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“Social policies and private sector participation in water supply – the case of France”

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1. Introduction

Given the prominent size of the private water industry in France and the specific Private Sector Participation (PSP), it is natural to investigate how the private sector impacts on equity, access and affordability issues. Access and affordability of water for poor households have been discussed in France since the beginning of the 1990s. An example is the Law, promulgated in 1992, creating a minimum insertion income, which states that “*all families must have access to energy and water*”. A recent and major change in terms of water-related social regulation has been the creation in 2000, jointly by public and private water operators, of a fund specifically dedicated to subsidizing the poorest households. If these social measures reflect a wish, both from the public authorities and the private water companies, to address the issue of water affordability there is still a lack of formal statistical analysis of the affordability of the water service for the low-income and for other vulnerable household groups in France. In this chapter, we wish to explore the various social policies and regulation taken by private water companies and by public authorities in charge of the water sector that are intended to help the poor.

France has been a pioneer in terms of PSP in the water sector. The first well-documented case of private participation in France dates back to 1776 when the city of Paris decided to allocate to “*Sieurs Perrier*” a 15 years exclusive concession of the water supply system (Duroy 1996).¹ Water affordability to poor households was already at that time an important issue since the concession contract stipulated that “*The Sieurs Perrier must build water fountains in order to guarantee appropriate price for poor households*”. Currently, the water industry in France is organised on a municipal level. Local communities can either directly manage water services or they may choose to delegate it to a private company through various contractual agreements including management contracts, affermage (lease contract) and concessions (here the private operator is responsible for financing all new investments over the period of delegation). Whatever the type of arrangement, water services must have the characteristics of a *public service*: equal access for all consumers, continuity of the service and adaptability to technical innovations. The participation of the private sector has progressively increased in France during the 20th century to reach now around 80% of the market share (Guérin-Schneider and Lorrain (2004); Pézon (2000)).

The remaining of this chapter is organised as follows. In the following two sections we present the main characteristics of the French water industry and we discuss the main issues related to private participation and water affordability. Next, we focus on social policies and regulations dealing with water affordability in France. In particular, we describe and analyse critically the recent, current and proposed support mechanisms to assist low-income households in paying water and sewerage charges. We also discuss alternative approaches to the measurement of water affordability in France. Using the Family Income and Expenditure surveys published by the National Institute for Statistics and Economic Studies and the existing literature, we provide a formal definition of water affordability in France. In the last section we identify the determinants of water affordability. We focus in particular on the private participation into the water sector as a potential determinant of affordability. We conclude by deriving some policy implications from our findings.

¹ On February 7th 1778, Louis XVI gave the Perrier’s brothers the exclusive right “to build and establish all facilities (pumping machines, pipes, etc.) required to bring water from the Seine to all Parisian districts and suburbs”.

2. Characteristics of the French water industry

2.1. Organisation of water services in France

2.1.1. A local organisation

French local communities have been responsible for water supply, treatment and sanitation since 1790. But local communities only started to organize water delivery since the middle of the 19th century. At the end of the 19th century, the Conseil d'Etat (the highest administrative jurisdiction in France) recognized that the water service was a prerogative of French municipalities². In 2003, there were approximately 29,300 water services in France for 36,679 local communities (BIPE 2005) of which 14,900 deal with water supply and 14,400 with sewage.

2.1.2. The legal status of water services

Water services in France are considered as public services.³ Being a public service means that water services must have a certain number of characteristics including equal access for all consumers, continuity of supply in quantity and quality and adaptability to the technical innovation (Mescheriakoff 1985).

But the French water services belong to a specific category of public service called *industrial or commercial public services* (*Service Public à caractère Industriel ou Commercial* in French, SPIC). Belonging to the industrial or commercial public service category means that the local public authority can delegate the management of the water service to a private firm. Local public authorities may decide to cooperate with an external operator. If the municipality retains this option, it will have a wide variety of contractual arrangements at its disposal. These contractual arrangements differ according to the degree of the firm's involvement in the service and the proportion of the risk that the external operator bears.

The delegation of water services is currently governed by the “*Sapin Law*” of 23 January 1993. In case of private management, the relationship between the local municipality and the firm can take different forms: management contracts, affermage (lease contract) where the municipality remains the owner of assets, and concession where the private operator is responsible for financing all new investments over the period of delegation. Typically, all these contracts specify the nature of expected services and the water pricing schemes (including price adjustment formula). Affermage is the most common form of contract, usually awarded for a period of 7 to 12 years. The private firm is responsible for operation and maintenance of the water utility; it collects tariff revenues from users and pays a special additional charge to the local community, which is included in the water rate determined by the contract. It has no obligation to invest in the infrastructure. Whatever the type of management chosen by the local community (public versus delegated), water services must have the characteristics of a public service: equal access for all consumers, continuity, and adaptability to technological changes.

² See the 28 April 1977 decision of the Conseil d'Etat for the city of Poitiers or the 6 August 1978 decision for the city of Lille.

³ The definition of water services as a public service has a long history in France. According to the Cour de Cassation (the highest judiciary authority in France), the public water fountain service was already considered in 1863 as a public service (Duroy 1996:17).

2.1.3. Institutional organisation of the water sector

One important characteristic of the institutional organisation of the water sector in France is the complexity of public authority intervention. There are several levels at which public authorities may have an impact on water utility management (from EU level to the local community level).

1) The European Union level

Most of environmental regulation currently takes place at the European level. The two most important EU provisions dealing with water regulation are the Water Framework Directive and the Urban Wastewater Treatment Directive.

The Water Framework Directive⁴ establishes a European framework for the protection of all water bodies in the European Union - rivers, lakes, coastal waters, groundwater and inland surface water. Its objective is to achieve “good quality” of water resources by 2015. This objective is to be reached through integrated management based on river basins, as water systems do not stop at administrative borders. The Water Framework Directive operates with clear deadlines for various steps that are required to move toward sustainable, integrated water management in Europe. The national legislation necessary to implement the Directive became due in December 2003.

The Urban Wastewater Treatment Directive⁵ addresses nutrient-based, bacterial and viral pollution caused by urban wastewater. Urban waste water that discharges excessive levels of nutrients, in particular phosphorous and nitrogen, into rivers and seas promotes excessive growth of algae and other forms of aquatic plants. This process known as "eutrophication" in turn leads to a lowering of oxygen levels, threatening the survival of fish, which depend on oxygen. It can also make the water unsafe for drinking. By introducing potentially harmful bacteria and viruses, the discharges also pose human health risks in waters that are used for bathing or shellfish culture.

2) The State level

Since the decentralization laws of March 1982 and January 1983, the role of the central State has been limited to water law enforcement (withdrawal and discharge of authorizations), and to guaranteeing public health and safety. Water services are controlled by the territorial administration of the State: control of the legality of public procurements and, generally speaking, of all activities of local communities (Prefecture) and compliance with technical standards (Local Directorate of Agriculture and Forestry, Directorate of Public Works, Directorate of Health and Social Affairs).

The State also guarantees solidarity between users at two levels:

- At the level of each of the six large river basins, a Water Agency (public establishment under State supervision) levies water charges on withdrawals and wastewater discharges. These water charges are used to subsidize investments to improve water resources and to treat effluents or to improve the operation of treatment plants.

⁴ Directive 2000/60/EC of the European Parliament and that of the Council of 23 October 2000 establish a framework for Community action in the field of water policy.

⁵ Council Directive 91/271/EEC concerns urban wastewater treatment.

- At the national level, the National Fund for Rural Water Supply (Fond National pour le Développement des Adductions d'Eau, FNDAE) levies a tax that now amounts to 10.5 centimes on all cubic metre of water supplied in France, and allocates each Department (administrative district) subsidies for small rural communities to enable them to invest in potable water supply system. This fund has however ceased to exist since January 2005.

3) Water agencies and drainage basins

The water agencies oversee the application of the “polluter pays” principle and implement the policies for the basins drawn up by the committees, in order to protect water resources and control pollution. Six water agencies (one per major basin) were set up in 1964. They are independent public institutions under the dual supervision of the Ministry of the Environment and Sustainable Development and the Ministry of the Budget. They distribute financial aid to industry, local authorities and farmers who undertake to protect water resources and quality.

In order to support these operations they collect fees from water users, calculated on the “polluter pays” principle. In the course of the seventh investment programme (1999-2001), the agencies invested € 16 billion and collected € 7.8 billion in fees. The difference between these organizations and those established in other countries is that they do not play a role either in carrying out projects or in regulating or supervising water. The agencies are supplementary to the existing structures and their role is to accelerate or stimulate necessary projects by offering technical and financial incentives. The arrangement based on the major drainage basins means that water policy could be adapted to the specific features of each region. This is one of the unique aspects of the French system.

4) Regions

Water is the largest item of environment expenditures at the regional level, accounting for an average of 33.4%. The regions have however a very limited regulatory jurisdiction over water (they only grant funds for investments that are of regional benefit, for example for major supply projects) and they do not have specific environmental financial resources.

5) Departments

Water is also the biggest item in terms of environment expenditure at the department level, accounting for 61.4%. Departments assist local communities at the technical and financial level. They manage the bulk of the FNDAE budget. This budget was on average equal to € 122 million per year from 1996 to 1999. After the water agencies, the French Departments are the second largest source of water sector financing.

6) Local communities and inter-communal arrangements

There are approximately 29,300 water services in France for 36,679 local communities in 2003 (Bureau d'Informations et de Prévisions Economiques et Syndicat Professionnel des Distributeurs d'Eau 2005) of which 14,900 deal with water supply and 14,400 with sewage.

The production and distribution of drinking water and sewage are the responsibility of the communes. The latter are also responsible for the quality and the cost of each of these services and their proper operation.

2.2. Economic, social and environmental performance of the French water industry

2.2.1. Population connected to the water network

It is difficult to find long-term statistical information on the connection rate to the water supply network in France. Berland and Juery (2002) and Guerrin-Schneider and Nakhla (2004) however have reported data on the rural population connected to the water supply network. These figures give a lower bound for the whole French connection rate since the connection rate is known to be lower for the rural population than for the urban one.

Table 1: Evolution of the rural population connected to the water supply network

Year	1954	1960	1966	1971	1976	1981	1990	1995
Rural population (million)	21.6	21.8	26.1	26.7	28.4	29.6	36.9	n.a.
Connected rural population (million)	8.1	10.4	16.6	20.1	25.0	27.8	36.3	n.a.
Connection rate (%)	37.6	47.4	63.6	75.3	88.0	93.7	98.2	98.2

Source: Berland and Juery. (2002), Guerrin-Schneider and Nakhla (2004) and FNDAE, Pézon (2000)

At the beginning of the 1950s, less than 40% of the rural population was connected to the water supply network (it was just 25% in 1939 (Pezon 1999)). From 1954 to 1995, the connection rate has increased by more than 2.5 times to reach almost a full connection rate of rural population at the end of the 1990s.

The rapid increase in the connection rate was possible through the creation of the FNDAE in 1954 (See later).

Table 2: Total population connected to the public water network 1960 (December 31st)

Size of water supply network	Population connected (million)	Connection rate (%)
Less than 2,000 inhab.	10.4	50.5
2,000 to 5,000 inhab.	5.1	71.2
5,000 to 10,000 inhab.	3.8	84.8
10,000 to 20,000 inhab.	4.1	90.4
20,000 to 50,000 inhab.	5.3	93.4
50,000 to 100,000 inhab.	2.8	93.2
Greater than 100,000 inhab.	4.6	90.8

Source: Berland and Juery. (2002)

The fact that the FNDAE primarily focuses on development of water networks in small communities can be easily understood from Table 2. Hence, it is important to stress that at the beginning of the 1950s the connection rate to the public water network used to highly depend upon the size of local municipalities. The previous table reports the connection rate in 1960. Although more than 90% of inhabitants living in large local communities (number of inhabitants greater than 10,000) were already connected to the public water network at that time, the percentage significantly drops in the case of small local communities (less than 10,000 inhabitants). For the smallest municipalities, only one

inhabitant out of two was connected in 1960. The fact that the connection rate used to highly depend upon the size of local communities was clearly incompatible with the notion of public service.

Another assessment of the French connection to the water network is possible through the housing surveys regularly conducted since the 1970s by the National Institute for Statistics and Economic Studies (INSEE). The connection rate statistics are presented for households belonging to the lowest, median and the highest income decile.

Table 3: Evolution of the French population connected to the water supply network by income class for 1984, 1992 and 2002

Income decile class	1984				1992				2002			
	1	5	10	All	1	5	10	All	1	5	10	All
Households only supplied with cold water (%)	33.0	5.1	0.4	7.7	11.9	2.1	0.2	2.8	3.9	0.8	0	1.1
Households not connected to the water network (%)	2.2	0.3	0	0.4	1.0	0.1	0	0.5	0.3	0.1	0	0.1

Sources: INSEE housing surveys 1984, 1992 and 2002 and author's own calculation

In twenty years, the proportion of French households supplied only by cold water has dropped from 7.7% in 1984 to 1.1% in 2002. For the poorest households, the change is very significant (from 33% to 3.9%). We observe a similar trend for the share of households not connected to the water network. The proportion of French households not connected has dropped from 0.4% in 1984 to 0.1% in 2002. For the poorest households, the change is also very significant (from 2.2% to 0.3%).

From the previous data it is clear that, today, access is not a major issue in France, except maybe in very specific areas (very small local rural communities) where building a water network is not possible or too costly to undertake. But one should keep in mind that:

- The process of connecting households has taken one or two generations;
- Achieving a full connection of the French population has required high level of investment (subsidies from urban to rural areas);
- The process of connecting households has benefited from long periods of economic growth.

The crucial challenge that must now be solved by the French water sector will be to maintain the access rate to the water network at the current level. According to Berlan and Juery (2002) 29% of the network pipe are 30 years old or more and 10% of the network is even 60 years old or more. The investment required to renew the network is estimated to be between € 1.5 and 2 billion per year from now to 2015. Financing such investment is a challenging issue for the French water sector.

2.2.2. Evolution of household sanitary equipment and quality of water

Another way to assess the social performance of the water sector is to analyse the sanitary equipment of French households. In 2002, less than 1% (7.5% of the lowest decile) of the French population did not have a bathroom inside the housing. Ten year ago, this figure was 4.3%. This reflects an important improvement for French households. The proportion of

population without any toilets has also significantly dropped from 2.3% in 1990 to 0.7% in 2002. Access to basic sanitary equipment is not a major issue, except for the poorest households.

Table 4: Evolution of household sanitary equipment

	1990 ^(a)	1996 ^(b)	1999 ^(a)	2002 ^(b)
Households				
No bath, shower or wc inside	814,755 (3.8%)	388,000 (1.7%)	298,468 (1.3%)	199,339 (0.8%)
No bath, shower but wc inside	596,246 (2.7%)	302,000 (1.1%)	257,069 (2.2%)	197,387 (0.9%)
No wc but bath or shower	575,486 (6.6%)	244,000 (2.7%)	532,899 (1.9%)	214,818 (1.2%)
Persons				
No bath, shower or wc inside	1,428,824 (2.5%)	621,000 (1.0%)	458,230 (0.8%)	303,063 (0.5%)
No bath, shower but wc inside	997,232 (1.8%)	469,000 (0.8%)	390,808 (0.6%)	253,043 (0.4%)
No wc but bath or shower	1,321,197 (2.3%)	504,000 (0.8%)	1,192,485 (2.0%)	428,954 (0.7%)

Note: Figures in parentheses are based on the total number of households or the total number of persons.

^(a) *Source:* French census and author's own computation

^(b) *Source:* INSEE housing surveys and author's own computation

Table 5: Evolution of household sanitary equipment by income class for 1984, 1992 and 2002

		1984				1992				2002			
Income decile class		1	5	10	All	1	5	10	All	1	5	10	All
Households	without bathroom (%)	40.2	10.9	1.4	13.6	20.9	3.9	0.4	5.6	7.5	1.1	0.3	2.1
Households without wc (%)		5.6	0.8	0.1	1.3	3.1	0.5	0.1	0.7	1.3	0.2	0.1	0.3

Sources: INSEE housing surveys 1984, 1992 and 2002 and author's own calculation

2.2.3. Quality of water delivered to final customers

One of the tasks of the French Ministry of Health and Solidarity is to ensure that the water delivered to customers satisfies the EU drinking water standards. Every year, around 300,000 samplings are realized and 4.5 millions of tests are conducted (including tests on nitrates, pesticides and microbiological parameters). The following table presents the percentage of water production units and test results, which do not comply with the EU drinking water standards in 2002 (SISE-EAU database).

Table 6: Quality of water delivered according to the size of distribution units in 2002

		Volume produced (in m3 per day)						Total
		<100	100-1,999	2,000-9,999	10,000-49,999	50,000-99,999	>100,000	
Nitrates	Non-compliant distribution units	2.70%	4.36%	2.80%	1.61%	0.00%	0.00%	3.41%
	Non-compliant tests	3.04%	3.81%	1.30%	0.31%	0.00%	0.00%	2.66%
Pesticides	Non-compliant distribution units	13.45%	16.28%	16.52%	22.53%	22.73%	7.69%	15.73%
	Non-compliant tests	2.04%	1.27%	0.48%	0.32%	0.09%	0.04%	1.04%
Microbiology	Non-compliant distribution units	28.39%	13.52%	10.73%	9.55%	4.40%	0.00%	21.51%
	Non-compliant tests	2.77%	10.02%	2.33%	1.00%	0.59%	0.38%	2.77%

Source: Ministère de la Santé et des Solidarité (2005)

In 2002, 3.41% of the distribution units present a maximal nitrate concentration greater than 50 mg/l. On average 2.66% of the tests reveals a contamination by nitrates. The non-compliance rate decreases with the size of the distribution unit. Data shows that on average 2.77% of the tests reveal a contamination by pathogenic microorganisms. The rate of non-compliance with microbiological parameters is higher than 20% for the water distribution units on average. One may consider that these figures reflect a good quality of water delivered to consumers⁶.

3. Modalities of private sector involvement

Local public authorities are responsible for the maintenance and operation of water services. Full privatisation is not an option in view of the French law (which derives from the Roman law), stating that the public domain in France (including the infrastructure such as pipes, lines, etc. built on the public domain) is “*inalienable*”. This implies that no one can own it except a public authority. As the organizer of the local public service, local public authorities must define the general principles governing the service (e.g. it has to monitor the prices, control the firms that enter the market, organize the competition, ensure that there is no interruption in the service provision, etc.).

Nevertheless, even though the organization of the activity is public, the management of the service can be either public (direct management), or private. Therefore, local public authorities may decide to cooperate with an external operator. If the municipality chooses this option, it will have a wide variety of contractual arrangements at its disposal. These contractual arrangements differ according to the degree of the firm’s involvement in the service and the proportion of the risk that the external operator bears. Hence, in spite of the public domain being “*inalienable*”, private participation could become a major component of the water sector in France.

⁶ However in October 2004, (case C-505/03), the European Union's Court of Justice condemned France for excessive concentrations of nitrates in tap water in Brittany.

3.1. Political and economic rationale for private involvement in the water sector

As mentioned earlier, France has been a pioneer in terms of private-public partnership (PPP). As early as the 12th century, French legal texts mention “*affermage*” and “*concession*” - terms, which are still used today (Ménard and Saussier 2003). According to the French legal system, the delegation of a public service takes the form of a contract through which a local municipality gives a private firm the right to build and/or to operate a public service.

An increased level of PSP took place in 1950-1970s. During this period, there was a huge need for investments (into water networks of treatment facilities). This leads us to conjecture that investment constraints on the part of the local authorities were instrumental in increasing PSP.

3.2. The size of the private sector

As mentioned earlier, the PSP in the water sector has a long history in France (Paris allocated an exclusive concession to a private company in 1776; less than a century later, Napoleon III created the Compagnie Générale de Eaux in 1853 by).⁷ At the beginning, the two main objectives were “*to irrigate the countryside and to supply water to towns and cities*”. However, only in 1940ies did a significant change take place in terms of public/private market shares, as depicted in the following table.

Table 7: Recent evolution of the private participation in the water supply sector

Year	1938	1964	1975	1979	2001
Public	83%	56%	50%	47%	20%
Private	17%	44%	50%	57%	80%
CGE			42.3%	35.6%	51.1%
SLE			26.9%	24.6%	24.3%
SAUR			5.8%	10.4%	13.1%
Other			19.2%	16.4%	9.9%
SODEBA			5.8%	6.8%	--
SDEI			--	6.5%	--
Independent			--	--	1.9%
Total French population (millions)	42		52	53	60

Source: Guérin-Schneider and Lorrain (2004)

The participation of the private sector has progressively increased in France since the 20th century. For the water service, the market share (in terms of customers) of the private sector used to represent 17% in 1938 and 44% in 1964. According to the French Ministry of Environment, it was around 80% in 2001. The main characteristic of the private sector is its oligopolistic form with three major companies: Générale des Eaux (Véolia Environnement), Lyonnaise des Eaux (ONDEO-SUEZ group) and SAUR (Bouygues group). They represent the quasi-totality (98%) of the private market (other private companies operate at a local level but their weight remains small).

⁷ In 1999, the Compagnie Générale des Eaux changed its name to Vivendi Environment and became Véolia Environment in 2003.

3.3. Contractual relationship between local communities and private operators

Local communities may either entrust the management of their water supply services to a specialized private company or directly manage them.

3.3.1. Direct management

The community, or an intercommunity syndicate of which the community becomes a member, takes complete charge of investments and operation of water supply services, of the relations with users, invoicing and recovery (generally through a municipal collector). The staff of the water authority is composed of municipal agents with a civil servant status. Today, except in some medium and large towns that have set up their own technical municipal services, water authorities are mainly found in small rural communities.

3.3.2. Delegated management

In this case, communities delegate the management of all or part of their water supply services to a private water supplier within long-term contracts; “affermage” (leasing) and concession are the two types of contracts that are usually used. Currently in Paris, the water service is delegated through a concession contract. One part of the service is delegated to the Suez group (“Paris rive gauche”) and the rest of the network to Véolia Environment (“Paris rive droite”). It should be noticed that, until 1985, the water service used to be publicly managed in Paris. The City Council decided first to use “affermage” contracts, before switching to a concession regime in 1985.

In the “affermage” contract, the community is responsible for investments and only entrusts the operation of installations to a private supplier. The latter's services are paid by billing the water price and part of the income is paid back to the community to meet the technical depreciation cost and financial amortization of the supply network. In a concession contract, the private company builds installations, operates them at its own expense and recovers its cost by billing water price. At the end of the contract, it will hand the network and installations in working order back to the community. The concession contract implies a higher degree of risk for the operator to the extent that it is responsible for all the investments. But the level of risk depends of course on the type of price regulation implemented. There could also be mixed management where the communities can decide to operate water production and intakes by themselves and choose to delegate distribution to private companies.

3.4. Important issues related to private involvement in the French water sector

3.4.1. Regulation of the private sector

Economic regulation of French water services is directly carried out by local communities. They must ensure that users’ interests are protected with respect to prices and quality of the service. They must also guarantee that there is no undue discrimination between users.

This decentralized system creates a number of problems. In particular, due to information asymmetry, local communities are not always in good position to exercise an efficient control over water service providers. As a consequence and contrary to other industrialized countries, there is no price-cap or rate-of-return regulation imposed to water utilities in France. Such regulation is replaced by a contract between the private operator and the local community in the case of private operation, or a decision of the municipality board

(regarding the way the water utility is managed) in the case of public operation. In other words, regulation is based on the contract.

The delegation contract sets the price and also describes the obligations of the private operator (both in terms of service and economic information that must be given each year to the local community). Water price for the first year is calculated from financial forecasts. For the following years, a rate revision rule based on input price index changes is used. The main sanction in case of non-respect of delegation rules is the non-renewal of the delegation contract. There are several examples in France where the non-renewal of the delegation contract has resulted from the non-respect of delegation rules or from a disagreement on the water price level.⁸

Contrary to the UK model, in France, where there is no centralized public authority in charge of the regulation of the water industry, the economic regulation of delegated services results from two elements. A national legislative framework governs both the form of the private sector participation, and the procedure of the delegation bidding process. The Sapin Law (1993) and the Barnier and Mazeaud Laws (1995) are the main legislative texts defining these relationships between local communities and private firms. Environmental regulation takes place both at the national level within the Ministry of Environment and at the European level the importance of European Commission regulation is growing.

3.4.2. Private sector participation and water price

In France, water-pricing schemes have been affected by decisions of public authorities. The January 1992 Water Law has attempted to reduce water wastage and to promote equity between users. It has prohibited the use of flat tariffs, ruling out both entirely non-volumetric pricing schemes and tariffs combining a fixed charge covering a given volume of consumption with volumetric charging on the remainder. The result of this Law has been a decisive move in France towards one or two-part tariff systems without minimum consumption charges.

The process of price setting is different whether the local community has chosen to delegate the service to a private firm or not. If the local community manages directly the water service, it can set the price of water by itself. In such a case, the rate is designed in order to generate revenue that allows the utility to cover its costs. Since French legislation requires the water utility budget to be balanced, the “revenue-recovery principle” is usually the primary objective in the design of water prices. Hence the rate structure is designed to cover both operating and capital costs.

If the local community has chosen to delegate water services to a private firm, the rate structure is determined by projecting financial accounts provided by the operator over the period of delegation. Periodic revisions of water rate are defined using a price index adjusting formula. The relationship between the local municipality and the firm is formalized by means of a contract that specifies a price structure, a formula of price revision and clauses allowing for exceptional conditions. This contract is the result of a negotiation process: the local community and the firm have mainly to agree on a price structure that achieved budget balanced for the firm while remaining consistent with policy objectives of the local

⁸ Le Monde Diplomatique (March 2005) reports the example of the city of Neufchâteau located in the East of France. In Neufchâteau, the water service used to be delegated to a private firm, la Compagnie de l’eau et de l’ozone for a long time (more than 15 years of contract delegation). In 1992, the mayor decided to conduct an audit of the water price. The conclusion of this audit was that the average water price should be equal to 2.90 Euros per m³ compared to 3.65 actually paid by Neufchâteau customers. After the 2001 local election, the city council decided to cancel out the delegation contract and to manage the water service directly. As a result, the water price, which used to be 3.84 Euros per m³ in 2000, went down to 2.92 euros in 2004.

community. Since the bargaining power is in most of the case favourable to firms, the price structure is likely to reflect a monopolistic behaviour rather than social welfare maximization. Whatever the choice of water service delegation, the question of price efficiency still remains open.

3.4.3. Private involvement and competition

The “Sapin Law” limits the duration of the delegation contracts and imposes a procedure of publicity and consultation preliminary to the conclusion of renewal. The main objective of this Law is to ensure transparency when the delegation agreements are made. To this end, the Law defines a specific procedure that is to be followed by the execution of the delegation agreements. This procedure includes a negotiation stage where the local communities wishing to delegate their water services (or to renew the delegation) must negotiate with one or more contractors in order to obtain specifications and detailed information about the content of their bids.

To evaluate the impact of the Sapin Law on the water sector, the public authorities have conducted a set of surveys targeted toward water services where the delegation agreement was renewed between 1998 and 2001. The impacts of the Sapin Law are reported in the table below. It is estimated that the number of agreements will reach around 2,000 in 2005.

Table 8: Impact of delegation agreement renewal on the water sector

	1998	1999	2000	2001
Number of delegation agreements	582	684	509	477
Number of delegation agreements in the sample	333	195	211	208
Length of contracts before / after delegation agreement	17 / 11	16.8 / 11	15.2 / 10.8	15.7/10.9
Private operators renewed (%)	92%	82%	88%	89%
Average number of offers received	n.a.	2.4	2.1	2.2
Price change (%)	-9%	-10%	-12%	-8%
Price change in % (local communities with less Than 10,000 inhabitants)	4%	-4%	-3%	-3%
Price change in % (local communities with more Than 10,000 inhabitants)	-16,5 %	-14%	-17%	-12%

Source: Guérin-Schneider and Lorrain (2004)

The number of agreements leading to a change in operators is rising. However, in 80 to 90% of the cases, the existing operator is renewed for another term. The number of offers received by local communities is still very low, 2.2 in 2001. In 28% of the cases, the local community receives only one offer, which means that there is no ex-ante competition for the market. To summarize, the level of competition among private companies through the delegation contract bidding process is still low in France. In terms of water and sewage rates, the renewal of the delegation agreement leads to an average fall of the price of between 8% and 12%. The largest price decreases are observed for populations of more than 20,000 inhabitants.

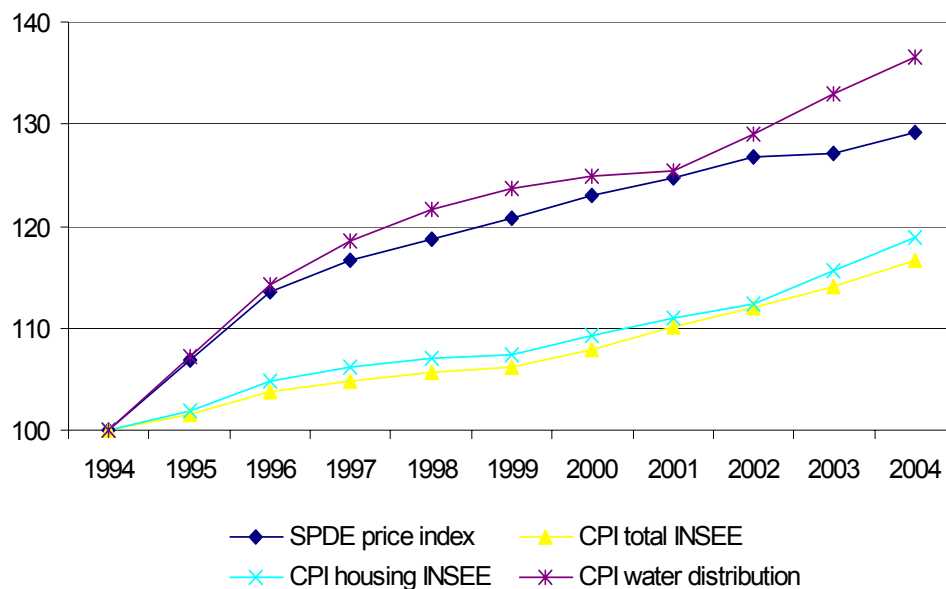
The renewal procedure of delegation agreements is concomitant with a price decrease. This is linked to introducing of more competition and change in the services to be provided by the operator.

3.4.4. Quantitative assessment of private firm's performance

A possible way to compare the performance of private and public water services is to compare the water price of these services. One must be however very careful since a direct price comparison has a meaning only if the water service publicly and privately managed to follow the same data generating process. As demonstrated by Carpentier et al. (2004), this is not the case in France. The probability of delegating the water service to a private firm increases with the complexity of the service (low quality of raw water, elaborated water treatment process, high level of interconnection with other water network, etc.).

In the next figure, we have plotted the last 10 years' dynamics of the consumer price index (CPI), of the consumer price index for housing expenses (CPI housing), of the consumer price index for water expenses (CPI water) published by the National Institute for Statistics and Economic Studies (INSEE).

Figure 1: Evolution of CPI and water related price index



First, the burden of water charges for households has increased significantly more rapidly than the total household expenses. During the last 10 years, the SPDE price index and the CPI water index have increased more than twice as quickly as the general CPI index. Second, the SPDE and the CPI water indexes follow similar dynamic paths, except for the last 2 years.

Next, it is interesting to compare the water price for private and public water services. Carpentier and al. (2004) have provided the first econometric analysis of water price in France with a special focus on the comparison between prices used by public and private services.

Table 9: Average domestic water price (in FF per m3) in France in 1998 for the water supply service

	Average price	St. dev.
<i>According to the type of the water service</i>		
Private water service	8.73	2.80
Public water service	6.57	2.21
	+33%	
<i>According to the organisation of the water service</i>		
Inter-communal agreement	8.59	2.64
Independent local community	6.81	2.64
	+26%	
<i>According to the size of the water service</i>		
Local community with more than 10,000 inhabitants	7.69	2.13
Local community with less than 10,000 inhabitants	7.88	2.90
	-2%	
<i>All local communities</i>	7.85	2.78

Source: adapted from Carpentier and al. (2004)

The average domestic water price was 7.85 FF on average in France in 1998. *On average, the price for the water service is 33% higher in the case of a private management than in case of a public one.* However, any direct policy implication drawn from this result should be taken with caution since it would suffer from a self-selection bias problem. Indeed, Carpentier et al. (2004) have shown that local communities tend to delegate the water services in case of difficult operational conditions.⁹ Taking into account these complex operational conditions (complex water network, large seasonal population, capital investment required), the water price would be 15% higher in the case of a private management for small local communities (less than 10,000 inhabitants) and only 5% for large communities (population greater than 10,000 inhabitants). Moreover, the price difference between private and public water utilities is not significantly different from zero for large local communities.

Another interesting result in Carpentier et al. (2004) is that a model explaining the water service private/public choice can be constructed and estimated. This choice reflects some efficiency considerations since, for instance, the water price is expected to increase slightly if the large local communities having chosen to delegate their water service to a private firm decide to manage this service directly). Hence, the impact of PSP on the water price depends upon local conditions.

Next, we focus on the organisation and the size of water services. On average, in 1998, the domestic price was higher in case of inter-communal management of the water service than in case of an independent local service (+26% on average). This reflects a

⁹ There is a typical self-selection problem. Some observed and unobservable characteristics of local communities that have an impact on the water price also influence the choice of delegating the water service. To correctly relate the price difference between private and public management of the water service, a choice delegation model must be first estimated. This is the approach followed by Carpentier et al. (2004) using a treatment effect framework.

higher technical complexity of water services operating under an inter-communal agreement since they usually correspond either to rural areas with very low population density (high cost per capita due to the network pipe maintenance) or on contrary to urban areas with a high level of population density (high level of network inter-connection, high level of reliability, etc.). Last, the size of water services does not seem to have a strong impact on the price since the water price for water utilities serving less than 10,000 inhabitants is not significantly different from the price for services serving more than 10,000.

Table 10: Average domestic water price (in euro per m3) in France in 2001 for the water supply service

	Public	Private	Total
Independent local community	1.03	1.26	1.19
Inter-communal agreement	1.19	1.58	1.47
Total	1.12	1.46	1.36

Source: Coutelier and Basso (2004) based on the IFEN-SCEES water survey

According to a study by IFEN-SCEES, the average price paid for one cubic metre of water can vary across French Departments by as much as 100%. Between 1998 and 2001, the price of water rose by around 5% for the supplying of drinking water service (compared to +10% for waste water collection and treatment services). In France, supplying drinking water accounts for 49% of the price of water, and wastewater collection and treatment for 51%. Prices are higher if the water service is managed at an inter-municipal level and if the water management is delegated to the private sector. Whatever the type of water service organisation considered (independent versus inter-communal agreement) or the type of water service considered (water supply or sewage), the price is significantly higher in the case of a private management.

4. The issue of water affordability in France

4.1. Water affordability in France, some empirical facts

In 2005, according to the French “Observatoire des Inégalités”, there were between 3.6 and 7.1 millions of people facing poverty in France.¹⁰ More than 3 millions lived in unsanitary housings and almost 5 million did not have access to a minimum banking service. In addition, with 2.9 millions of people being unemployed (10% of unemployment) resulted in around 3 millions depending upon social aid.

According to Smets (2005), 300,000 households have accumulated important debts (rent) and at least 3 millions of people are late in paying water, electricity, gas or phone bills. Around 300,000 poor households receive a specific social aid in order to pay electricity bills and 700,000 households have asked to reschedule their water bills. These figures show that affordability of water is an important issue in France, at least for poor households.

Charitable and non-profit organisations offer an interesting picture for assessing water affordability in France since those institutions deal with the poorest people. In 2003, 1.6 millions of people (2.5% of the French population) went to a centre managed by the

¹⁰ The number of poor people varies according to the definition of the poverty threshold (either 50% or 60% of the median income). According to the National Institute for Statistics and Economic Studies (INSEE), 3 millions of households (representing more than 12% of the population) are considered as being poor (their income per consumption unit is lower than 50% of the median income).

Secours Catholique¹¹ in France. According to the Secours Catholique (2004), half of these people live below the poverty threshold (12.8% do not have any income and 41.7% relied exclusively on social aid) and 58% of the poverty cases present at least one type of unpaid charges (electricity, gas, water or banking services). The average debt per household in 2003 represented 1,646 Euros, which corresponds to two months of average income. For around 10% of the poverty cases analysed, the water bill has not been paid.

Another way to empirically assess the issue of water affordability in France is to analyse the disconnection policies of private firms in charge of water services. According to Fauquez-Avon (2005), the number of customers served in France by the Compagnie Générale des Eaux (CGE) was 6.3 millions in 2002. The CGE granted 250,000 payment facilities to customers facing financial difficulties (representing 20‰ of the water bills or 40‰ of the customers) that year. 80,000 disconnections have been realised by the CGE (13‰ of the customers) that year. According to the ministry of Sanitary and Social Affairs, the rate of disconnection due to *serious financial difficulties* is around 15% in France. Hence, the number of disconnections by the CGE due to serious financial difficulties is estimated to be 12,000 (2‰ of the customers). Among them 1,200 (0.2 ‰ of the total number of customers) disconnections last more than 24 hours.

A last way to assess the importance of water affordability for poor households in France is to analyse the social actions directly undertaken by municipalities through Social Action Centres. On average, 64% of the French municipalities offered in 2000 water debt payment programs oriented toward low-income households facing financial difficulties, DRESS (2004). Moreover, the share of municipalities having implemented household debt payment programs is significantly higher for water than for any other basic goods (phone, gas or electricity). This may reflect that, at the local level, water charge payment by low-income household used to be a significant problem.

4.2. Private and public regulation of water affordability

4.2.1. A system of ex-post social help

In France, there is currently no specific water price rebate or discount tariff for the poorest households (there is no formal social water pricing). Historically, the mechanism put in place by public authorities and private firms in order to guarantee an affordable access to water may be viewed as an *ex-post* financial aid to help poor households facing difficulties for paying the water bill. In case of financial difficulties, qualified low-income households can have access to a specific fund in order to write off their water debts.

There are two main reasons explaining the choice of an ex-post help system in France. First, according to the definition of a public service, all customers having similar characteristics must pay the same price. As the level of income is not considered as a particular characteristic of a household, this implies that no specific tariff can be implemented for the poorest households.¹² Of course, increasing block rate pricing may be used to help small water consumers (poor household) but this is not an explicit social pricing system. Second, it is clear that the size of the private water sector may constitute a possible

¹¹ The Secours Catholique is a non-profit association created in France in 1946 committed to assist the poor and to fight poverty, exclusion, intolerance and discrimination.

¹² Duroy (1996) reports that the Conseil d'Etat (the highest French administrative jurisdiction) used to consider that any price discrimination based on customer income was not allowed by the administrative code. In 1982, the Conseil d'Etat published a decision stating that the rebate implemented in Charente-Maritime for the sewage service for low-income households and elderly people was illegal since any category of customers can benefit from a specific pricing.

explanation for the ex-post choice, which may be opposed to having an *ex-ante* pricing scheme.

A recent Water Law proposition, presented in March 2005, has confirmed that social pricing will not an objective *per se* of the State and that maintaining water affordability to low-income households did not necessarily imply applying social water pricing. The mayors may decide to use increasing block rate pricing, according to the social policy they have chosen, since the pricing cannot rely on the size or on the income of households, the text cannot be used for implementing any form of social pricing in France, that is any form of income-based pricing. Finally, the December 2006 water Law explicitly mentioned the notion of universal water service.

4.2.2. A historic view of State social and regulatory mechanisms

Although there is no specific tariff oriented toward poor consumers, the State has defined a set of regulatory instruments aiming at guaranteeing affordability of water for French households. We briefly describe and discuss the most important of them.

As mentioned earlier, one of such policies was the creation of the National Fund for Rural Water Supply (FNDAE) in 1954.¹³ The FNDAE levies a tax on all cubic metre of water supplied in France, and allocates each Department (administrative district) subsidies for small rural communities to enable them to invest in potable water supply and storm and wastewater collection and treatment. These subsidies compensate for low population density and the small size of human settlements. The main objective of this fund was to finance water supply equipment in rural areas. The FNDAE has been quite successful since, at the beginning if the 1950s, less than 40% of the rural population was connected to the water supply network.

It was not until the early 1990s that some social policies were introduced towards the water affordability issue. The main objective of the 29 July 1992 Law on the Minimum Income (RMI) was to guarantee each person (older than 25 years) a minimum income level. But some articles of this law were dedicated to basic human needs, including water. In particular, the article 43 states that “*Mechanisms aiming at dealing with serious financial difficulties and social exclusion include financial aids for household unpaid water and energy bills*”. However, since no specific fund dedicated to unpaid water bills was created at that time, this law has not helped the poor households.

Four years later (1996), the Water Solidarity Charter was promulgated. The main specificity of this charter is that it is neither a Law nor a legislative text. The Water Solidarity Charter is a voluntary contractual agreement between the State, the Association of French Mayors (AMF), the Federation of local communities delegating public services (FNCCR) and the Professional syndicate of water and sewage operators (SPDE). The Charter is based on two general principles. First, the access to water must not be disconnected in case of unpaid bill due to serious financial difficulties. Second, in case of payment default the water and sewage bills can be paid, totally or partially, by local communities, private water operators or charitable associations. Although this Charter has been a step towards a guaranteed access to water for low-income households, the impact of this Charter in terms of access to water services has been limited due to a complex system involving several institutions with divergent interests. There is no clear definition of obligations and responsibilities between institutions and there is lack of sanctions in case of non-application of the Charter (Billard & al. 2001). As a consequence, in the late 1990s,

¹³ The FNDAE has ceased to exist from January 1st 2005.

130,000 disconnections a year were still taking place. Of this, 20,000 belonged to the low-income households.

A National Water Solidarity Convention took place in 2000 to clarify the 1996 water Charter. This Convention has been signed by the State, the AMF, the FNCCR and by the SPDE. The Convention explicitly specifies that water access must not be disconnected in case of unpaid bill due to serious financial difficulties (up to 3 months while the case is put to a specialised commission), that disconnection of households with babies or elderly people will be prohibited and that households in serious financial difficulties must be identified by State social agencies at the local level. As a result, a financial fund was created (mainly from State resources, 4.6 millions euros and from the SPDE resources, 3 millions of euros in 2000¹⁴). For the first time, public and private institutions involved in the water sector have clearly defined their respective financial contribution to a social water fund.

A recent law on housing (2005) reinforces the protection of poor households in case of non-payment of water bills. No disconnection should be allowed for low-income households facing financial difficulties for paying water charges.

4.2.3. Private utilities water pricing practices

Pricing policies for public services are often used to satisfy several requirements and to pursue several objectives. In the specific context of urban water supply, some criteria have been emphasized, including efficiency, equity, and/or public acceptability and transparency. Many empirical studies have analysed efficiency issues, but only a few have approached the distributional aspects of water pricing (García-Valiñas 2005). It has been argued that cost-recovery pricing approach goes against the equity principle since low-consumption and low-income households are characterized by a more price inelastic water demand. As a consequence, redistributive pricing mechanism has been promoted.

For example, increasing block rates may favour small consumers (that is poor households). On contrary, large consumers (rich households) will benefit from decreasing block rates. Similarly, a small fixed charge will reflect a more socially oriented tariff policy. Hence, the choice of pricing schemes implemented by water utilities (increasing or decreasing block rates, flat rates, constant unit rate, etc) has a significant distributional impact.

It has been found that the marginal cost and marginal price is not very different (Garcia and Reynaud 2004). The private sector secures its profit through fixed charges. The average fixed charge (25.85 euros per user) is more than one half the average capital expenditures (16.12 euros per user). As a result of these high fixed charges, poor households are disproportionately affected.

4.3. Measuring water affordability in France

To our best knowledge, there is currently no formal accepted definition of water affordability in France (or even elsewhere).¹⁵ The international norm has been that each household should

¹⁴ For instance, the financial participation of private operators belonging to the SPDE represents 0.2 euros per customer and per year.

¹⁵ The OECD has however proposed several methods for measuring the affordability of water charges. "Macro-affordability" indicators are developed by relating national average household water charges to either average household income (disposable or gross) or average household aggregate expenditure. "Micro-affordability" indicators disaggregate the former by income groups, family types or regions. Available evidence of affordability indicators suggests that, in about half the OECD countries (15 out of 30), affordability of water charges for low-income households is either a significant issue now or might become one in the future, if appropriate policy measures are not put in place.

use between 3-5% of their expenditure on water bills. However, several authors have consequently used 3% for developed country context (Sawkins and Dickie 2002), Fitch and Price 2002). Following these authors, we define water affordability as the share of income spent on water charges. Moreover, we define a “*water-poor*” household as a household spending 3% or more of its income for paying water charges. One should be however cautious with using the term *water-poor* in case of high-income classes. For a rich household, being *water-poor* results from a high water bill. It is likely that such a high water bill is the consequence of a large water consumption associated with water consuming equipments such as air conditioning, swimming pool, garden, etc. Hence, being *water-poor* in the case of a high-income class is the result of a voluntary decision of the household. On contrary, being *water-poor* in the case of a low-income class likely means that a significant part of the total income must be devoted to the water bill for insuring basic human needs.

4.3.1. Measuring water expenses and household income

Water affordability has been defined by reference to the share of income spent on water charges (*water income share*). Assessing the affordability of water for a household involves the straightforward comparison of their water bill with their income.¹⁶ Obviously, the definition of income is critical and we need to clarify our approach. But a clear definition of water charges taken into account is also necessary.

Water charges may be divided into three parts in France namely the water supply charges, the sewage treatment charges and the taxes and fees. The first and main component of water price corresponds to the supply process, which involves extraction of water, treatment and distribution to customers. In 2003 the share of the supply used to represent 46% of total price paid by a consumer (Bipe 2005). The second component of the price corresponding to the sewage service used to represent on average 37% of the total water price in 2003. It is important to notice that all consumers do not necessarily pay sewage charges. This is for instance not the case in small rural local communities, where no collective sewage service exists. The last component, which corresponds to taxes and fees, includes the river basin agency fees, the National Fund for the Development of Water Supply System fee (suppressed in January 2005) and the Value Added Tax (VAT) at 5.5%. These taxes represent now more than 17% of the price. This component has registered the sharpest increase during the last decade (+256% for the basin agency fees and +115% for other taxes from 1991 to 1998).

Since we focus exclusively on the water service, we exclude from the water charges those related to the sewage service. Hence, the water charges we consider are those corresponding exclusively to the water supply service (extraction of water, treatment and distribution to customers) plus the taxes and fees that must be paid by each household. In order to avoid any seasonality problem, we consider the annual water charges paid by each household. The source of data for water expenses at the household level is from the *family income and expenditure surveys* conducted regularly by the National Institute for Statistics and Economic Studies (INSEE).

¹⁶ Water affordability could also be defined by comparing the water expenses to the total household expenses. We prefer to use the household income for two reasons. First the statistical information is more reliable for income than for household expenses. Second, the intra-year variability of household expenses is higher than the income one (total expenses are registered for a given period of year, hence they may be subject to seasonality problems). It follows that a water affordability index based on household expenses would more heavily depend upon the date at which the survey is conducted than an index based on household income.

4.3.2. An empirical assessment of water affordability in France

The water income shares have been calculated using the INSEE *family income and expenditure surveys* (1979, 1984, 1989, 1995 and 2005) by dividing the annual water bill paid by each household by the total income. In the following table, we report the water income shares by income deciles (income classes).

Table 11: Water income shares from 1979 to 2001 by income classes

	1979	1984	1989	1995	2001
Total sample	0.79%	1.11%	1.05%	1.19%	1.20%
income class 1	2.256%	4.692%	3.915%	3.100%	2.311%
income class 2	1.079%	1.234%	1.252%	1.725%	1.663%
income class 3	0.736%	0.949%	0.994%	1.339%	1.588%
income class 4	0.699%	0.845%	0.941%	1.267%	1.292%
income class 5	0.647%	0.728%	0.774%	1.117%	1.166%
income class 6	0.598%	0.634%	0.769%	1.087%	1.041%
income class 7	0.546%	0.613%	0.618%	0.889%	1.002%
income class 8	0.474%	0.558%	0.609%	0.873%	0.873%
income class 9	0.412%	0.494%	0.524%	0.735%	0.742%
income class 10	0.335%	0.391%	0.407%	0.574%	0.607%
1% poorest households	9.70%	22.61%	22.65%	17.64%	4.80%
5% poorest households	3.25%	8.48%	6.47%	4.25%	2.69%
5% richest households	0.29%	0.34%	0.35%	0.47%	0.51%
1% richest households	0.19%	0.25%	0.27%	0.36%	0.37%

Note: This tables gives the water income shares by income classes (deciles). Data sources: INSEE Family budget and income surveys and author's own calculation.

In 2001, the average income spent on paying water charges is 1.20%. The average French household is not water-poor (3% of the total income devoted to paying water charges). From 1979 to 2001, the share of income devoted by French households to paying the water bills has significantly increased from 0.79% to 1.20%. For example, in 1979, the water expenses were less than 1% of the total income for deciles 3-10. In 2001, the share of the total income devoted to water bills is smaller than 1% only for deciles 8-10. One may suspect that a significant part of this change is due to the water price increase observed during that period (during the past two decades, water prices have increased twice as fast as the consumer price index).

The percentage of income spent on paying water charges varies significantly according the income level. For the highest income decile, the water expenditures represented only 0.335% of the total income in 1979, compared to 2.256% for the lowest income class. For the 1% poorest households the water charges represent 4.80% of their total income in 2001 compared to 0.37% for the 1% richest.

Table 12: Basic good income shares by income decile in 2001

Income decile	Water	Electricity	Gas	Phone
1	2.32%	6.45%	4.31%	1.04%
2	1.67%	4.04%	2.40%	0.61%
3	1.59%	3.77%	2.01%	0.60%
4	1.29%	3.14%	2.73%	0.55%
5	1.17%	2.75%	2.01%	0.45%
6	1.04%	2.52%	1.90%	0.40%
7	1.00%	2.32%	1.58%	0.33%
8	0.88%	2.03%	1.40%	0.31%
9	0.74%	1.86%	1.35%	0.29%
10	0.61%	1.42%	0.96%	0.20%

Note: This table gives the percentage of income spent on water, electricity, gas and telephone charges by income classes (deciles). Data sources: 2001 INSEE Family budget and income survey and author's own calculation.

The issue of affordability is important for water, electricity, gas or even phone services. Yet it is difficult to precisely say whether a particular expenditure is affordable in an absolute term or not because that involves value judgements about priorities. From the 2001 INSEE *family income and expenditure surveys*, we have calculated the share of household income spent on four basic commodities by income decile (water, electricity, gas, phone). For all income deciles, the percentage of income devoted to water charges ranks third, below electricity and gas but above the share of income spent on phone charges. The poorest households spend on average 14% of their total income on water, electricity, gas and phone. For households belonging to the higher income class, the share of income devoted to these basic services represents less than 3.3%.

All these questions lead us to further empirically investigate the issues of affordability of water in the French private and public sector.

5. Empirical investigation of affordability

5.1. Assessing the determinants of water affordability in France

There are several potential determinants that may explain the level of the income spent on water, including household and housing characteristics, the type of water pricing scheme implemented by the water service, the level of participation of the private sector into the management of the service and the State regulation (either social or economic).

It is demonstrated that a single parent families (especially if the head of the household is a woman) or a large family for which social aid represents a large proportion of the household total income could be considered as the most vulnerable groups in terms of water affordability (Reynaud 2007). In addition, the private participation seems to have a detrimental impact on water affordability for low-income households and almost no impact for rich households. In this case, we could argue that the private utilities are more likely to implement pricing that favour large consumers (wealthy consumers, with decreasing bloc rates or tariffs with a large fixed charge).

5.1.1. Being “water-poor” in France

In year 2001, 4.31% of households in France (representing around 1.16 millions of households) spent more than 3% of their income on water charges. The proportion of income these households are obliged to devote to water is on average more than four times that of the population as a whole (1.19%).

Table 14: Descriptive statistics for water-poor and non water-poor households for year 2001

	All households	Non water-poor households	Water-poor households
<i>Proportion of households</i>	-	95.69%	4.31%
<i>Total income (euros per year)</i>	27534	29108	12169
<i>Percentage of income spent on water charges</i>	1.19%	1.05%	4.50%
<i>Share of social income to total income</i>	41.08%	43.03%	66.88%
<i>Private participation</i>	72.75%	69.00%	72.79%
<i>Average water price (euros per cubic metres)</i>	1.32	1.31	1.33
<i>Share of the fixed water charge to the total bill</i>	16.40%	16.50%	16.09%
<i>Periodicity of the water bill (months)</i>	7.06	7.65	6.80
<i>Number of persons</i>	2.42	2.58	2.17
<i>1 Adult only</i>	-	92.32%	7.68%
<i>1 Adult (man) and children</i>	-	93.32%	6.68%
<i>1 Adult (woman) and children</i>	-	85.85%	14.15%
<i>Head of the household unemployed</i>	-	88.47%	11.53%
<i>Head of the household 65 years old or more</i>	-	93.65%	6.15%

The households that are vulnerable to water poverty share a number of specific characteristics. First, the share of social income to the total income is higher in the case of water-poor households. As expected, the average total income of water-poor household is significantly smaller than the average income for the whole French population. The most vulnerable groups to water poverty are the single adult families. 14.15% of the single adult families where the head of the household is a woman are water-poor (compared to 4.31% of the whole population). Unemployment of the household’s head is also a clear determinant of water poverty since 11.53% of the households where the head is unemployed are water-poor (compared to 4.31% of the whole population). And finally the average number of persons per household is smaller in the case of water-poor household.

We argue that being a single parent family is associated with a higher probability of being water-poor. This is especially true if the head of the household is a woman. Being elderly results in a small but significant increase of the probability of being water-poor. Finally, the larger the size of the household the greater the chance of being water-poor. Here we assume that there exists a positive relationship between household size and water

consumption levels. In terms of the impact of housing characteristics of water affordability, we find that living in an individual house results in a higher probability of being water-poor. In addition, we find that a high proportion of votes to the socialist or to the communist part at the last local election results in a lowering the probability of being water-poor. This implies that these political parties are more pro-poor and have more social policies.

We also find that the predicted probability of being water-poor significantly decreases with the income class. For example the probability is 24 times higher to be water poor for a family belonging to the lowest income class. In addition, if we increase the PSP by 10%, the probability of being water poor increases for all income groups, especially for the lower classes.

To summarize, the impact of the PSP differs according to the level of income. The PSP significantly increases the probability of being water-poor for households belonging to the lowest income classes.

6. Conclusions

We have seen that a specificity of the French water sector is that there is currently no specific pricing scheme, rebate or discount tariff, for the poorest households. The mechanism put in place by public authorities and private firms in order to guarantee an affordable access to water corresponds to an *ex-post* financial aid designed to help low-income households facing difficulties for paying the water bill. Our empirical evidence shows that there is still a need for specific social policy to guarantee water affordability to poor households.

We also demonstrated that the water affordability depends upon a certain number of household characteristics. For example, being a single parent results in increasing the share of income spent on water charges, more so if the head of the household is a woman. Despite the social regulation mechanisms put in place by public authorities, the most vulnerable households in terms of water affordability are those heavily depending upon social aid. In addition, a high proportion of votes to the socialist or to the communist party at the last local election results in a lowering the share of income spent on water charges since these parties tend to be more pro-poor.

The empirical analysis has also revealed that water affordability to the poor in France was a relevant social policy issue. There is a strong chance that the poor are water poor. In other words, the *ex-post* financial assistance system has not fully succeeded in achieving water affordability objectives for poor households.

Finally, by increasing the PSP results in a significant increase in the water income share spent on water, especially for the poor. This shows that the type of delegation arrangement has an impact on affordability of water. For example, a concession type contract results in having higher share spent on water, since concession contracts are usually long-term contracts and the “regulating” becomes difficult especially if the municipality lacks of technical skills. This calls for better monitoring the private sector by municipalities (in particular with respect to the tariff). The length of the delegation contract should be shorter. Second, the fact that the private participation seems to have a detrimental impact on water and better regulating the tariff.

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Appendix: Description of surveys used in the French case study

1. The *INSEE* family income and expenditure *surveys*

These surveys have been conducted every 5 years since 1978 (1978-79, 1984-85, 1989, 1994-95, 2000-01). The most recent surveys report household expenses using the Classification Of Individual Consumption by Purpose, COICP. The sampling of the population is based on the last available census. The database is representative at the national level.

2. The *INSEE* housing surveys

These surveys have been conducted every 4 or 5 years since 1973 (1973, 1978, 1984, 1988, 1992, 1996, 2000). The sampling of the population is based on the last available census. The database is representative at the national level.

3. The political database

The political databases give the percentage of votes obtained by each party at the municipal election in 1989 and 1995. These databases are defined at the municipality level. We observe the political results on a randomly selected sub-sample made of respectively 927 municipalities in 1989 and 965 in 1995.