roma.
- DEFRA (Department for Environment, Food and Rural Affairs) (2004–updated 28 February 2005). *Cross-Government Review of Water Affordability Report*. DEFRA, London.
- GAO (United States General Accounting Office) (2003). *Drinking Water: Experts' Views on How Future Federal Funding can Best be Spent to Improve Security*. GAO-04-09, Washington DC.
- Hart, O. (2003). Incomplete contracts and public ownership: remarks, and an application to public–private partnerships. *Economic Journal*, 119(486), C69.
- House of Commons – Environment, Food and Rural Affairs Committee (2003). *Water Pricing: First report of session 2003–2004*. The Stationery Office Limited, London, HC121.
- ISTAT (2002). La povertà in Italia nel 2001. In *Note Rapide*. 7. ISTAT, Rome, (2).
- ISTAT (2003). *Il sistema di indagini sulle acque – Anno 1999. Statistiche in breve*. ISTAT, Rome.
- ISTAT (2004). *Archivio Opere Pubbliche e di Pubblica Utilità*. ISTAT, Rome.
- Jasinski, P. (1998). Partial privatization: the caveats and experiences. *Intereconomics*, 33(1), 30–40.
- OECD (2002a). *Purchasing power parities – measurement and uses. Statistic Brief*. OECD, Paris, Year 2002(3).
- OECD (2002b). *Social Issues in the Provision and Pricing of Water Services*. OECD, Paris.
- OECD (2004). *Purchasing Power Parities – Comparative Price Levels. Main Economic indicator – January*. OECD, Paris.
- OFWAT (2004). *Future Water and Sewerage Charges 2005–2010: Final determinations*. OFWAT, Birmingham.
- Peruzzi, P. (2004). Le tariffe dei servizi idrici dopo la riforma della legge 36/94. *L'acqua-Rivista bimestrale dell'Associazione Idrotecnica Italiana*, 69.
- Schmitz, P.W. (2000). Partial privatization and incomplete contracts: the proper scope of government reconsidered. *Finanzarchiv*, 57(4), 394–411.
- SMAT (2003). *Le tariffe dei servizi idrici in Italia*. SMAT, Torino.
- SMAT (2004). *International Tariff of Water Services*. SMAT, Torino.

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