Chapter 5
Technological Rent: The Key for Water Services Regulation

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5.1 Building a New Technological Paradigm

Questions concerning the definition of a regulatory approach capable of reconciling market mechanisms and general interest obligations are at the heart of a debate about the definition of public services (Demsetz 1968; Finger and Allouche 2002; Lorrain and Stoker 1995; Rachline 1996; Lorrain 2003). In France, in terms of local public services like water distribution and sanitation, such questions have a particular consonance due to both the large number of different contexts that need to be taken into account and a long tradition of partnerships between public institutions and private enterprises in the field. The most important of these questions focus on how to circumscribe the economic and financial power of private operators and on ways in which to counter the asymmetry of information between various actors (Balance and Taylor 2004; Breuil and Nakhla 2005; Chong et al. 2006).

The history of relations between local authorities and private water companies in France demonstrates the degree to which public and private interests were and continue to be intertwined in the emergence and development of water and sanitation services. The technological aspect always has played an essential role in the dynamic of the water sector and has contributed to introducing an advantage for private enterprises in public-private partnerships (PPPs) that has developed over time.[1] This point, rarely underlined in the literature, represents a fundamental problem in the regulation of the public-private relationship worldwide. The need to place a greater emphasis on conserving the resource has the effect of undermining the

[1] There are several definitions of the public-private partnership. The definition used here was elaborated by C. Boiteau (2007): the delegation of a public service, particularly as a concession, is considered a form of PPP.

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technological paradigm based on the treatment of water—"healing" polluted water—and enables us to glimpse new regulatory opportunities.

A general recognition emerged in the early 2000s of the need for a more integrated approach to managing the water cycle (from the spring to the treatment, including water supply), with a focus on preserving the resource before pollution occurs. Suppliers are beginning to fulfill this expectation. The trend not only concerns new scientific paradigms, but will also, of necessity, have organizational implications. This represents a historical chance for public authorities to establish a new kind of PPP that makes it possible to overcome problems associated with the technological rent deriving from treatment technologies. In this context, technological rent is the income procured by the competitive advantage of owning a unique technological resource.

5.2 Technological Rent and Regulatory Problems Concerning PPPs: A Historical Perspective

Since the mid-nineteenth century, private companies have been involved in supplying a service for which local authorities are responsible. Contracts were first delegated to private enterprises, largely because municipalities were both fragmented and small, so they could not meet their obligations on their own. Of course, another reason was that a private offer already existed and represented, in the eyes of public decision makers, a credible alternative to public management. Because private interests in water services were introduced very early in France, the question of the regulation of public-private relationships within the framework of the local water monopoly was posed there earlier than elsewhere. An analysis of relations between sovereignty-based and market approaches over the last 150 years makes it possible to understand why technology, like sewage treatment plants, is today a key variable in PPPs and why it poses fundamental regulation problems.

5.2.1 The Water Market and the Private Offer

While local public services in France are defined as those for which, unlike other public services, the municipalities are primarily responsible, it is clear that government initiatives have had a relatively strong influence on how they are organized. As in all sectors associated with public demand (Nelson 1993), the growth of water companies and their success in international markets can be explained by a particularly favorable environment created by national institutions (Petitet 1999; Pezon 2000).

5.2.1.1 The Structure-Providing Role of the State

From the 1930s to decentralization in the 1980s, the state—guarantor of the general interest—was opposed to the untrammeled expression of particular interests,

including local interests. Water services did not escape the process of tutelary homogenization deployed throughout France. Initially, this process was designed to meet the need for water distribution infrastructure, which went hand-in-hand with the high urban growth rates of the time. The proportion of the French population supplied with drinking water rose from 70 % in 1954 to more than 95 % in 1982. The sanitation market started to grow in the 1960s.

The expansion of network infrastructure was carried out within the framework of a state project to modernize the country's public services. The project, which was designed to support economic growth, encompassed state-of-the-art firms such as the large French water companies, the so-called majors: Générale des Eaux, Lyonnaise des Eaux, and, to a lesser degree, SAUR.[2] In water, this modernization of public services formed a series of trusteeship systems encompassing legal and administrative instruments. The project was orchestrated by leading civil servants and executed by major state organizations such as the engineers of the Ponts et Chaussées,[3] the technical administration, and what are called départements.[4] It included a series of measures favorable to delegation that accompanied the introduction of an obligation for municipalities to balance their water budgets, the elaboration by state services of a standard concession specifications sheet (1947), the appearance of affermage (1951)[5] and, lastly, the introduction of technical, administrative, and financial monitoring of the management of water services delegated by the state (Pezon 2000). Finally, in 1952, a century after the Compagnie Générale des Eaux[6] was set up, private operators already had supplied drinking water to half of the French population (Pezon 2000, p. 123). State intervention, more than anything else, has contributed to the success of affermage.[7]

[2] Compagnie Générale des Eaux became Veolia Environnement and Société Lyonnaise des Eaux became Suez Environnement. See Chap. 4 for more on the French majors.

[3] The École des Ponts et Chaussées is one of the world's oldest engineering institutes. It has been training the elite of French engineers for more than 200 years.

[4] A département is a territorial and administrative division of France between the région and the commune. There are 96 départements in metropolitan France and five overseas.

[5] An affermage contract is a written agreement between the public owner of a facility/property and an operator that stipulates the conditions under which the operator may possess the facility or property for a specified time and rent. With an affermage contract, the municipality guarantees the infrastructure investments, while the private operator covers the day-to-day operating expenses. In a concession contract with a municipality, the private operator is granted the exclusive right to operate, maintain, and invest in the public utility for a set period of time.

[6] Founded in 1853, Compagnie Générale des Eaux obtained its first public service concession to supply water to Lyon. On the initiative of Napoleon III and throughout the entire Second Empire, the creation of private companies to operate the urban water systems opened the way for modernization and enhanced the quality of life in towns and cities. Compagnie Générale des Eaux became Veolia Environnement in 2003.

[7] Four main mechanisms were to contribute: subsidies to municipalities acquiring infrastructure; the financial interest of the engineers of the Ponts et Chaussées; the introduction of a ceiling for water prices (between 1952 and 1970) within the framework of France's anti-inflation policy of guaranteeing local politicians the right to raise prices gradually when using private operators, according to a contractual price-indexing mechanism; and, from 1986, the implementation of tax breaks for affermage management.

Theoretically, this approach presupposes that different actors fulfill different roles, with local authorities responsible for constructing the necessary infrastructure while the private company (the delegatee) operates and maintains the facilities and collects fees. But C. Pezon demonstrates that the private operator gradually extends its field of action by acting as a financier, an investor, a project engineer, and a builder. This administrated demand benefitted pioneering French water companies that would later use their position as domestic leaders to conquer substantial markets abroad.[8]

The gradual process of decentralization in France introduced a degree of confusion in tutelary relations between the "center" and the "periphery" (Grémion 1976). Vis-à-vis the consumers, mayors of French towns and cities are those most directly responsible for ensuring that the quality of local public services is maintained. Urban mayors responsible for managing aging infrastructure are faced with both technico-economic problems and the financial issues of public management (Gaudin 2007). Furthermore, under European Union (EU) law, municipalities are obliged to do everything in their power to ensure the distribution of high-quality water and the improvement of wastewater treatment. Even if the municipalities attempt to develop their own expertise by improving technical equipment, there is little to suggest that the dominant model has been called into question, especially in that private actors have been able to adjust their offer to take local characteristics into account (Lorrain 2005) and that EU law does not intervene in choices concerning the management of local public services. In fact, once the guidelines have been set out, the development of the water market cannot help but benefit well-established operators who display technical competences and numerous commercial contacts. It was not until the 1980s, with the revelation of irregularities and a general feeling that the situation had become far too opaque, that relations between the public and private spheres were called into question by municipalities, professionals, and public opinion. The government intervened vigorously.[9] On the ground, the period was marked by an ever-increasing sophistication in terms of contracts, giving rise to more frequent inconsistent agreements combining standard aspects of both affermage and concession approaches (Cordier and Morel 2007).

The proportion of the French population supplied by the private sector rose from 17 % in 1936 to 50 % in 1975 to 80 % in the early 2000s (Guérin-Schneider and Lorrain 2003). Thus, the state at its different levels has played an essential role in the emergence of national oligopolies. With decentralization, the confrontation between supply and demand became more direct and the role of consumers more influential, but the post-war economic model did not disappear: the needs expressed by local authorities defined an infrastructure market in which private companies were able to provide an offer based on technology. Inversely, technical progress,

[8] Générale des Eaux, Lyonnaise des Eaux (known, at the time, as Société Lyonnaise des Eaux et de l'Eclairage), and, later, SAUR, set up, respectively, in 1853, 1880, and 1933.

[9] For instance, the 1993 Sapin Law on the Prevention of Corruption and Transparency in Economic Life and Public Procedures.

oriented by increasingly constrictive European laws and decrees, has provided opportunities to improve the service, which, in turn, have increased infrastructure requirements.

5.2.1.2 Exploiting Technological Rent

The most recent developments in the theory of the private operator, the evolutionary theory of the firm in particular, insist on the essential role of innovation in terms of performance and place cognitive capacities at the center of value creation. The firm is viewed as an ensemble of skills efficiently accumulated and combined over time (Dosi et al. 1988, 1990; Nelson and Winter 1982). The process of collective learning and research and development help boost competencies, which gradually become specific. The firm's core competencies constitute barriers to mobility, protect it from imitation, and guarantee adequate performance over the long term. Benefitting, as highlighted above, from a favorable economic and institutional environment that encompassed the development phase of major urban networks, regulatory requirements, the legal "safety" of contractual relations, fragmentation of the municipalities, and government incentives for PPPs, the three French majors found it easy to build and exploit their knowledge base and put an unbridgeable gap between themselves and their competitors. Gradually, these companies were able to adopt a multi-divisional style of organization that enabled them to operate in various specific segments, providing a complete turnkey installation offer.

The 1970s marked a turning point in the water sector. Based on their core competencies, the French companies diversified into complementary activities such as maintenance and the construction of piping and conduits, and took a more systematic interest in energy distribution, heating, waste, and other network-based urban services before going into other sectors newly open to competition, including communication, construction, and transport. In effect, they became multi-utility groups. In the 1990s, this strategy was imitated by other actors abroad who were able to enter the water market. But in the early 2000s, multi-utilities, faced with growing insolvency, were obliged to sell assets deemed to be less strategic. Some groups, like the European electricity companies that exited the water sector, refocused on their core business, while others, like the French groups, concentrated on municipal services.[10]

In terms of innovation strategy, the leading water operators organized themselves within an international network based on the principle of the cognitive division of work—a network in which research is segmented between subsidiaries according to the knowledge and learning capacities they require in order to maximize efficiency (Moati and Mouhoud 1994). This strategy is not uniquely focused on technology; indeed, it also aims to improve interactions between technology and the characteristics of the market. Such firms are thus capable of identifying and exploiting innovation

[10] See Chauchefoin and Sauvent (2008) for more details on the various movements influencing the sector-based structure.

opportunities and maintaining their capacity to appropriate knowledge (David and Foray 1995). Furthermore, knowledge accumulated by the firm increases its acquisition cost. Their leaders protect this technological rent, their historical accumulated knowledge. This is based on a so-called curative or treatment logic, largely influenced by the orientation of European regulations: the objective is to solve the problem posed upstream by applying a specific technical or technological approach to water treatment (Gray 2005; Twort et al. 2000). The growing severity of rules and laws, increasing demands on the part of consumers, changing needs, the degradation of the resource, and the development of ever-more accurate measuring techniques have contributed to the growth in the number of stages needed to produce drinking water and treat wastewater and to the sophistication of treatment technologies and procedures. In addition to this global offer from the major water companies, there are margins occupied by a large number of specialized actors associated with the various stages of the production of drinking water and sanitation that conform to the principle of the cognitive division of labor. If actors are sometimes viewed as competitors in specific segments, they also can be partners, providing that their skills complement those of the majors or that resources have to be shared for research purposes. At the local level, a demand is viewed as consonant with the general interest, and a private offer is seen as deriving from horizontally integrated international oligopolies possessing key skills. This technological aspect considerably complicates the regulatory framework.

5.2.2 PPPs and Regulation Problems

The regulation of competition is based on two major principles: increasing the efficiency of competition between operators and reducing asymmetry of information. But local regulation does not escape, any more than its national counterpart, the influence of the regulator (Hart 2003; Ménard and Saussier 2000, 2003; Yvrande-Billon 2008).

5.2.2.1 The Problem of Regulation

Theoretical reflection about regulation revolves around two major issues: access to the market and the execution of the contract. First, how can competition for the market be organized? Water distribution and sanitation forms a local monopoly; once attributed to a concessionaire, the local market is captive because it is impossible to duplicate the infrastructure network to make rival offers possible. There are only two ways of intensifying competition: ex ante, before a contract has been signed, and ex post, on the expiry of the contract, with the possibility of the contract holder renewing.

In the water sector, it is hard to create competition for the market because regularly putting companies up against one another is difficult. The required level

of investment to build infrastructure networks induces long-term depreciation; thus, water companies need long-term contracts to make their initial investment profitable.

For ex post competition, in theory (Baumol et al. 1982), the credible threat of the entry of a newcomer (or of the return of the contract holder) at the end of the contract should be enough to create competitive pressure throughout the duration of that contract. In reality, there are obstacles to this mechanism. First, the newcomer (or the local authority in the case in which the contract is renewed) must be correctly informed about the network's technical characteristics (size, degree of obsolescence, quality of past maintenance, performance). However, many of these variables cannot be accurately measured because most installations are underground. Equally, the assets involved should not have become too specific over the course of the contract (Baumol 1982). This means only the contract holder will have the resources needed to guarantee the continuity of the service in a new contract.

There also is the problem of how to ensure the contract will be executed efficiently. Two theories address this question. According to incomplete contract theory (Hart and Moore 1988), because a contractual document cannot take into account all factors that are or become relevant over the course of the contract, either that contract must be frequently renewed to ensure that the contract holder has to deal with competition as often as possible—which raises the problems outlined above—or the specifications must be classified so that only services that can be properly assessed are covered by the contract.

Transaction cost theory asserts that the major problem resides in the existence of specific assets (Saussier et al. 2004; Williamson 1975). Specificity depends on the degree to which assets are complementary: the productivity of the specific asset is higher when it is associated with a particular asset for which it has been designed than when it is linked to any other asset. If the asset is highly specialized, it will be difficult to redeploy (treatment systems meet particular quantitative and qualitative requirements and are thus not automatically transposable to other situations). Owners of complementary assets (local authorities) therefore run the risk of being highly dependent on their partners possessing key skills, a fact that would give the partners extra clout in the contractual relationship. Thus, the more highly specific the required assets are, the higher the risk of opportunistic behavior on the part of private enterprises is and the higher the transaction costs borne by the local authority will be. The specific character of the assets in the water distribution and sanitation sector covers a number of realities, which correspond to the theoretical categories developed by Riodan and Williamson (1985): investments are localized (water catchment operations, drinking water distribution networks, and the collection and treatment of wastewater are all, of necessity, located within a specific geographical area); they are dedicated to a particular method of production (pumping or purification stations specifically adapted to local needs and unable to satisfy, even temporarily, a demand from outside the local network); and the human resources mobilized are involved in a learning process, which implies a specific form of expertise.

5.2.2.2 Difficulties of Implementation

After more than 20 years of decentralization and repeated legislative interventions, lawmakers drew up a report[11] highlighting the persistence of an information asymmetry between the various stakeholders, a lack of communication and strategic planning, poor definition of objectives and monitoring of results, and an excess of technical culture. In an attempt to suggest solutions to these problems, a 2006 law[12] provided a more rigorous definition of the obligations of the delegatee, encouraged free choice in terms of management approaches, and gave detailed information concerning pricing rules. But the law did not solve the essential problem linked to the existence of specific assets in the sector. In effect, because water distribution and waste services are highly technical, assets within the industry are becoming more specific. Thus, when treatment procedures are complex, municipalities often have no choice but to call upon private operators because they themselves lack the requisite expertise.

Faced with the growing importance of environmental issues, municipalities have the chance to become more involved in emerging segments and create new kinds of organization encompassing the entire water cycle. This could provide new possibilities in terms of public-private partnerships.

5.3 A New Approach to PPPs: Integrating the Water Cycle

Naturally, a more integrated approach to managing the various stages of the water cycle implies the development of technological innovations, but it also presupposes organizational innovations, in which a closer relationship exists among private operators, local authorities, and consumers. This is an essential issue for authorities responsible for organizing water and sanitation services.

5.3.1 A Worrying Situation

Reports provided by the French Institute for the Environment (IFEN) describe in no uncertain terms the alarming state of the resource (IFEN 2005). According to the institute (2006), the level of diffuse pollution remains high across France,

[11] The Martinand Report (2001). Another report, the Miquel Report, issued in 2003, established a critical summary of various laws on water (1964–2004) by underlining "the very mediocre measures introduced to conserve the resource." Taking into account the lack of investment in certain areas, it will be necessary to work simultaneously on both conservation and treatment.

[12] The 2006 Water Law.

degradation has become chronic, and the presence of toxic micropollutants in the water has been noted for the first time. In parallel, the tendency to overexploit the resource has been growing from year to year. Now, the quality and quantity of water are interdependent: the development of water abstraction over the last 30 years has altered the way in which natural ecosystems function. The concentration of pollutants has increased, diminishing capacity for self-purification, and excessive pumping has led to saltwater intrusion into coastal aquifers (Miquel 2003).

The Water Framework Directive of 2000, which fixed the objective of attaining high-quality water by 2015, obliged France to react rapidly and effectively. Tasks included strengthening conservation parameters; implementing more efficient approaches to anticipating restrictions and ensuring they are respected in critical periods; improving communication and promoting awareness on the part of users; and supporting the introduction of instruments designed to manage the resource collectively, a focus of water agencies in their multi-annual intervention programs.

This evolution will inevitably have financial consequences for local authorities, especially given that major projects concerning the renewal of the drinking water network, filtering stations, and the improvement of treatment technologies are ongoing (IFEN 2006). From a strictly financial point of view, the annual cost of renewing pipes and conduits and maintaining the country's filtering stations is estimated at 3 billion euros between now and 2015, a figure that is set to increase yet further after that date, according to available forecasts (Berland and Juery 2003; Talpin 2002). An added cost is the investment required to extend networks to meet demand generated by urban development and cover additional charges for treating drinking water for more consumers. Taking into account the delicate financial situation in which the local authorities find themselves (Genguant 2008), these imperatives will probably be difficult to satisfy and will require funding and amortization procedures (Guérin-Schneider and Lorrain 2003). One way to resolve this worrying situation would be to move away from raw water treatment and focus on preserving the resource.

5.3.2 Toward a Logic of Co-Production

The current period is marked by a growing awareness of the need to develop technologies that respect the environment. Organizing authorities are strongly encouraged to make progress in this direction. New market opportunities are becoming available. Meanwhile, major companies in the water sector are now emphasizing their social and environmental responsibility.

5.3.2.1 New Initiatives in Favor of the Conservation of the Resource

Today, new products are being developed around green technologies and preventive measures, notably emanating from actors intervening in niche markets

and the conservation of natural resources. This emerging and potentially rich market is of interest to all private operators in the water sector and beyond. For example, operators in the construction industry already are developing technical systems designed to collect and use rainwater in individual housing estates. In terms of treatment technologies for drinking water and wastewater, research is increasingly focused on biological procedures that limit the formation of sub-products. As recent databases on newly lodged patents in the water sector attest (Chauchefoin and Sauvent 2008), quantitative problems with the resource have led some innovators to focus on reducing leaks in the networks and in the homes of individual consumers, implementing more economical procedures, and seeking alternative resources (desalination of seawater, recycling wastewater, collecting and using rainwater), etc. The way forward in terms of technological development is shrouded in uncertainty. These orientations could spur a paradigm shift and the introduction of new productive relations, because innovators are obliged to put the accumulated competencies and experiences of everyone in the market to good use.

5.3.2.2 Opportunities for a New Regulatory Approach?

In all sectors undergoing a technological mutation, investors are incapable of correctly anticipating the characteristics of the market. The principle of rational anticipation that prevails in inter-temporal economic calculus cannot be applied. Choices can only be made in a sequential fashion, principally by taking into account three conditions that need to be satisfied simultaneously: the specific resources of the firm must be used to maintain or strengthen its competitive position as market opportunities are identified and anticipated; those resources must make it possible to minimize irrecoverable costs, because infrastructure that cannot be reused in an identical way implies a financial loss if it is abandoned; and there must be complementary investment. The first two points are obvious, consisting as they do in simply verifying the existence of a correlation between beliefs or weak market signals and the resources of the firm. The question of complementary investment is less familiar but equally important. This requirement was highlighted by Richardson (1960), who demonstrated that the profit potential of any investment is conditioned by the fact that complementary investments are made by other entrepreneurs. Those investments can be combined with competencies required in the construction phase of new productive capacities. Later on, in the use phase, they help avoid bottlenecks or interruptions in the production process. In terms of inter-firm coordination, time is vital. In its most current expression, coordination can be envisaged as a process in which autonomous entities pursuing distinct objectives are placed in a functional relationship. The most elaborate definitions emphasize organizational approaches that guarantee collective learning processes based on cognitive cooperation between the actors involved and the attentive management of information flows.

This is the context of uncertainty in which water companies operate today. That is why new partnerships, such as those between SAUR and IFREMER,[13] are developing and why Veolia has become involved in the NARSI project.[14] But, above all, coordination opens new perspectives for local authorities on both the construction and use of new productive capacities which, to guarantee the success of innovative approaches, must be closely intertwined.

On the primary level, the organizing authorities play an influential role in selecting associated knowledge and expertise when private companies cannot deliver a standard offer for new segments of local demand. This could be achieved by, for example, setting up research consortia and training high-level public sector engineers in the new technologies. Local authorities would thus be involved in the co-production of new knowledge, a situation which did not pertain when the water treatment industry first emerged. Such an approach would shift power in the relationship to the local authorities.

In terms of the use of new capacities, the need for anticipatory management implies territorial planning, which takes into account the localization of the resource, a countryside policy, and the articulation of territorial scales. As a corollary, several relatively new approaches will have to be exploited, among them encouraging a systematic reduction in consumption and collecting rainwater; providing advice and incentives in the construction of new buildings; developing new storage techniques in urban developments; and differentiated network management. Consumers find themselves at the forefront of all of these concerns. Here again, original organizational approaches must be introduced to enable local authorities to play a genuine intermediary role vis-à-vis the market.

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[13] Institut français de recherche pour l'exploitation de la mer (French Research Institute for Exploitation of the Sea).

[14] Natural and Artificial Systems for Recharge and Infiltration.

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