REFORM AND RISK MANAGEMENT IN THE URBAN WATER SECTOR: THE ROLE OF REGULATION

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SUMMARY

Traditionally, urban water services were characterised by local monopolies, where the incumbent was publicly-owned. This was explained by safety, health, economic, and technological reasons related to the sector's specificities. However, in spite of this, the sector has undergone important *reforms* in recent years, triggered by efficiency, underinvestment, and environmental problems. The most important features of reform are competitive pressures, private sector participation, and more autonomous operators. These reforms have created a new environment for urban water management and regulation.

The *objective* of this thesis is to analyse the role of regulation in the management of the risks created by the sector's reform. The *theoretical analysis* is developed along two lines. Firstly, we present an extensive literature review of the theories of economic and social regulation, with the aim of clarifying the interactions between regulation and reform better. We conclude that regulation matters, even after reform. Secondly, we use contract theories as a framework for presenting the vulnerability analysis of the main elements at risk because of reform, namely capital investments and the provision of the service of general interest. At the same time, risk-sharing regimes are identified for the most common institutional arrangement in the sector.

The *empirical analysis* focuses on risk-sharing patterns and the vulnerability of the elements at risk. It is based on a questionnaire targeting management entities, five case-studies illustrating different institutional arrangements, and a study on operator's strategies in a context of reform. In the new context, asset specificity and informational hazards are the most important factors increasing the vulnerability of capital investments. The lack of funding sources is also highlighted, specifically in developing countries. It also became clear that non-provision of the service may result from non-capacity of the system or to non-affordability of the service. Along these lines, we propose *regulatory governance mechanisms* that tackle the problems highlighted in each institutional arrangement, involving different actors, for every step of the reform *risk* management process.

Key-words: regulation, urban water sector, reform, risk management, capital investments, universal service provision, delegated management contracts

RÉSUMÉ

Traditionnellement, les services de l'eau sont en situation de monopole naturel et sont gérés par des opérateurs publics qui possèdent les actifs d'exploitation. La spécificité de ces services est à la base de cette organisation. Néanmoins, le secteur a fait l'objet de *reformes*, justifiées par des problèmes environnementales, d'efficacité et de sous-investissement. Les principales caractéristiques de la réforme sont les pressions compétitives, la participation du secteur privée, et l'autonomisation des opérateurs. Ces réformes ont crée un nouveau cadre institutionnel pour la gestion et la régulation du secteur.

Cette thèse concerne l'étude du rôle de la régulation dans la gestion des risques crées par la réforme. L'*analyse théorique* est développée à travers deux lignes. D'abord, nous présentons une révision de littérature des théories de régulation économique, avec le but de clarifier les interactions entre la régulation et la réforme. Nous concluons que la régulation est importante, même après la réforme. Par la suite, les théories des contrats sont utilisées pour identifier les facteurs qui affectent la vulnérabilité des éléments à risques à cause de la réforme, à savoir les investissements durables et la fourniture universelle d'un service d'intérêt générale. Une analyse du partage du risque entre les partenaires dans chaque cadre institutionnel est présentée.

L'*analyse empirique* se concentre sur le partage des risques et la vulnérabilité des éléments à risque. Elle se base sur un questionnaire aux opérateurs, 5 études-de-cas illustratifs de différents cadres institutionnels, et une étude sur les stratégies des opérateurs. Dans un contexte de réforme, la spécificité des actifs et les aléas informationnels sont les facteurs les plus importants augmentant la vulnérabilité des investissements. Le manque de sources financières est aussi important, notamment dans les pays en développement. Il est aussi devenu clair que la vulnérabilité de la fourniture universelle du service résulte d'un manque de capacité du système ou des prix non-abordables du service. Sur la base de ces résultats, nous proposons des mécanismes de *gouvernance et régulation*, impliquant de différents acteurs, qui leur permettent de résoudre les problèmes créés dans chaque cadre institutionnel, pour toutes les étapes du processus de gestion des *risques* liés à la réforme.

Mots-clés: régulation, services d'eau et d'assainissement, réforme, gestion des risques, investissements durables, fourniture universelle du service, contrats de gestion déléguée

SUMÁRIO

O sector da água, isto é as actividades de abastecimento de água e de saneamento de águas residuais, é tradicionalmente caracterizado por monopólios naturais de cariz local ou regional, e gerido directamente por entidades públicas. Na base desta organização estão factores de saúde pública, económicos e tecnológicos relativos às especificidades do sector. No entanto, o sector tem sido objecto de *reformas* motivadas por problemas de eficiência, sub-investimento e ambientais. Os aspectos mais importantes da reforma são a criação de pressões competitivas, a participação do sector privado, e a autonomização dos operadores. Estas reformas criaram um novo quadro institucional para a gestão e a regulação do sector.

Esta tese tem como *objectivo* estudar o papel da regulação na gestão dos riscos criados pela reforma do sector. A *análise teórica* desenvolve-se ao longo de duas linha orientadoras. Por um lado, apresentamos uma revisão aprofundada da literatura relativa à Regulação Económica, com o objectivo de clarificar as interacções entre a regulação e a reforma do sector. Concluimos que a regulação é importante, mesmo após a reforma. Por outro lado, utilizamos as Teorias Económicas do Contrato para identificar os factores que afectam a vulnerabilidade do investimento e da prestação universal do serviço de interesse geral.

A *análise empírica* centra-se na partilha do risco e nos factores de vulnerabilidade do investimento e da prestação universal do serviço. Esta análise é baseada num questionário aos operadores, em estudos-de-caso ilustrativos de diferentes quadros institucionais e tipos de contracto, bem como numa análise da estratégia dos operadores. Num contexto de reforma, a especificidade dos activos e os problemas de informação são os principais factores que afectam a vulnerabilidade do investimento. A importância da falta de recursos financeiros sobressai igualmente, especialmente nos países em vias de desenvolvimento. Relativamente à prestação do serviço, esta pode estar em risco devido à falta de capacidade da infra-estrutura ou à inacessibilidade dos preços. Com base nestes resultados, são apresentados novos mecanismos institucionais e de *governância na área da regulação*, capazes de enfraquecer os problemas identificados em cada quadro institucional, e para cada etapa do processo de gestão dos *riscos* criados pela reforma.

Palavras-chave: regulação, serviços de água e saneamento, reforma, gestão de risco, investimento, prestação universal do serviço, contratos de gestão delegada

To Laura and Pedro

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ACRONYMS

ATO	*Ambiti Territoriali Ottimali* (Optimal Territorial Unit)
BOO	Build-Operate-Own
BOT	Build-Operate-Transfer
CRA	*Conselho de Regulação do Abastecimento de Água* (Water Regulatory Council)
CS	Case-Study
DEFRA	Department for Environment, Food and Rural Affairs
DDAFSS	*Directions Départementales des Affaires Sanitaires et Sociales* (Departmental Service for Public Health)
DDE	*Directions Départementales de l'Equipement* (Departmental Service of Public Works)
DWI	Drinking Water Inspectorate
EA	Environment Agency
EIB	European Investment Bank
EU	European Union
E&W	England and Wales
FDM	Framework for Delegated Management
FIPAG	*Fundo de Investimento e Património do Abastecimento de Água* (Investment and Assets Fund for Water Supply)
FNE	*Fonds National de l'Eau* (National Water Fund)
ICT	Incomplete Contract Theory
IMF	International Monetary Fund
IRAR	*Intituto Regulador de Águas e Resíduos* (Portuguese Institute for the Regulation of Water and Solid Waste)

NAW	National Assembly for Wales
NI	Network Industries
NEI	New Institutional Economics
OFWAT	Office of Water Services
PSO	Public Service Obligations
PSP	Private Sector Participation
ROR	Rate-Of-Return
RPI-X	Price Cap Regulation
RPR	Relative Price Regulation
RWA	Regional Water Authority
SGI	Services of General Interest
TCT	Transaction Costs Theory
TNC	Trans-National Corporation
UK	United Kingdom
USA	United States of America
UWS	Urban Water Sector
WaSC	Water and Sewerage Company
WB	World Bank
WFD	Water Framework Directive
WSS	Water Supply and Sanitation

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PART I. INCEPTION

Urban water systems are *essential* for life and health, as well as for economic development (Green, 2003, e.g., Marvin et al., 1999, UNDP, 2006). For this reason, decisions about the urban water sector (UWS) are undoubtedly political in nature, yet they are also eminently economic. They refer to choices about the allocation of scarce resources - namely water, capital, and human resources - among competing uses in order to satisfy the needs of the community. This is particularly important for two reasons: (1) potable water resources are scarce, and (2) the UWS is highly capital-intensive, and capital is also scarce (Green, 2003).

Traditionally, the urban water services were characterised by *local monopolies*, where the incumbent was local authority-owned. This can be explained by safety, health, economic, and technological reasons related to the sector's specificities. However, in spite of this, the urban water sector has undergone important reforms in the past decade, triggered by the search for efficiencies, by underinvestment, and by new environmental problems.

These reforms have created a new environment for urban water management and regulation. This PhD thesis examines the main elements at risk in the new environment in the various institutional arrangements, with the aim to propose alternative regulatory governance mechanisms that tackle the problems highlighted in each arrangement.

This General Introduction starts out by presenting the water-sector's specificities, characterising the reform of the sector, and identifying the dominant institutional arrangements. It then defines the problem under study, and presents the objectives as well as the structure of the thesis.

Chapter 1. General Introduction

1.1. The context: the Urban Water Sector

Within the scope of this research, the urban water sector (UWS) is restricted to water supply and sanitation services. In particular, it excludes irrigation and the transfers of raw waters over long distances. Although both of these sectors depend upon the availability of water resources, and as such are competitors over their use, they have different characteristics that justify their separate analysis. These are, for example, different final users, quality standards, capital intensity, operators, and financing sources.

The urban water sector is a typical network industry. As such, it displays economies of scale resulting from large fixed costs, as well as economies of system resultant from connections to an integrated network. However, the UWS displays additional specificities when compared to other network industries. These are specificities stemming from the nature of its technology, the nature of the good, and the nature of the resource.

1.1.1 Specificities related to technology

The urban water sector displays strong *natural monopoly* characteristics arising from special production/distribution features, which in turn are determined by the underlying technologies. Indeed, the water sector exhibits large economies of scale associated with the infrastructure network. The fixed (largely sunk) costs are very high in comparison with the variable costs (more than 80% in the UK according to Armstrong et al., 1994, and 70% according to Gee, 2004). Therefore, duplicating water networks (whether for raw water transfer or the delivery of potable water) is not realistic and is a real barrier to entry of possible competitors.

Moreover, the production and the transport of water are *costly* due to high sunk costs and quality requirements. Given the fact that the transport of water in relation to its value is expensive, water services have traditionally been treated, and even sourced, locally.

Alexander Gee (2004) has estimated that transport costs per 100 km represent about 50% of the wholesale cost of water (as compared to 5 percent for electricity, and 2.5 percent for gas).

The natural monopoly characteristics thus determine that a single supplier tends to be more efficient than multiple, competing ones. This is the reason why the sector has been considered for long as *intrinsically non-competitive*. Therefore, the introduction of competition has been limited to so-called "competition *for* the market", as opposed to "competition *in* the market". However, new ways to introduce other forms of competition are currently debated, whether via benchmarking or third party access (Gordon-Walker and Marr, 2002).

1.1.2 Specificities related to the nature of the good

There are also specificities related to the nature of the good, namely merit and quasi-public good characteristics, and low price elasticity since there are few substitutes for urban water services.

The existence of strong positive and negative *externalities* on the environment and public health are central to the nature of the good. An externality occurs when a decision causes costs or benefits to individuals or groups other than the person making the decision. In other words, the decision-maker does not bear all of the costs or reap all of the gains from his or her action. The provision of clean water and sanitation services actually provides enormous positive externalities to the environment and public health through the control of pollution and water-borne diseases.

The urban water services have characteristics of a *merit good* in the sense that society considers these services as being important, irrespective of whether customers are willing to pay for them or not, and that the social benefits of these services exceed private benefits. Therefore, if water provision and sanitation are left only to the private sector, it is likely that these services will be undersupplied, especially for the low-income population. Public

authority often has a greater understanding than consumers themselves of the clean water and proper sanitation benefits to their health, well-being, and to the global environment.

In theory, public goods display two particular characteristics: non-rivalry and non-excludability. When there is sufficient infrastructure capacity, urban water services are possibly transformed into a quasi-public good because the externalities and social objectives related to its provision may limit, in practice, excludability. These two characteristics, driven by the existence of strong externalities, and the fact that water is essential for life and economic activities, make water services a prime example of *"general"* or *"public interest" activities*.

As for the *elasticity* of demand, i.e. the variability in demand resulting from a price change, it is close to zero for the primary uses of water since these are essential needs for the user, and few substitutes to UWS are available. For urban water uses in general, the price elasticity is low (see for instance Nauges and Thomas, 2000), especially for low-income customers. When the price elasticity is low, an unregulated monopoly provider may raise tariffs since users are captive (Garcia et al., 2007).

1.1.3 Specificities related to the nature of the resource

Finally, there are also specificities related to the nature of the water resources, which are scarce and with limited capacity for regeneration. This leads to the need to take a broader perspective than solely the one of the management of the infrastructure, i.e., to the need to consider the entire "*water cycle*". Consequently, both quantitative and qualitative issues must be simultaneously taken into account when managing the water systems. The costs of supplying drinking water are indeed highly correlated with the pollution level of the sources, which in turn depends, among others, upon the quality of the water reintroduced into the cycle.

1.2. The reform of the Urban Water Sector

The specificities of the urban water sector identified in the previous section determined the way the sector has traditionally been structured as a local public monopoly. However, the sector has undergone important reforms in many countries, triggered by the search for efficiencies, by underinvestment, and by new environmental challenges.

1.2.1 Factors of change

The main factors of change that have influenced the reform in the UWS can be separated into economic, financial, managerial, and ideological factors. The impact of these factors varies, in such a way that the reform processes have been taking place unevenly both in terms of time and scope, depending upon the specific economic, cultural and political context. Thus, the management of the urban water services varies greatly across countries, as there are numerous local (or even regional) types of solutions. This diversity of management modalities is a specific characteristic of the water sector.

Economic factors

In global terms, the Rio de Janeiro and Dublin conferences in the beginning of the 1990s reaffirmed the environmental concern in the sector, leading to a generalised consensus that water needs to be managed better, and that it should be treated as an *economic good* (UNCED, 1992, WMO, 1992). Managing water as an economic good is an important way of achieving its efficient and equitable use, and of encouraging conservation and protection of water resources. An important corollary is that water companies should be treated as commercial enterprises.

The assumption that the urban water sector is a *natural monopoly* has also been recently questioned. Despite the fact that the structure of the sector is characterised by strong natural and local monopolies, which suggests a tendency towards monopolisation and vertical integration, various segments may be separated (i.e., unbundled) and exposed to some forms of competition. For instance, the separation between water production and water

distribution or between collection and sewage treatment is possible and different firms can operate each of these parts of the supply chain. Theoretically, the introduction of competition is meant to encourage greater efficiency, to the benefit of users.

Financial factors

Environmental and public health *standards* related to the urban water sector have become increasingly stringent in the past decades, for example in the European Union (Garcia et al., 2007). These standards have consequently increased the cost of water and sanitation services.

Moreover, in many developed countries, the infrastructure *network is ageing* in many countries and, thus, there is a considerable demand for infrastructure-renewal investments. Also, customers increasingly demand high quality and value for money services. As for developing countries, the need to invest relates primarily to *new infrastructures*.

On the one hand, there is an upward pressure on costs. On the other hand, there is a *crisis in public financing*, which has made the traditional way of financing through the public budget less reliable. In developed countries, there are tighter budget controls and limits to indebtedness, such as the EU Stability and Growth Pact. In developing countries, there is a structural lack of resources and a low development of financial markets.

The crisis in public financing is pushing for *reform* and contributing to increased private sector participation (PSP) in the sector. The trend towards increasing PSP may be accentuated in some cases by the lobbying power of water trans-national corporations (TNCs) to enter new markets (Finger and Allouche, 2002).

Management factors

Another factor of change is the *failure* of the traditional public mode of management. This is due to the conjunction of several aspects, namely the lack of resources (e.g., financial and technical), the difficulty to raise customer bills (e.g., demanded by cost recovery policies), and the political interference in operational management. Having said that, it does not

invalidate that water systems under public management can be very efficient (e.g., Shirley et al., 2000), provide accountability to the consumer, and borrow money at better rates than private companies do (Green, 2003).

As mentioned above, in the beginning of the 1990s there was an international consensus that water needed to be managed better. There were two fundamental principles at the core of the reform, namely treating water as an economic good, and involving in water management both users, planners, and policy-makers, at all levels (Garcia et al., 2007).

In addition, the increase in the *technical complexity* of water management (due to higher environmental and service standards[1]) might force local water managers to delegate decisions to professionals who possess the necessary expertise, be they public or private.

Ideological factors

There is also an ideological factor in water sector reform, namely the influence of *neo-liberal ideology* in policy definition (e.g., EU, international development agencies). It advocates for the virtues of competition and questions the role of the State as an operator (Finger and Allouche, 2002). Neo-liberal theories criticise state intervention in economic activities as being too costly and, in any case, counter-productive for the global competitiveness of a country.

1.2.2 Features of the reform processes

In spite of the above outlined specificities of the urban water sector, it has undergone important reforms in many countries, triggered by economic, financial, managerial, and ideological factors. Table 1 summarises the main trends in the UWS, before and after these reform processes.

[1] This is one hypothesis tested by (Garcia et al., 2007)

Table 1 *The main trends of the sector reform processes*

	Pre-reform	***Post-reform***
Owner of the infrastructure	Public/municipality	Mainly public
Scale of infrastructure	Local	Local Local network linked to regional
Operator's characteristics	Local operator (mainly municipalities)	Local/regional/trans-national operator Increased private participation
Operator's objectives	Public services Public policies	Public services under profit goal
Financing	Cross-subsidies	Cost-recovery
Operation versus regulation	Integrated Direct public ownership	Integrated Separated (e.g., regulatory agency)
Main objectives of regulation	Public health Public service	Public health Environmental protection Public service (obligations) Market structure
Type of liberalisation	No liberalisation Local monopoly	Competition for the market Comparative competition

It is important to note that these reforms are not all triggered by the same causes. Nevertheless, there are main features characterising the majority of the reforms, such as (1) introduction of competitive pressures, (2) participation of the private sector,

(3) regionalisation, and (4) the increased autonomy of the management entities. These features are developed in greater detail below.

Introduction of competition / liberalisation

There are three different routes to establishing the conditions of market rules and competition (i.e., to liberalise):

1. competition in the market (operators compete for the end-users),
2. competition for the market (operators compete for obtaining exclusive rights to operate in specific segment(s)), and
3. comparative or benchmark competition.

As explained above, in the urban water sector, competition in the market is difficult to implement due to the strong network and economies of scale, and/or to the obligation to provide services of general interest (SGI).

One alternative in these cases is to institute *ex-ante* competition, i.e. competition for the market. Competition for the market occurs when potential (public or private) operators bid competitively for the right to operate in the sector, i.e., for a delegation contract. International lending agencies, such as the World Bank, have been strongly promoting the competitive tendering for private sector provision of water supply and sanitation services in developing and transition countries.

A delegation contract can take various forms depending on the types of rights and responsibilities that are transferred to the operator. It can be a:

- concession,
- lease, or
- intermediary management contract (services, operation and management contracts).

The main feature of a *concession* is that the right and responsibility to invest in the infrastructure is transferred to the concessionaire (i.e., the firm who operates the concession). The concessionaire also operates the service.

In *lease* contracts, only the rights to operate the system are transferred. These contracts are a means for firms to benefit from the income streams generated by publicly owned assets, in exchange for a fixed lease payment, and the obligation to operate and maintain the assets according to preset standards.

Moreover, public authorities can enter into *service contracts* with a third firm for the completion of specific tasks. These contracts are well suited to operational requirements. They often focus on the procurement, operation and maintenance of a limited range of equipment. These contracts involve both service and management aspects, and are often useful in enhancing efficiencies and technological sophistication (Garcia et al., 2007).

When direct competition (in and/or for the market) can not be created, a method currently used is the performance comparison of different companies operating in different geographical areas but on similar services. This is called yardstick, benchmark, or comparative competition. The comparisons can cover a range of variables, such as capital-maintenance costs, operating costs, prices, and service quality.

Private sector participation

The private sector can be a source of capital, management expertise, and new technologies. One of the key features brought about by private sector participation is the shift in *business models* from the provision of a public service to the provision of a public service under a profit-goal regime. Even under the traditional public procurement model, public authorities rely on the private sector for design, construction and management of services. As seen in the paragraph on competition for the market, private sector participation is carried out through different types of delegation contracts.

Especially for higher degrees of private sector participation, such as divestiture, there are lower degrees of public involvement and public accountability. Private entities are accountable to shareholders rather than to the public. This also coincides with the passage from tax-paying citizens to bill-paying customers.

Regionalisation

Although the water network utility has been justly described as a natural local monopoly, some trends towards *regionalisation* are extending the geographic impact of the so-called local monopoly. Regionalisation of urban water services' management refers to an increase in the scale of water services, often due to a grouping of municipalities. Its rationale lies in the fact that the very small size of several suppliers actually limits the benefits that can be derived from economies of scale. However, according to our knowledge, the impact of such regionalisation has not yet been analysed in the UWS.

Increased autonomy of the management entities

The drivers of change in the sector do not necessarily lead to increased competition and private sector participation. In many countries, the alternative approach to liberalisation lies in giving enough *autonomy* to public utilities, so that the business principles and practices can be adhered to.

The increasing autonomy of water management in relation to politics and the *outsourcing* of specific tasks to experts are important trends in the sector. Local authorities remain generally the owners of the assets. One common example is the transformation of organic units within the local public authority structure into *autonomous organisations* possessing sole decision-making competency at all levels of operational action (i.e., corporatisation of utilities).

1.2.3 Dominant institutional arrangements

The reform of the water sector corresponds to a change in the *institutional arrangement* coordinating the provision and regulation of water services. When there is a transfer of (property, management, or investment) rights and responsibilities, each institutional arrangement can be interpreted as a sequence of contracts ruling the transactions between the responsible authority for service provision and the operator. As for the regulatory rights, these may be taken by the responsible entity for service provision (normally the local public authority) or may be unbundled and delegated to a regulatory agency.

The set of characteristics that distinguishes these institutional arrangements corresponds to the aforementioned features of the reform, particularly:

- unbundling/ integration of functions,
- private sector participation, and
- type of competition.

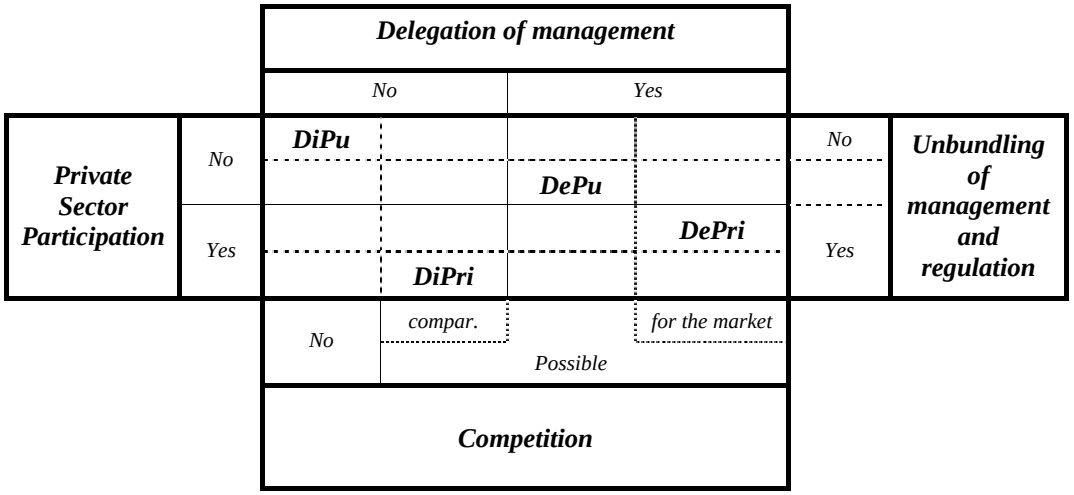
Based on the results of the Euromarket project (see major results in Finger, Allouche, and Luís-Manso, 2007), we have identified four institutional management arrangements[2]:

- Direct Public (D_iPu)
- Delegated Public *(DePu)*
- Delegated Private (*DePri)*
- Direct Private, with Independent Regulation (*DiPri*)

[2] Although important, Build-Operate-Transfer/Build-Operate-Own schemes are not considered because they pertain to special purpose projects and not to the entire water system.

Table 2 presents the institutional arrangements in relation to the main features of reform.

***Table 2** Dominant institutional arrangements in the UWS*



Direct Public Management

The traditional institutional arrangement is direct public management. There is no private sector participation and no competition. The public operator is both responsible for the regulation and the provision of the service, and is manager of the system (i.e., there is no unbundling of functions). There are several examples of this in Europe, such as: water supply and sanitation (WSS) services in Austria, Denmark, Switzerland, Sweden, and Ireland; sanitation services in Germany; and sewage collection in the Netherlands and Belgium.

Delegated Public Management

In the Delegated Public Management arrangement there is no private sector participation in the provision of the service. The responsibility and management functions are unbundled and the responsible entity appoints a public management entity to provide the service with relative autonomy (increasingly a publicly-owned private law company). It is possible (yet still not very common) that the regulatory and responsibility functions for service provision

become unbundled, and that benchmarking becomes the key competitive pressure in the industry. WSS provision in Italy, Portugal and Greece, as well as German water provision, and Dutch and Belgium water and sewage treatment are dominantly organised according to this institutional arrangement.

Delegated Private management

Delegated management (mainly private) based on agreements between autonomous actors, such as delegation contracts, are becoming very important (hybrid) forms of coordination in the water sector. Under Private Delegated Management, the responsibility for service provision and management functions are unbundled, and the responsible entity appoints a private company for providing the service.

The operator may be chosen after a competitive tender and, in this case, the key competitive pressure is competition *for* the market. The regulatory and responsibility functions may also be unbundled, and a regulatory agency created. French and Spanish WSS services are provided according to this arrangement (yet no independent regulatory agency was created in this case) and regulation in these two cases is said to be "by contract".

Direct Private Management

Finally, there is direct private management. Responsibility and management functions are integrated and carried out by a private operator. On the contrary, the regulatory function is unbundled and it is implemented by an independent regulatory agency. The case of England and Wales illustrates this arrangement because water utilities were privatised and a sector regulator was created.

1.3. Problem statement

The urban water sector reforms summarised in the previous section are creating new sources of uncertainty and vulnerability, resulting from the emergence of new actors playing an active role in the sector, as well as from "unbundling" of operational and regulatory functions. As a matter of fact, new issues are raised by the multiplication of the actors, as well as by new institutional arrangements diffusing responsibilities which were traditionally integrated in the publicly-owned utilities.

In a sector characterised by strong economies of scale, as well as merit and "quasi-public" characteristics, one main issue is the ***sustainability of capital investment.*** Firstly, due to the *merit good characteristics*, if water provision and sanitation are left only to the private sector, it is likely that they will be under-supplied, especially for the low-income population. Secondly, the introduction of competitive pressure may reduce *economies of co-ordination* and incentives to invest. Moreover, a balance between introducing competitive pressures, the length of delegating contracts, and the return on capital investments is hard to achieve.

Furthermore, an unregulated (monopoly) provider of water services may raise tariffs to socially unacceptable levels since users are *captive*. It may also carry out a selective expansion of activities to the most profitable segments, i.e. "*cherry-picking*" process (see for e.g., Marvin et al., 1999). ***Social concern*** thus increases in the event of privately-owned operators and assets. In this context, regulation appears inevitable for creating conditions under which firms can operate efficiently, as well as for protecting consumers and the public interest.

1.4. Objectives of the research

The objectives of this research are to analyse the different risks that are created by the sector's reform. These are aggregated as *reform risks*, and pertain to capital investment and universal provision of the service of general interest.

The thesis focuses on the management of the risks created by the reform of the urban water sector, and the role of regulation. Thus, the main research questions pertain to the ***role of regulation in reform risk management***.

The research aims at verifying whether and how:

1. the sector's reform is affecting the nature and intensity of risks in the sector;
2. the risks created by reform vary according to different institutional frameworks; and
3. regulation can be a tool for reform risk management.

The nature of the reform process depends, among other things, upon the developmental stage of the countries. In developing countries, the main impetus for reform comes from the need to invest in new infrastructures (Allouche et al., 2002). In developed countries, the main driving force for reform stems from financial pressures to respond to the needs of maintenance, to higher sewerage and water production costs due to increased pollution and water use, and to stricter environmental norms (Garcia et al., 2007). Therefore, the analysis of reform risks and their consequences differs in these two situations, a fact that we take into consideration throughout this thesis.

1.5. Structure of the thesis

The thesis is divided in four main parts (Figure 1).

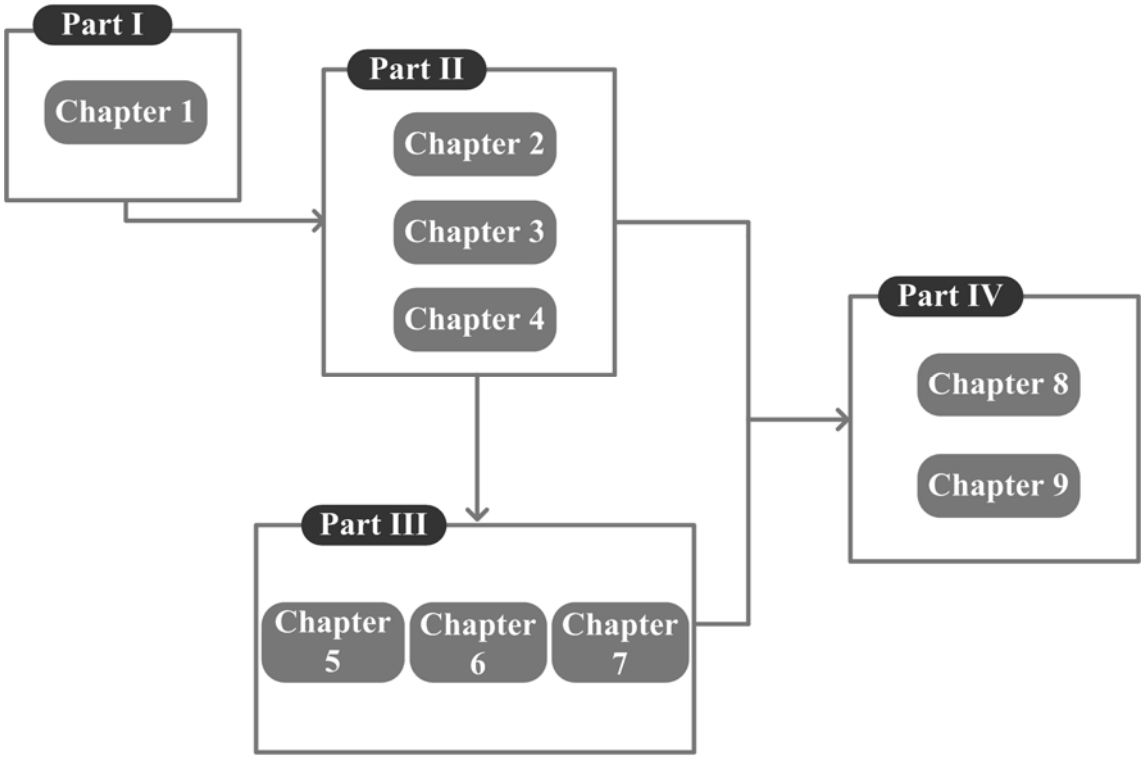


Figure 1 *Structure of the thesis*

Part I comprises *Chapter 1*, which presents this General Introduction. We started out by identifying the main characteristics of the sector, and the features of reform, before defining the main problem and objectives set for this thesis.

Part II is dedicated to the elaboration of the conceptual framework used to answering the research questions. *Chapter 2* presents an overview of regulation in the urban water sector, starting by making reference to the larger literature on regulation of the network industries. It then focuses on the specificities of regulating the urban water sector, and the main regulatory objectives in a reform context. *Chapter 3* addresses the issue of risk management in the UWS, focusing in particular on the types of risks accentuated by the sector reform.

Chapter 4 draws together the issues that influence the main elements at risk because of reform, namely capital investments and provision of the service of general interest.

Part III presents an empirical analysis of risk-sharing patterns and the vulnerability of the elements at risk because of reform. In *Chapter 5*, we present the main trends identified by the questionnaire developed in the scope of this research. Then, in *Chapter 6* we present 5 case-studies selected to illustrate different institutional arrangements in 4 countries, corresponding to different degrees of operational and regulatory "unbundling", participation of the private sector, and competition. In *Chapter 7*, we present one study developed by the author in the context of the Euromarket project about operators' strategies in a context of reform with the objective of assessing the alignment of these strategies with the challenges posed by the sector's reform.

Part IV presents the main results and conclusions of this thesis. *Chapter 8* synthesises the reviews, concepts, and empirical evidence into a comprehensive regulatory governance approach adapted to the new risks posed by reforms. It concludes by proposing new governance mechanisms to tackle the problems highlighted in each institutional arrangement. Finally, in *Chapter 9* we present the main conclusions of this thesis, and suggest future areas of research.

PART II. THEORETICAL ANALYSIS

The Urban Water Sector (UWS) is a typical *network industry*. As such, it displays economies of scale resulting from large fixed costs, as well as economies of system resulting from connections to an integrated network. However, the UWS displays additional specificities when compared to other network industries, which are related to the nature of its technology, the nature of the good, and the nature of the resource. These specificities determine the way the UWS has traditionally been structured as a local public monopoly. Nonetheless, the sector has undergone important reforms, such as the introduction of competitive pressures, the participation of the private sector, and the increased autonomy of the public utilities.

Overall, these *reforms* are creating new sources of uncertainty and vulnerability for the management and regulation of water utilities. In this thesis, the focus is on the role of regulation in managing these new risks created by the reforms. It is therefore important to understand the main approaches and instruments of regulation in the network industries, and in the urban water sector in particular (Chapter 2).

In parallel, we analyse the sector considering the transactions of (property, management, or investment) rights and responsibilities as the unit of analysis, with the view of presenting the most important *risks* in the urban water sector, as well as the main risk-sharing patterns *per* institutional arrangements (Chapter 3).

Finally, two *elements* are identified in this dissertation as being particularly at risk because of reforms - investment in specific assets, and universal provision of the service of general interest. Using the literature on Transaction-Costs and Incomplete-Contract Theories as a starting point, a vulnerability analysis is made for each element at risk across the most common institutional arrangements (Chapter 4).

Chapter 2. Regulation of the Urban Water Sector

To understand the *regulation* of the urban water sector one must make reference to the broader literature on regulation of the network industries (directly related to the regulation of natural monopolies). To start with, there are three main categories of regulation in the network industries, namely economic, social, and technical regulation.

Firstly, *economic* regulation is about introducing competitive market structures in industries characterised by market failures, regulating the market (i.e., specific aspects of operating in the market, such as defining tariffs and fostering operational efficiency), and guaranteeing the sustainability of the system (i.e., to ensure asset service ability over time). The major instruments of economic regulation are price and access regulation.

Secondly, *social* regulation refers to regulatory policies and practices designed to achieve social policy objectives that may not be met through competitive market forces or economic regulation alone. They aim at correcting other market failures, such as externalities and information asymmetries (Ogus, 2004).

Service quality and public service obligations become major issues with regulated providers. Quality standards are the most important instrument of social regulation. They subject suppliers to behavioural controls and impose penalties to those who fail compliance. Standards are particularly important when there are price controls because these create incentives to reduce quality. There are several associated costs, which are borne either by the authority or the firms, such as administrative costs (related to standard formulation, monitoring and enforcement) as well as compliance costs (related to capital and other costs incurred to meeting the standards).

The goods and services provided by the network industries are considered as being of general interest to society (because they are essential for achieving acceptable levels of quality of life and for the development of countries and regions). For this reason, providers of the service are subject to specific public service obligations, in other words to specific

requirements ensuring that certain public interest objectives are met. European institutions have developed the concept of universal service in the context of the liberalisation of some network industries, namely telecommunications, post, and electricity (Box 1).

Box 1 Universal Service Obligations

Universal service obligations (USO) refer to a minimum set of services of specified quality, to which all users throughout the European Community have access, at an affordable price (Garcia et al., 2007). USO have become an important instrument of social regulation in the newly liberalised network industries. By setting a USO, political authorities ensure a non-discriminatory provision of services of general interest, overcoming social exclusion and isolation. The definition of USO varies across industries and countries. The definition is not always clear, and it often gives rise to different interpretations. With the end of monopolies, the funding of USO have become a major issue. Usually, the burden of USO provision lies on the incumbent.

Thirdly, externalities and informational asymmetries may also create *technical* problems related to interoperability and interconnection when the infrastructure is unbundled. In this event, there is the need to ensure the integrity of the infrastructure systems through technical regulatory instruments. In the situations of structural unbundling, the old vertically-integrated utility model is abandoned and it must be ensured that the physical material of the system does not fail when exposed to external and internal stresses.

System's integrity is essential for the overall quality of the service provided. It requires a regular assessment of the state of the overall infrastructure and requires frequent decisions concerning maintenance, replacement, and renewal of unreliable network elements.

In this thesis we mainly focus on economic and social regulation. The reason is that, due to technological reasons, the infrastructure systems cannot be unbundled in the urban water sector. Therefore, the need for technical regulation is not as acute in the UWS as it is in other network industries.

2.1. Regulation in the Network Industries[3]

Over the past decades, most network industries have *evolved* from integrated monopolies to restructured industries with private sector participation, and/or to (partially or almost completely) liberalised industries. The literature on regulation in the network industries has followed, and sometimes triggered, the restructuring processes in sectors that are normally characterised by large sunk costs and strong social, environmental, and economic externalities (e.g., Klein, 1996). These industries include telecommunications, postal services, energy (electricity and gas), railways and public local transport, air transport, water supply and sanitation.

The *reform* processes and the evolution of the theories about regulation do not necessarily follow a specific order of events, and differ across network industries and regions. In fact, some sectors were and are being liberalised without having been privatised first (e.g., air transport in several European countries); while others were privatised, but not liberalised (e.g., water utilities in England and Wales).

In *geographical* terms, the tradition in the United States of America (USA) is more liberal than in Europe. In the USA there has been a strong belief in the market and on *ex-post* intervention, while in Europe, public ownership was expected to protect the general interest against private interests, and interventions were mainly done *ex-ante*. Many developing countries present yet a different path, mainly due to the influence of World Bank policies. The Bank started by pro(im)posing privatisation, however lately it has focused on competition as the restructuring solution for these industries.

Several theories have been developed over the past decades, suggesting different answers to the question *why do network industries need to be regulated, even after being restructured?*

[3] Parts of section 2.1 were published in (Luís-Manso and Felisberto, 2006).

We differentiate a first group of theories, which have emerged in the context of privatisation, and a second group influenced by the liberalisation paradigm, which defends the virtues of competition and the power of its alternative forms.

2.1.1 Privatisation and the need to regulate

Traditionally, the default resolution of the conflict between consumer protection and investment needs used to be public *ownership*, thus providing both access to investment funds and political control over final prices (Newbery, 2004). This is still the case in many countries and industries in the world.

However, in the early stages of the network industries restructuring process, there was a pressure to shift from public to private ownership. There were several reasons which explained the decision to *privatise*. One of the most important was the increase in operational efficiencies expected by means of a change in ownership. Neo-classical authors presented other advantages of privatisation, such as the reduction of the public sector borrowing requirement and of the government involvement in enterprise decision-making (Vickers and Yarrow, 1988).

Together with the trend towards the privatisation of public utilities came the need for *government regulation*. State ownership was substituted by economic regulation, in other words by government intervention in the market. At this stage, the regulation was basically needed to ensure that the monopolist would not abuse of its privileged position in the market.

There is a long tradition of regulating private utilities in the United States of America (USA), where several theories were initially developed in order to explain the reasons for regulation, and how regulatory agencies behave when they are created. Public Interest, Private Interest, and (New) Institutional Economic Theories are amongst the most important ones.

A. Public Interest Theory

The Public Interest Theory of regulation suggests that government regulation is justified by the pursuit of the *public interest*. It thus suggests that regulation arises from the need to protect and maximize social welfare. Public Interest Theory assumes that rational and disinterested expert regulators exist, and that they actually are the best means to identify and ensure the common goals of society.

The theory is based on two main assumptions:

1. markets are prone to fail if left alone, and

2. regulation is costless.

Thus, *market imperfection* justifies regulation, which has no cost (Posner, 1971). The objective of regulation is to achieve certain public desired results by rectifying situations of market failure, which make markets operate inefficiently or inequitably. The most relevant market failures in network industries arise in relation to natural monopolies, externalities (e.g. public good characteristics and pollution), and asymmetry of information in the market.

This theory has been *criticised*[4]. Some authors argue that public interest is difficult to define and to be written down into specific policies. There are no complete informed and rational decisions, so critics to the theory say that it is preferable to rely on the market to solve market imperfections, than on government intervention. Moreover, in many cases, empirical research could not demonstrate that regulation solve market failures.

The lack of clarity on how to balance economic and social efficiencies has been also criticised since these are frequently incompatible.

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[4] Some of these are general criticisms addressed to regulation in general.

Another drawback is related to the fact that Public Interest Theory assumes that government intervention is perfect and has no costs, which is not the case in reality (Posner, 1974). Additionally, regulators are thought to have a disinterested expertise and to be efficient, which may not be always the case.

Some critics of this approach also argue that regulation is extensively influenced by economic and political powers. Thus, it is claimed that regulatory policies and institutions are often influenced by powerful regulated parties, politicians or groups of consumers (Baldwin and Cave, 1999). Finally, the Public Interest Theory is said to be incomplete since it does not specify where and how regulation should be introduced.

Not all authors were convinced by the way Public Interest Theory justified regulation. Therefore, Private Interest Theories emerged as alternative theories to explain government intervention.

B. Private Interest Theories

Private Interest Theories or, as some authors designate them, Capture Theories, are driven by the *pursuit of private* and not public interests. They emerged as a response to the perception that regulators were ineffective in meeting the public interest goals.

Stigler (1971) proposes that the creation and operation of regulatory agencies is meant to transfer economic resources to private interests in return for votes or campaign contributions to politicians, meaning he provides a political justification for regulation. Stigler, based on Olson's theory of collective action, also explains that "as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefits".

In this context, regulation is not imposed to the economic agents but it is demanded and supplied according to the interests of those regulated. So, regulation is the outcome of the demand and supply forces, in other words, it is a product supplied to the interest groups that value it the most. As such, the value of regulation to particular groups and the costs of obtaining regulation become important variables in the regulatory arena.

The Private Interest Theory considers that regulators tend to be *dominated* over time by the regulated industries, even if at first they are driven by the pursuit of public interest. The regulator acts in the interest of incumbents rather than in the interest of society as a whole. At the heart of this argument is the fact that firms have stronger incentives and resources to defend their cases than consumers do. The industry's control of information, its career opportunities, and the repeated iterations between the regulator and the firm, often lead to a situation where the regulator comes to serve the interests of the regulated.

Empirical findings, mainly from the USA, on regulatory decisions that were against firms' interests questioned these arguments. The Private Interest Theory then developed to include other actors, such as consumers, and not only the relationship between the regulator and the firm (Posner, 1971). This is the approach taken by the Economic Theory of Regulation.

Economic Theory of Regulation[5]

The Economic Theory of Regulation has a broader view than initial Capture Theories, because it admits the possibility of capture by interest groups other than the regulated firms (Peltzman, 1976). This theory recognises that the need to regulate is likely to appear in the event of market failures because these failures inflict losses on some interest groups.

Stigler and Peltzman suggest that in the case of a competition failure, or monopoly, the regulator is given the power to allocate the monopoly profit. Therefore, the regulated industry in general has an incentive to influence the regulator so that it benefits from a "regulatory rent" (i.e., a market for regulation is created). In this case, the regulator would be captured by the industry because the commodity of regulation goes to those who value it most. Producers would thus tend to be better served by regulation than the (more diffused, less organised) masses of consumers (Baldwin and Cave, 1999).

[5] The Economic Theory of Regulation is in line with the thought of the so-called "Chicago school". Sometimes it is even called the Chicago Theory.

The proponents of this theory advocate that there is a tendency to design regulation in benefit of groups that are relatively small but who have strong preferences, homogeneity of interest and relatively low organisational costs. Nevertheless, the price will be less than the monopolistic price given that pro-producer tendencies are somehow disciplined by consumer groups. The main assumptions of the Economic Theory of Regulation are:

1. all parties involved in regulation are income maximisers (politicians, for instance, seeking votes to maximise their cash incomes), well informed, and learn from experience, and

2. regulation is costless (Baldwin and Cave, 1999).

Private Interest Theories, including the Economic Theory of Regulation, emerged on the basis of public choice analysis (Black, 1996) (Box 2).

Box 2 Public Choice Theory

The Public Choice Theory aims at explaining how individual preferences are reflected in voting and other procedures adopted by institutions, and at evaluating their consequences for social welfare (Ogus, 2004). The proponents of the theory argue that civil servants do not have incentive to manage state investments in an altruistic way, consistent with the public interest. This theory states that civil servants' primary motivation is their own interest, and it accuses special interest groups of lobbying in such a way that the state outputs are deformed in favour of particular groups in society. In the majority of cases, these groups are well organised and politically powerful. In this situation, there is clearly the risk that regulation goes beyond the economically efficient level.

Still in the same line of thought of Private Interest Theories, some authors challenged the emphasis placed on the regulatory agency's control by one narrow group with powerful interests.

Special Interest Theory

The Special Interest Theory proposes that *multiple groups* compete for the control of the regulatory agency's activities (Becker, 1983, Peltzman, 1976). Stigler and Peltzman argue that the behaviour of legislators is driven by the desire to remain in office, and that the different interest groups compete against each other (by offering political support in return for favourable legislation). Peltzman (1976) tries to combine both views by considering the regulator as an actor searching for support from competing interest groups.

Recent authors (e.g., Armstrong et al., 1994) tend to maintain this view that regulators draw support from a variety of sources that change over time. They focus on the winners and losers in the regulatory process, the associated rent seeking, and the incentives regulators have to act for or against various groups in society. The regulator must trade-off the desires of consumers against those of the firms.

When there is a *risk of capture*, it may be desirable to limit the discretion of the regulator in order to reduce the firm's incentive to expand wasteful resources and rent-seeking. To overcome this problem, Armstrong et al. (1994) proposed that regulators should be banned from integrating the regulated firms' staff after their retirement from public service. This would prevent the temptation of benefiting the industry today in order to be rewarded by a generous remuneration in the future.

C. New Institutional Economic Theories

In general terms, Institutional Theorists argue that regulation is affected by the *institutional environment* rather than by an overriding public interest or the outcome of competitive bargaining between diverging private interests (Black, 1996). The emphasis is placed on how regulatory strategies are affected and constrained by the institutional environment, including legal and non-legal rules, which shape, mediate and channel preferences and actions (e.g., Shirley et al., 2000, Spiller and Tommasi, 2005).

Institutions are defined as the formal and informal rules that govern the ways in which individuals and organisations interact with each other. Thus, institutions include not only national laws and the political system, but also customs and social conventions. All this constitutes the institutional context in which the regulatory regime is embodied.

Beside this broad perspective on the influence of (social, political, and economic) institutions on regulation, New Institutional Economics also focuses on a micro perspective based on *transaction costs*. According to this approach, regulation is justified if other rules are more costly in terms of transaction costs. We come back to it in the next section.

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Contradictory findings on the relation between ownership and efficiency questioned the purpose of privatisation. New challenges were created by a different type of reforms and, consequently, different forms of intervention adapted to the new context were required. New theories emerged to support and/or explain different forms of economic intervention in the markets.

2.1.2 The challenges posed to regulation by liberalisation

Some authors argue that the *restructuring* of the network industries should not result from a change of ownership – i.e., from privatization –, but rather from the introduction of competition, i.e., from liberalisation (e.g., Armstrong, 2003, Newbery, 2002, Vickers and Yarrow, 1991).

As a reminder, *liberalisation* refers to a process by which competition is introduced in situations or sectors so far characterised as monopolies. Its economic rationale is grounded on the recognition that, in principle, competition is more prone to achieve efficiency than

monopoly[6]. In most of the markets, competition ensures that the interest of the consumers is satisfied because it obliges the firms to be cost-efficient, to attain a certain level of quality or to be innovative. This is the only way firms can survive and be profitable in the competitive market (Armstrong et al., 1994).

The process of liberalisation can also be characterised as a process of "*deregulation*". The idea behind this is that, where there is competition, normal competition policy should replace regulatory control exercised by the regulatory entities. However, in practice, many "deregulating" measures in the network industries involved a change in intensity rather than in number (Ogus, 2004). This means that regulatory instruments are less interventionist (e.g., fewer prescriptive standards; general targets as opposed to detailed mandatory requirements) and not necessarily removed.

Indeed, in the event of market failures there are two ways to overcome the problem of market power:

- regulating the market, or
- introducing more competition in the market (Armstrong et al., 1994).

The introduction of competition may not be desirable if the industry presents important natural monopoly characteristics, or if there is the threat of "cream-skimming". In these cases, *regulation tends to persist*.

There are only two network industries where competition appears attractive, namely telecommunications and postal services. In these cases, notably in the telecommunications

[6] Although this is a relatively consensual principle in economics, some authors argue that the unsatisfactory results of some privatisation and liberalisation projects sustain the hypothesis that state monopolies might outperform competitive markets, even in markets that do not exhibit economies of scale (e.g., Ungern-Sternberg, 2004).

sector, unbundling and technological innovations enables the introduction of competition in the whole - or part - of the value chain.

In many network industries competition is limited, at least in a first stage. That is why government regulation is nonetheless deemed necessary as a means to ensure that the pursuit of profits does not conflict with social welfare (e.g., Vickers and Yarrow, 1991, Train, 1997).

Newbery (2002) goes a step further, suggesting that regulation should not be confined to the natural monopoly elements. The author advocates that the potentially competitive elements also need regulatory oversight so as to ensure that markets are not manipulated nor market power abused. According to these authors, deregulated industries will still need to be regulated (a process also called "*re-regulation"*).

In a context of deregulation, the regulatory debate focuses on the *balance* between regulatory intervention and competition policy, and not anymore exclusively on the abuse of monopoly positions. Let us now go through the main bodies of literature influencing these "deregulation" and "re-regulation" trends. Even in situations where it is difficult to introduce competition (e.g., due to market failures), they explore alternative mechanisms to overcome this limitation, and influence regulation.

A. Contestable markets

According to the Theory of Contestable Markets, the threat of competition (or potential competition) on its own induces a monopoly to be efficient (Baumol, 1982, Baumol et al., 1982, Baumol and Willig, 1986). Therefore, there is no need to intervene in the market (i.e., to regulate).

When there are *no sunk costs*, there is the possibility for free entry and free exit (hit-and-run competition), and the markets are considered to be contestable. In this case a competitor can profitably enter the industry, undercut the incumbent, and take away its business. The best way for the incumbent to respond to that threat is to eliminate such profit opportunities

by being productively efficient and pricing at average cost (given uniform pricing). Given the constraint that profits cannot be negative, this outcome is welfare-optimal, that is allocative efficiency is maximized subject to the break-even constraint without any duplication of fixed costs (Armstrong et al., 1994).

One of the major *critiques* made to this theory is that entry can happen faster than the incumbent's price response. Another important criticism, especially in the context of the network industries, is that by slightly relaxing the hypothesis of absent sunk costs, the predictions of the theory change substantially.

One interesting result is that rather than being an argument for the elimination of regulation, the Contestability Theory can be used as a guide for regulation (Baumol and Willig, 1986). Indeed, regulation should simulate contestability by setting the regulated prices between incremental and stand alone costs in markets that are not contestable.

Franchise Bidding

One way to make a natural monopoly contestable is to assign a *franchise* through a competitive tender. Demsetz (1968) proposes a return to concession contracts, which had been common in the nineteenth century, as an alternative form of competition (in opposition to both competition in the market and potential competition). The idea is to auction the right to operate the natural monopoly to the firm offering the lowest price of supply. The author criticises the performance of U.S. regulatory agencies and argues that competition for the right to serve the market can substitute competition within a market.

Franchise bidding is regarded as being beneficial for efficiency. The fact that the concession is competitively awarded ensures that prices and services standards are fair to both consumers and investors. Even though franchise bidding has still strong advocates, it presents some drawbacks especially under asset specificity and cost uncertainty. New Institutional Economists (NIE) analyse in detail franchise bidding contracts. Some results are presented below.

B. New Institutional Economics

NIE abandons the full-informational rational economic behaviour in favour of bounded-rationality. Coase (1937) is amongst the first authors to question the ability of public authorities (and regulatory agencies for that matter) to have complete and costless access to information, and showed that public regulation is not better in principle than private negotiation for dealing with market failures (Glachant, 2002).

There is a special emphasis on contracts and on franchise contracts in particular. These works produced important results in terms of *regulation*. Firstly, new institutional economists argue that complexity of the service, agents' cognitive limits, and incomplete information make it impossible to negotiate a complete contract (Williamson, 1985).

Secondly, they argue that factors such as multidimensional quality, asset specificity[7], and opportunistic behaviour (e.g., *ex-post* appropriation threat) fade out the results of *ex-ante* competitive mechanisms (e.g., Goldberg, 1976, Williamson, 1976, Williamson, 1985). Indeed, investment specificity, average cost uncertainty, and high costs associated with repeating the auctions, might well undermine the incentives to invest into the network infrastructure.

Finally, it is difficult to make the bidding truly competitive, to define the optimal duration of the contract, and to renegotiate tariffs. For these reasons, some authors (e.g., Williamson, 1985, Armstrong et al., 1994) do argue that even in the event of competitive bidding for the market, *ex-post* (i.e., after signing the contract) intervention in the industry is still necessary. According to Williamson's model, *ex-post* intervention depends on asset specificity.

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[7] Asset specificity refers to the relative lack of transferability of assets intended for use in a given transaction to other uses. Highly specific assets represent sunk costs that have relatively little value beyond their use in the context of a specific transaction.

Williamson (1985, , 1996) distinguishes two types of network industry reform:

1. industries with low asset specificity where the threat of competition remains credible *ex-post*; and

2. industries with high asset specificity and little *ex-post* credibility of contractual incentives, and therefore where *ex-post* regulation is needed.

Thus, institutional arrangements in network industries need to be adapted to different asset specificities, and cannot be reduced to public intervention. As a matter of fact, no uniform solution, involving either pure competition or public oversight, will find universal application to all network industries (Glachant, 2002).

C. Intensity of Regulation (Bergman's model)

Bergman et al. (1998) analyse the conflicting priorities[8] faced during the transition from monopoly to competition. Accordingly to their model, the intensity of regulation varies during this transition as a result of the resolution of conflicting priorities faced in the regulatory process.

The authors distinguish three phases. In phase *one*, monopoly prevails and regulation is exerted through ownership in the majority of the cases. There is concern with all the aspects of the industry's activities, such as prices, investments, allocation of output, and social obligations.

[8] The authors identify ten conflicting priorities: short vs. long-term objectives; efficiency vs. equity objectives; competition vs. monopoly; slow vs. fast liberalisation; public vs. private ownership; sector specific regulation vs. application of general competition rules; rules vs. discretion; permanent vs. temporary regulation; centralised vs. decentralised regulation; and light-handed vs. heavy-handed regulation.

In phase *two*, one assists to a gradual introduction of competition (monopoly and competition coexist). The focus of regulation is on monopoly abuse by dominant incumbents, emerging competition issues, and public services obligations.

Finally, in phase *three*, competition is extensive and increasingly effective in some or all markets. The need for regulation decreases in this phase but it is not completely abolished. The maintenance of public service objectives and fair trading practices still demands some light-handed regulation.

The authors also analyse the *trade-off* in terms of regulatory intensity. If regulation is excessively light-handed, then the introduction of effective competition may be delayed due to legal uncertainty. If regulation is excessively heavy-handed and there are few sunset clauses, then it is more likely that institutions become entrenched and the progress towards a more effective regulation is delayed.

2.1.3 The major regulatory instruments

Alternative theories explain the reasons and the different approaches to regulation when network industries are restructured. Independently of the reasons behind the public intervention in the market, *pricing* of the service and *access regulation* are the most important instruments of economic regulation in the network industries.

A. Pricing of the service

The control of prices is the most common instrument of economic regulation. In markets with monopolistic characteristics, the intervention on prices aims at preventing predatory pricing and over charging. *Marginal cost pricing* provides the first best solution to pricing. However, it raises a problem by not taking into account other overheads, such as depreciation and capital costs (Kahn, 1970).

In *network industries*, facilities normally have short-term spare capacity, so the cost of providing an additional unit of the service is low. Actually, only a part of the firm's costs is

variable in the short-run, which means that by setting prices at the short-run marginal cost level, fixed costs would never be covered. It therefore raises the issue of average cost (based on cost recovery premises) versus marginal cost pricing (based on allocative efficiency premises).

Box 3 Rate structures in the Network Industries

Linear pricing

Under linear pricing, the price per unit remains the same irrespective of the consumption volume. This uniform rate may be based on the average or the marginal cost of service provision. It is easy to understand and implement, and it provides a stable revenue stream for the operator.

Nonlinear pricing

There are two types of nonlinear tariffs, namely decreasing and increasing block tariffs. Under decreasing block tariffs, the price per unit of service decreases with the volume of consumption. It is justified under natural monopoly conditions. Its main disadvantage refers to its low incentives for resource conservation (e.g., in the urban water sector). As for increasing block tariffs, the unit price increases with the volume of consumption. It can be implemented for equity purposes, or to face resource or capacity constraints.

Two-part tariff

A two-part tariff is a price discrimination technique in which price is composed of two parts, namely a lump-sum fee and a per-unit charge (that may correspond to an increasing or a decreasing block tariff).

Peak-load pricing

The rate structure may support tariff differentials for peak demand. That means that prices are higher when the demand for the service is at its highest levels (Boiteaux, 1949), as a means of reflecting investment costs needed for meeting peak demand. According to the economic theory, if the same type of capacity serves all users, then capacity costs should be levied only at peak hours.

The main *challenge* when setting prices in the network industries pertains to their natural monopoly characteristics, namely to find an alternative to the marginal cost principle that avoids the "dead-weight" welfare loss associated with monopolistic pricing (Ogus, 2004).

Possible solutions that avoid the "dead-weight" welfare loss are to:

1. allow price discrimination,
2. set a two-part tariff with a fixed fee and a per-unit charge equal to marginal cost,
3. meet the operator's loss from marginal pricing with a subsidy. This is called *Ramsey pricing* if the amount exceeding marginal cost is inversely proportional to demand elasticity (i.e., if charged to customers with less elastic demand functions).

All these solutions have *drawbacks* when implemented in network industries. For example, the universal service obligation defined in many network industries may not allow for price discrimination. Also, the fixed-fee of the two-part tariff might discourage low-income consumers from using the service. Finally, subsidies may distort incentives for efficiency. These solutions combine different rate level definitions and rate structures (Box 3).

Rate-of-return and price-cap regulations remain the most important methods for defining the rate levels. Other methods are a mixture of these two.

Rate-of-return regulation

Rate-of-return (ROR) regulation establishes a price that covers the firm's expenditures (including operating costs and depreciation) plus a reasonable return on capital investment (i.e., a "fair" rate-of-return). It aims at increasing certainty relatively to the profit outcome.

The main *difficulty* of this approach is the definition of a "fair" rate-of-return capable of attracting the adequate level of investment. There are different methods for calculating the ROR, which are based on returns in comparable industries, on the necessary return to attract investors in the past, and on returns obtained from a portfolio of diversified

investments. However, none of these methods guarantees that the ROR optimises investments in a specific industry at a particular point in time (Ogus, 2004).

The main *criticism* of rate-of-return regulation is its lack of incentives. In effect, the fact that the firm transfers to customers all its costs restrains incentives to improve efficiency. Moreover, since the profit is set according to the asset base, the firm might be tempted to over-invest (i.e., gold-plating) and/or to intensify its costs (i.e., cost padding) (Averch and Johnson, 1962). Finally, there are large regulatory (administrative and information) costs related to monitoring capital and operating costs, and to defining the necessary investment needs (and, accordingly, the fair rate of return).

Price-cap regulation (RPI-x)

Under *price-cap* systems, popularised by Littlechild (1983), the price is fixed and, therefore, the profit margin is variable as a function of the costs. The firm has to ensure that a weighted average of price increases in one year does not exceed the percentage increase in the Retail Price Index less a variable factor x (Armstrong et al., 1994). The factor x, which is the core of the system, is calculated by the regulatory agency and pertains to the firm's cost-efficiency potential. Originally, price-cap regulation was intended to be a transitional form of regulation until competition developed.

The *advantage* of price-cap over rate-of-return regulation is that it has stronger incentive properties. Price-cap creates an incentive for the firm to become more efficient because lower costs of production lead to higher profits. Prices are most commonly fixed on the basis of the costs observed for firms operating under the same conditions (i.e., yardstick competition).

Apart from cumbersome information requirements, the main *criticisms* to price-cap regulation are the real impact of its incentive properties. Some authors criticise the length of time between reviews, most commonly five years, as being very short in comparison with the lives of many assets, yet too long to predict costs with confidence. In this case, price-caps provide weak incentives for efficiency savings (e.g., Mayer, 2001).

Laffont and Tirole (1993) go a bit further by pointing out that efficiency incentives depend not only on the length of time between reviews but also on the percentage of the firm's costs that are covered by the price-cap.

Another critique focuses on capacity investment, a critical issue in network industries. Newbery (2002) argues that setting price-caps may be a good solution for transferring past efficiency gains to customers, yet it is not proved that they provide incentives for efficient and adequate capacity investment.

These critiques led to the definition of alternative price-cap mechanisms, such as the *sliding scale* and *relative price regulation* methods presented below.

Sliding scale regulation

Sliding scale regulation (Burns et al., 1995) is a mixture of price-cap and rate-of-return mechanisms. The adjustment in prices depends on whether the agreed profit level is attained. When the agreed profit level is reached, prices are adjusted downwards (independently of time).

The obvious *disadvantage* of this system is that it does not create incentives for cost efficiency. The *advantage* is that, in the short-run, the eventual benefits of efficiency gains are shared between producers and consumers.

Relative Price Regulation (RPR)

The criticisms of RPI-x regarding its incentive properties led Mayer (2001) to propose a new type of regulatory system, which combines the best features of rate-of-return regulation (setting the prices based on actual outcomes rather than on projected ones) with the incentives of price-cap.

Mayer argues that providing incentives through price-cap is a noble objective, yet the way it is being implemented across the network industries is not sustainable. The main reason is that price-caps focus on creating aggregate incentives over time (which are dependent on

forecasts of future costs and demand) instead of creating relative incentives across firms (Mayer, 2001). The high level of uncertainty about projections calls for systematic regulatory interventions between reviews, consequently undermining price-cap incentives.

RPR involves adjusting the regulatory asset base of all companies to:

1. projected new capital expenditures,
2. changes in the RPI, and
3. differences between average industry rates-of-return and the cost of capital.

Companies retain incentives to outperform their peers by retaining relative returns in excess of the cost of capital. RPR intensifies incentives by allowing excess returns to be retained by the regulated firm for longer periods of time and by mitigating the risks of regulatory intervention. One of the main limitations of this approach is that it cannot be applied to natural monopolies where, by definition, there is only one firm.

B. Access regulation

Access regulation instruments become particularly important when monopolistic infrastructures are liberalised. There are three different routes to establishing the conditions of market rules and competition (i.e., to liberalise):

- competition *in* the market (operators compete for end users),
- competition *for* the market (operators compete for obtaining exclusive rights to operate in specific segment(s)), and
- comparative competition.

Competition in the market encompasses full market opening, third-party access or a combination of both. Technical unbundling, i.e. the separation of the network into its

reserved and competitive elements, is a pre-condition to third-party access. Different firms can operate each of these parts of the value chain.

Also, when it is only possible to introduce competition for the market, the definition and allocation of exclusive rights also becomes a key issue. Thus, regulating the access to the network is fundamental in a liberalisation context.

The remainder of the section focuses on the two types of access regulation pertaining to competition *in* and *for* the market, namely the use of the infrastructure through third-party access, and the allocation of rights of supply through franchising.

Third-party access

In the "classic" third-party access problem, the owner of a monopoly infrastructure is required to allow a third-party to provide a service using the infrastructure[9]. One of the main issues related to third-party access is *access pricing.* The price should, on the one hand, offer the access provider an adequate return to capital in order to encourage investment in the infrastructure and, on the other, encourage its efficient use by third-parties.

The *principles* governing access pricing are an application of natural monopoly pricing theories. In the event of scale or other economies, marginal cost pricing does not allow the firm to cover its total costs. If other sources of revenue are unavailable (e.g., tax revenues), then prices must be raised above marginal costs.

In some cases, it is efficient to discriminate prices, charging for example a two-part tariff. An important variant of two-part pricing is capacity based pricing, where the fixed

[9] Other types of access problems refer to cases where competing firms purchase essential inputs (e.g., the use of the infrastructure) from a monopolist and, in addition, the monopoly firm must purchase inputs from the competing firms. In this review we only consider the classic problem of one way access.

component determines the capacity, and the variable component depends on the purchased quantity (being very high for quantity purchases above that capacity limit) (OECD, 2004a).

Two main *challenges* for the regulator are the substantial requirements of information (e.g., on the cost structure of the regulated firms), and problems of information asymmetry. The use of price-caps (i.e., a regulation that sets the maximum price a company can charge for a designated group of services, which changes and targets for improvements in productivity) is presented by some authors as a solution to these problems.

Finally, it is important to mention the widely discussed *efficient component pricing rule* (ECPR), which was popularised by Baumol and Sidak (1994). ECPR states that the appropriate access price equals the monopolist's opportunity cost of providing the access, ensuring that production or service provision is not diverted to an inefficient firm[10].

Franchising

In terms of *franchising*, it is important to define the way firms are selected and the conditions under which they operate. There are different reasons for allocating the right of supply to a firm, such as the existence of a natural monopoly, potential for cream-skimming, and technological or resource scarcity. The franchisee normally becomes a monopolist in a specific market for the duration of the franchise.

The franchise may be directly awarded by the public authority or it may be allocated through competitive bidding (based on public interest or pricing criteria). The degree of *competition* of the allocation process is an important variable to take into account. The fairness and transparency of the competitive process is essential in determining its consequences on allocative and productive efficiency.

[10] For a critical view on ECPR see, for example, (Economides and White, 1995).

So far the discussion has been centred on the rationale for regulating and the main instruments available to regulators, or, on the contrary, for non-state intervention in the markets. Overall – and even though the debate has not yet come to a final conclusion – it is nevertheless obvious that both privatisation and liberalisation have, somewhat paradoxically, led to a greater/or to a new role for regulation in the network industries. The following section focuses on how economic regulation of the network industries tends to converge at *incentive regulation*.

2.1.4 Incentive Regulation as the convergent form of Regulation

The traditional forms of regulation have been under criticisms for the past decades, consequently triggering deregulatory trends. However, at least in the network industries, there has not been total deregulation but instead a move towards different forms of public intervention, the majority of them focusing on creating more incentives.

Incentives aim at motivating different actors of the system, especially operators, to reach the objectives set by public authorities, with a reduction of information and administrative costs for both operators and authority/agency (Ogus, 2004).

At first, in the context of *privatisation*, rate-of-return regulation, which aimed at regulating the private incumbent, was criticised due to the little attention paid to incentives. As a consequence, regulators now tend to implement incentive mechanisms, such as price-caps, for regulating private monopolies (e.g., privatisation of the network industries in England).

In the context of *liberalisation*, competition is introduced in monopolist industries because they lack incentives for efficiency and performance. Therefore, independently from the type of reform implemented, incentive regulation appears to be the convergent form of regulation in the network industries.

The application of incentive regulatory mechanisms may actually refer to different *goals*, which may even be contradictory. Amid the most important ones are to:

- increase economic efficiency (i.e., minimise the costs);
- increase (environmental and service) quality in a cost effective way;
- stimulate (product/service and technical) innovation; and
- stimulate efficient capacity investment.

The most important incentive regulation *instruments* available to the regulator are price mechanisms. In terms of pricing, rate-of-return (or cost of service) and price-cap regulation are two polar examples of regulatory instruments regarding incentives creation. The former one is considered to be a low-powered incentive mechanism (the regulated firm is compensated for all incurred costs of production), while the later one is considered as a high-powered incentive mechanism (prices are adjusted according to an exogenous price and the regulated firm's performance).

When the *regulated firms* are given the choice between these two types of contract, low-cost firms prefer price-cap pricing (because they are left with some rent), while high-cost firms have a preference for cost of the service pricing (Laffont and Tirole, 1993). Sliding scale and relative price regulation are intermediate cases in terms of incentive creation, which can be considered optimal in a second best sense (Joskow, 2005).

Incentive regulation mechanisms thus relate to the regulated firm's *performance*, which is mainly defined by cost and quality variables. Again, the regulator's dependence on information about the regulated firm's costs creates information problems for the regulator.

Some authors propose alternative ways to reduce the regulator's *information disadvantage vis-à-vis* the regulated firm. One is by offering the regulated firm a menu of cost contingent contracts, forcing them to reveal their cost type (Laffont and Tirole, 1993). Another way is to set the price for each firm based on the costs of identical (non-competing) firms, i.e. by

yardstick regulation. Related to yardstick regulation it is benchmarking based on a hypothetical efficient firm (Vogelsang, 2002) (e.g., water and electricity regulation in Chile). Finally, the regulator can also accept the firm's level of costs and focus on benchmarks for performance improvements based on the firm's historical performance (Joskow, 2005).

At last, it is important to make reference to the important *trade-off* between (operating and capital) costs and (short- and long-run) quality of the service. Any incentive regulation mechanism needs to consider the potential impact of cost reduction on quality and vice-versa. This might imply the need to implement a package of cost- and quality-related incentives, which constitutes a huge challenge for regulators.

The following section focuses on the specificities of regulating the urban water sector. It identifies the main types of regulation, analyses the influence of the most important features of reform on the regulation of the sector, and presents the objectives of regulation in a reform context.

2.2. Specificities of Regulating the Urban Water Sector

Some features distinguish the Urban Water Sector (UWS) from other network industries[11]. The most important ones are the local nature of supply and the quasi-public good characteristics of the water services. Together with the sector's network and scale economies, sunk costs and environmental externalities, these features create significant regulatory challenges, which are in turn intensified by the sector's reform.

There are two types of problems calling for distinct regulatory *functions* in the UWS (Table 3). Firstly, there are problems resulting from the monopolistic characteristics of the water market calling for economic regulation. Secondly, there are problems arising from public

[11] For more details, please refer to Part I General Introduction.

health and environmental externalities, and information asymmetry calling for social[12] and technical regulation. These issues are traditionally considered to be areas of state intervention.

Table 3 *Types of regulation in the UWS*

Types of Regulation	Source of problems	Aspects to be regulated
Economic	Monopolistic characteristics	- Structure of the sector - Market creation/ functioning - Sustainability of the system
Social	Externalities Information asymmetry	- Consumer protection - Public health and safety issues - Water resource protection
Technical		- System's integrity

In short, one can summarise the aspects that need to be regulated in the UWS as follows:

1. market creation and functioning (including competition rules and tariffs),
2. system sustainability (e.g., investments),
3. consumer protection (e.g., quality of the service),
4. water cycle (i.e., environmental requirements regarding the quality and scarcity of water resources), and
5. system's integrity (i.e., technical norms).

These aspects are related to well-defined regulatory functions, which are applied at different levels and, in some cases, by different entities (Luís-Manso and Finger, forthcoming).

[12] Social regulation comprises environmental protection (following, for example, Ogus, 2004).

Economic regulation refers to competition, market regulation and sustainability of the system. The rationale for *competition regulation* is grounded on the fact that the current process of liberalisation in the water sector is progressively leading to significant changes in the structure of the sector. In particular, it is leading in some cases to oligopolies and market concentration[13], which might jeopardize the advantages of liberalisation (especially those for the consumers). Thus, competition regulation:

1. defines merger and anti-trust regulations in order to avoid an excessive concentration in the market,

2. sets the rules for bidding contracts, and

3. defines benchmarking mechanisms capable of creating competitive pressures (where other types of competition cannot be implemented).

Market regulation concerns specific aspects of operating in the market. Firstly, it is about defining tariffs taking into consideration environmental, social, and economic concerns. This is in fact one of the main areas of regulatory intervention in the urban water sector. Secondly, there is the need to foster operating efficiency in both technical (e.g., reducing water leakages) and economic terms (e.g., reducing costs).

Finally, there is the need to regulate the *sustainability of the system*, i.e., to ensure asset service ability over time and the development of the infrastructures. This aspect has been somehow neglected in theory with classical[14] utility regulatory analyses favouring a short-, rather than a long-term perspective (Hirschhausen et al., 2004).

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[13] The utilities remain local monopolies, yet the same firms are operating more than one utility.

[14] Classical utility regulation pertains to the regulation of the natural monopoly. Non-classical utility regulation refers, for example, to access regulation.

Competition law is most appropriately defined and enforced at national or even at global levels, as competition and anti-trust bodies must be sufficiently strong in order to regulate trans-national corporations (TNCs). As for market and system's sustainability regulation, it is most appropriately defined and enforced at the national level (eventually by the sector regulator), yet taking into account the costs and revenues requirements of local utilities.

Social regulation pertains to consumer and environmental protection. Accessibility to the service, service quality, and price affordability are three important dimensions of *consumer protection*, which are no longer automatically guaranteed in the context of reform. Service quality regulation refers to defining levels of service that meet consumer needs and can be provided at a financially sustainable and affordable cost, and monitoring that such level of service is actually provided (Trémolet et al., 2004).

In the water sector, the quality aspect is particularly important, as it includes health and sanitation standards. But service quality in this sector also refers to issues such as the number of hours of service provision per day and the handling of customer complaints. Consumer protection regulation is most appropriately set and enforced at the national level (most likely by the sector regulator).

Environmental protection refers to the regulation of the scarce resource, namely in terms of extraction and discharge of water resources. It comprises both quantitative and qualitative requirements. It also includes the promotion of the efficient use of water. The most appropriate level for defining and enforcing this type of regulation is the river basin, which is an ecologically and not a politically defined entity.

Technical regulation aims at ensuring the integrity of the infrastructure systems. So-called "system's integrity" is about interoperability. Again, technical regulation is most appropriately defined and enforced at the national level.

The reforms in the UWS created new challenges for the regulation of the sector. We analyse in particular the consequences of the private sector participation and the introduction of competition.

2.2.1 Challenges created by the private sector participation

Since the 1980s, in many countries the form of "regulating" the sector via ownership has been replaced simultaneously by new forms of operations involving the *private* sector[15], as well as by new mechanisms of regulation. Pricing of the service (i.e., economic regulation) and service quality regulation (i.e., social regulation) become particularly important regulatory instruments in this context.

There are different *forms* of reform involving the private sector, namely complete privatisation (e.g., England and Wales), Build-Operate-Transfer (BOT) schemes (e.g., in many East Asian and Pacific countries), concessions and other delegated management contracts.

A small number of large *trans-national companies* account for the largest share in terms of private sector participation in the water sector, namely Suez, Veolia, and SAUR (from France). However, a recent trend has been gaining importance lately with the emergence of local private operators (e.g., GWI, 2006).

At first, private sector involvement was thought to be the sole solution for water problems. Then the *failure* of several experiences[16] questioned this axiom and led to different routes, where the private provision of a service of general interest is possible and even desirable, yet it calls for other types of intervention in the market. The important things are whether the service provider has the right incentives, and how accountable it is to the general public (Prasad, 2006). With the private involvement in the sector, the role of the public sector does

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[15] Though private sector participation is increasing, there are many cases where both private and public operators co-exist at national level (whilst preserving their local monopolies).

[16] Some of the most scrutinised cases are Buenos Aires (Argentina), Cochabamba (Bolivia), and Manila (Philippines).

not vanish with reform but takes different forms. Regulatory mechanisms such as quality regulation and pricing are amongst the most important.

Regulated private firms were typically subject to *rate-of-return* regulation (Guthrie, 2006). In this type of regulation, prices are set to ensure that the provider receives a specified rate-of-return. However, rate-of-return regulation is blamed for lacking incentives and presenting high information costs.

An alternative pricing method, which was firstly adopted in England and Wales at the time of the sector's privatisation, focuses on incentives and refers to *price-cap* regulation[17]. Independently of the type of regulation, the main difficulties in setting an efficient pricing policy are: (1) its conflicting objectives (namely cost recovery, economic efficiency, equity and affordability (Kessides, 2004)), and (2) cost information asymmetry.

Competition is a common approach to overcome information asymmetry. The creation of competitive pressures, such as franchise bidding and yardstick competition, is yet another important feature of the sector's reform. The following section focuses on these types of competition, on its limits when introduced into the sector, and its consequences in terms of regulatory intensity.

2.2.2 Limits to competition and intensity of regulation

Even though the introduction of competitive forces is an important element of the network industries' reform, water services are not highly contestable (due to high sunk costs, especially in transport and distribution). *Competition in the market*, and access regulatory

[17] For more details, please refer to Section 2.1.3 on the major instruments of economic regulation.

regimes for that matter[18], remain experimental and rare in the water sector (Wills-Johnson et al., 2003).

The most feasible forms of introducing competition in the UWS remain competitive procurement of specific functions (short-term service contracts), and franchise bidding (concession, lease and other management contracts). Yet different problems, such as the creation of joint ventures between the private companies that control the "global" water markets, also limit *competition for the market* (Prasad, 2006).

Yardstick competition is another way of introducing competitive pressures in the sector. In this case, the regulated firm competes with a "shadow" firm, whose performance levels correspond to:

- the industry's average (e.g., England & Wales where the regulator promotes competition by assessing, comparing and publishing information on each private operator's performance), or

- the best practice (e.g., Chile where the regulator sets prices in accordance to a model operator that efficiently provides WSS services under existing regulations).

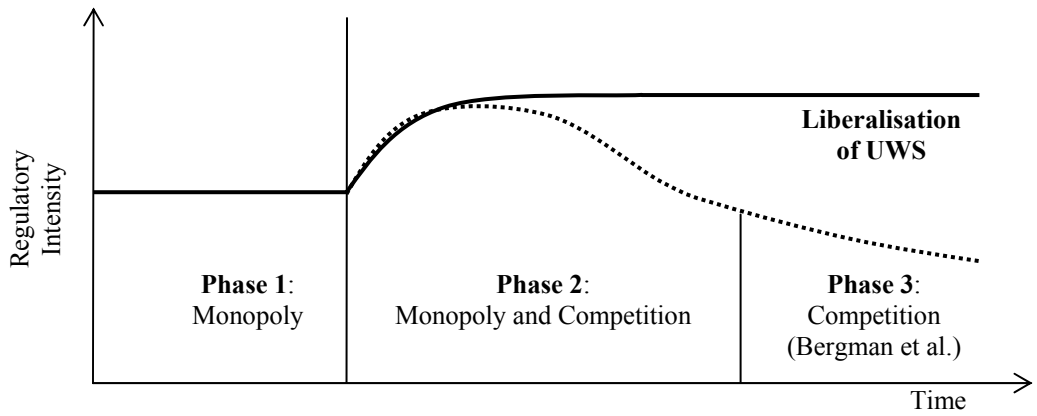
This form of regulation strongly encourages efficiency and mitigates the information asymmetry problem (informational rents are extracted via the comparison of cost). Its success depends on the degree of comparability across different systems, as well as on the existence of comparable firms under the jurisdiction of the regulator. In some cases, different companies operate in different parts of cities (e.g., Paris is divided in half, and Mexico City is divided into quadrants with separate companies responsible for the

[18] Access regulatory regimes are a necessary (yet not sufficient) condition for competition in sectors characterised by natural monopoly elements.

provision of water services), one of the reasons being the availability of data for benchmarking their performance against each other.

Due to the fact that there are important limits to introducing competition in the UWS, one cannot expect the sector to evolve into perfect competition. Therefore, the *need to intervene in the market will persist* in time (Figure 2), in order to provide a substitute for competition (in terms of efficiency incentives) and to meet the social welfare objectives (since water services are services of general interest).

This does not mean that the substance of the regulatory interventions does not change though. On the contrary, regulatory *interventions* are expected to change towards the creation of more incentives, and away from command-and-control types of regulation.



Source: Adapted from Bergman et al. (1998)

Figure 2 *Evolution of regulation over the liberalisation process in UWS*

In the next section, we present the two most common mechanisms of governance in the regulation of the sector, namely *regulation by contract* and by a *sector-specific regulatory agency*.

2.2.3 Mechanisms of governance

The most common mechanisms of governance in the economic and social regulation in the UWS are contract regulation and the creation of a sector-specific regulator.

Regulation by contract

Regulation by *contract* is a common regulatory system in several countries. Under this system, the majority of the rules and regulations are stated in the contract between the parties (i.e., the public authority and the firm). The supervising unit of the contract in the UWS is normally located at the local level. For this reason, its degree of autonomy and independence from policy-makers may be limited.

The *success* of this approach highly depends on the specification of performance parameters, procedures for renegotiation, and remedies for non-performance. The potential for contract incompleteness, which is high in the UWS due to long-asset lives and underground infrastructure, is an important issue that may intensify the risk of disputes and renegotiation. For this reason, the existence of a clear and functioning conflict resolution mechanism is essential for the sustainability of the reform and the efficacy of regulation (e.g., Biltrán and Arellano, 2005, Ménard and Clarke, 2002).

Regulation by contract is often *preferred* to the creation of regulatory agencies, because the costs and complexities of creating a new institution are avoided, as well as the potential overlap of functions with existing institutions (Trémolet et al., 2004).

Regulatory agency

One of the main trends in the evolution of urban water services, along with a shift towards market logic, is the creation of new regulatory regimes. In some cases, these new regulatory

systems include the establishment of *regulation authorities*, such as the cases in England, Portugal, Mozambique, Zambia, and Chile[19].

The creation of industry-specific agencies as opposed to contract regulation without a regulator aims at creating *stability* and continuity in regulatory decision-making (Haarmeyer and Mody, 1998a). The separation between regulation and policy-making, and a clear definition of the regulator's role and responsibilities, are critical for a good regulatory design (Eberhard, 2006).

The risk of the regulator's capture and its credibility are two other important factors influencing the *success* of such a regulatory framework. Regulators need to be made accountable for their decisions in order to reduce the information rents created by information asymmetry (Bergman et al., 1998). This is especially important in contexts with high risks of regulatory capture.

The scope for *capture* depends on several factors, such as the degree of flexibility (precision of rules *versus* regulatory discretion), the transparency of regulatory procedures and, as previously mentioned, the existence of adequate accountability.

Another important aspect is the *credibility* of the regulatory agency, which is essential particularly in sectors where investments are highly specific and durable, such as in the UWS.

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Regulation by contract and the creation of a regulatory agency are not incompatible and they often *co-exist*, corresponding to different levels of regulatory discretion. The adequate level of discretion depends on the local institutional context. Both forms of regulation may

[19] In the USA, there is already a long experience with regulating private utilities through regulatory agencies (named commissions).

also be supported by the outsourcing of regulatory functions, for example to external consultants or expert panels (Trémolet et al., 2004). An important common feature is that they both need to be subject to courts of law with effective appeal systems (Bakovic et al., 2003), and to (re)define their regulatory objectives for the system according to the challenges created by reforms.

2.2.4 Regulatory objectives[20]

In the new environment created by the sector reforms, there is the need for ensuring a number of *functions* that are quite heterogeneous and that were previously assumed, in the majority of the cases, by the public provider. Among these functions, maintaining the sustainability and integrity of the infrastructure, guaranteeing a "fair" attribution of the scarce resources among alternative users, as well as defining and enforcing public service objectives, all deserve special attention.

None of these functions could be eliminated by reforms. Therefore, new ways had to be found so that after reform (and ideally parallel to it), the sector would maintain its integrity and guarantee security for consumers. Such requirements meant that the sector had to be *(re-)regulated* in order to ensure the proper functioning of the new modes of organisation that intended to introduce market pressures for the benefit of both citizens and consumers.

The *specificities* of the urban water sector play a major role in the definition of the key regulatory objectives. Even after reform, forms of monopoly power continue to be dominant. The monopoly position of firms, whether they are public or private, requires forms of monitoring from public authorities (i.e., regulation). On the one hand, the fact that water services are vital for all human beings and have no substitutes, make them an almost perfect example of a service of general interest. On the other, the characteristics of

[20] Section 2.2.4 is based on a chapter published in (Luís-Manso et al., 2007b).

investments, namely the high rate of sunk costs, make the introduction of competition in the market highly improbable, and make *ex-post* regulatory interventions more necessary.

With respect to the problem explored in this thesis, we can categorise the UWS regulatory objectives into objectives aiming at protecting consumers and investments (Table 4).

Table 4 *Regulatory objectives in the UWS*

Objectives	
Protect consumers	- quality of the service - affordability - accessibility to the network - equity in conditions of access - efficiency in fixing problems - coherence of system with environment
Protect investments	- attraction of financial resources - secured access to financial market - guarantees regarding respect of property rights - protection against discretionary interference with management of operator - adequate incentives for long-term investments - coherence of investment plans - conformity with more general regulations - heavy (and credible) penalties when targets not met

One major difficulty in defining and monitoring these objectives, and one that has been a repeated source of conflict almost everywhere reforms were introduced, is the *tension* between the requirements associated to:

1. water (and sanitation) as a service of general interest, which requires that it be reliable, meeting quality standards, at an affordable price, and

2. the need to protect the system's sustainability and, in particular, long-term investments, which often translates in either sharp increase in prices, or

accepting the development of a substantial debt so that the burden is passed to future generations.

In order to mitigate this tension, the promotion of *efficiency* is crucial in that it aims at providing the service at the lowest possible cost, while maintaining properly the existing assets, and developing adequate capacity investments in order to meet future demand.

Finding ways to improve the efficiency of UWS is also essential in order to attract finance into the sector. This requires allowing investors to recover operational costs, and to earn a reasonable return on investments in the long run. This is not a trivial issue in the UWS, precisely because water (and sanitation) meets an essential need for which there is no substitute and because this very specific characteristic of water tends to feed ideologies that consider immoral or unsocial to pay high price for water (or to pay for water at all).

2.3. Conclusions

The literature on the regulation of the network industries has followed, and sometimes triggered, the sectors' reform processes. One can identify two different such processes:

1. privatisation and the need to intervene in order to ensure that there is no abuse of monopoly position, and

2. deregulation and reliance on competition policy.

In the urban water sector, *private* sector participation became an undeniable trend. Given that the private operators face little direct competition and have seldom used capital markets as source of finance, regulatory oversight remains the only mechanism to discipline their actions (Haarmeyer and Mody, 1998a).

As for the pressure to *deregulate*, in practice today this refers essentially to command-and-control types of intervention in the market. As a matter of fact, there has been a move towards different forms of intervention, with a special emphasis on

sector-specific and incentive regulation. There is actually a trend towards incentive regulation, which recognises the need to ensure that the pursuit of profit does not enter into conflict with social welfare.

At the same time, we are witnessing the rise in importance of *regulatory agencies* as significant actors of the regulatory system. By relying on regulatory agencies, the question that comes to mind is whether we are coming back to Public Interest Theories and to the belief that a well-intended agency can pursue public interest.

Our perception of reality in the majority of the network industries, and in water in particular, is that there are considerable differences today relative to the initial propositions of the Public Interest Theories. One important difference is related to the *independence* of these agencies both *vis-à-vis* political interferences and the industry. But probably the most important difference pertains to the *objectives* of regulation, especially the move away from the dichotomy between pursuing public or private interests.

Today, the main *regulatory objectives* in the UWS are the protection of consumers and the protection of investment. These are somehow contradictory objectives, which significantly increase the regulatory risk in the sector. The major challenge is thus to properly balance the interests and powers of both consumers and investors by improving efficiency and increasing incentives to invest in the network that corresponds to public policy objectives.

This chapter has shown that the regulatory objectives change along with the sectors' reforms. It now becomes essential to identify and analyse in detail the risks created by the UWS reforms. This is the focus of the next chapter.

Chapter 3. Reforms and Risks in the Urban Water Sector[21]

The urban water sector has undergone important *reforms* in many countries, triggered by the search for efficiencies, underinvestment, and new environmental challenges. Overall, these reforms are creating new sources of uncertainty and vulnerability for the management and regulation of water utilities. They result from the emergence of new actors in the sector, as well as from "unbundling" of operational and regulatory functions.

One of the main features of reform in the UWS is the transfer of rights and responsibilities that were traditionally integrated in the publicly-owned utilities to other actors in the broad water supply and sanitation system. The delegation of responsibilities to private (or public) operators and the outsourcing of specific tasks are two examples. This transfer of rights and responsibilities is called "*transaction*" and, according to Transaction Costs Economics, it can be characterised in terms of frequency, uncertainty, and specificity of investment required (Williamson, 1979).

Transactions differ according to the type of rights and responsibilities that are transferred:

- provision of specific tasks (service contracts),
- operation and maintenance of the system (lease),
- management and investment (concession), or
- ownership of property rights (divestiture).

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[21] Preliminary results of Chapter 3, with a special focus on specific investment, were published in LUIS-MANSO, P. and FINGER, M., "Risk sharing and capacity investment in the urban water sector in Europe" *in* ARAVOSSIS, K. et al. (Ed.) (2006), *Environmental Economics and Investment Assessment*, Southampton: WIT Press.

3.1. Types of risk in the Urban Water Sector

In this context, *risks*[22] are defined as any factor, event or influence that threatens the successful completion of a transaction in terms of time, cost or quality (adapted from EC, 2003). After identifying an exhaustive list of the different types of risks in the sector, as well as their causes, we differentiate them between those that are endogenous and exogenous to the transaction (Figure 3).

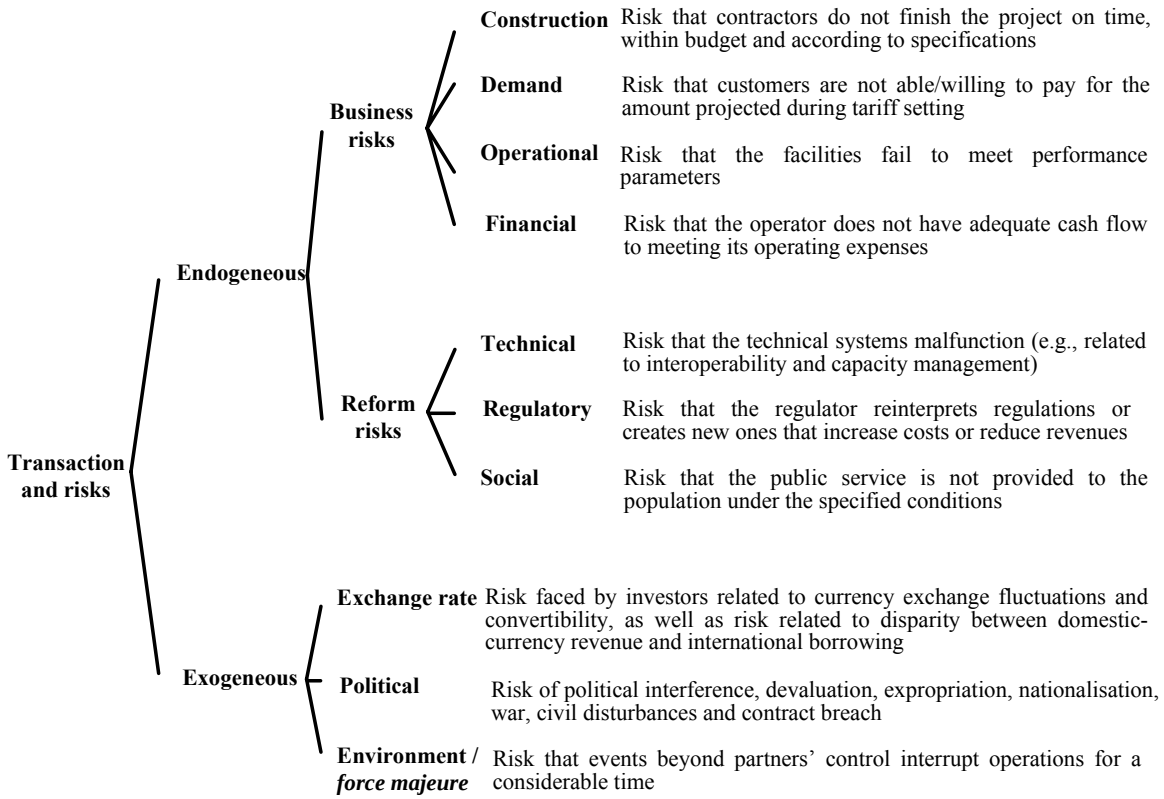

Figure 3 *Types of risk in the urban water sector*

[22] Risk management is an important element in framing the problem under study, even though it is not an objective of this dissertation to make a contribution to these theories.

3.1.1 Exogenous risks

Exogenous risks are those that are not subject to any manipulation by the parties during the transaction's duration. They pertain to the macroeconomic and political characteristics of the economy, as well as to major non-controllable events. They are:

- *Exchange rate risks* faced by investors pertain to currency exchange fluctuations and convertibility (Bakovic et al., 2003); to disparities between domestic-currency revenue and international borrowing; and to credit repayment;

- *Political risks* concern political interference, devaluation, expropriation, nationalisation, war, and civil disturbances; and

- *Force majeure risks* are related to events beyond the parties' control (e.g., natural disasters, riots, war) that lead to a prolonged interruption of operations.

3.1.2 Endogenous risks

In our perspective, **endogenous risks** are the most interesting to analyse because they are subject to manipulation by the transaction parties. Some of these risks are faced by any water sector operator in the execution of its functions and, as such, are named as business risks. These are:

- *Construction risks* if contractors do not finish the project on time, within budget and according to the contract specifications;

- *Demand risks* related to the ability and willingness to pay for the amount projected by the operator or the regulator while setting tariffs (Bakovic et al., 2003);

- *Operational risks* if facilities fail to meet performance parameters (e.g., due to process and production delays or limits on capacity); and

- *Financial risks* specifically related to the operator's capacity to raise an adequate cash flow to meet its operating expenses (e.g. depending on cost increases, and decline in demand).

Other (endogenous) risks are only relevant when (at least part of) the rights and responsibilities that had been traditionally integrated under a local publicly-owned utility are transferred to another actor in the broader water and sanitation system. These are the risks created by the sector's reforms[23], which pertain to technical, regulatory, and social hazards. We describe them as follows.

- *Technical risks* are created by the unbundling and fragmentation of the technical systems, which are normally required when introducing competition. Technical unbundling makes interoperability, interconnection, and capacity management more complex activities (see e.g., Newbery, 2001);

- *Regulatory risks* refer to a behaviour assumption of opportunism related to the reinterpretation of existing regulations by the regulator, or to the creation of new ones that increase costs or reduce revenues for the operator (Bakovic et al., 2003). When compared to other network industries, strong environmental and public health externalities related to the provision of water services reinforce the multiplicity of public policy objectives in the sector (Haarmeyer and Mody, 1998b) and, in the context of reform, exacerbate the need to regulate. Moreover, municipalities with little experience often become responsible for important regulatory functions (Haarmeyer and Mody, 1998b); and

- *Social risks* refer to the possibility that the service provider: (1) raises tariffs to socially unacceptable levels since users are captive, and (2) carries out a selective expansion of activities to the most profitable segments (i.e., cream-skimming), endangering the

[23] Some of these risks already existed, yet they become significant in the context of reforms.

financing of non-profitable segments. In a context of reform, the provision and financing of services of general interest (SGI) are no longer guaranteed by public ownership and management. Moreover, with the end of cross-subsidisation, price equity is no longer guaranteed. The revenue from a customer has to cover the costs associated with his supply, independently from equity considerations.

The sector's reform is indeed source to many risks, creating additional obstacles to managing and regulating the water systems. It is interesting to note that the risks created by the reform are also exacerbated by the specificities of the urban water sector. We now turn to a more detailed analysis of the reform risks by identifying the main elements at risk in the new context.

3.2. Elements at risk because of the reform of the sector

From the analysis of the risks created by the sector's reform, one can identify four main elements at risk, namely system's integrity, security of supply, equity of access, and affordability of prices (Table 5).

Table 5 *Categories and elements at risk because of reform*

Category of risk	**Elements at risk**	
Technical Regulatory Social	System's Integrity Security of Supply	*Specific Investment*
	Equity of access Affordability of prices	*Universal provision of SGI*

Integrity of a water system is its ability to handle external and internal stresses in order for the physical elements of the system to work properly. It is therefore essential for the overall quality of the service provided. It requires a regular assessment of the infrastructure's state

as well as frequent decision-making about maintenance, replacement, and renewal of the network's unreliable elements.

The separation of ownership and management responsibilities as well as the delegation of responsibilities to third-parties during a limited period of time may render it difficult to assess the state of the network and may jeopardize the necessary long-term perspective on the requirements of the system.

Security of supply is the water systems' capacity to avoid service disruptions below a certain tolerable level (adapted from Bazillian et al., 2006). Security of supply pertains to both issues of quantity, quality and price. It concerns:

- long-term physical integrity of the system,
- availability and vulnerability of sources of water resources, and
- institutional capacity of the sector to respond to challenges posed by a complex system of provision of a SGI.

Some features of the reform, such as the delegation of management for a certain period, make it difficult to define and implement a long-term strategy for the sector.

Equity of access is about the possibility every citizen benefits from water services provision. There are two important components of equity of access: one of them being the availability of infrastructure with adequate capacity and, the other being pricing (access price and consumption price).

Equity of access is therefore highly related to *affordability of price*, which refers to the ability customers have to purchase the service. A more competitive environment and/or increased private sector participation may lead to a selective expansion of activities to the most profitable segments (putting an equitable access to the service at risk), or to unaffordable tariff levels.

***

All these four elements are interrelated (Figure 4). To start with, non-affordability of prices makes capital cost-recovery very difficult and, therefore, jeopardises capital investments. As a consequence, the system's integrity and security of supply are at risk. The same applies for equity of access – it could be at risk if there is no security of supply or if the system's integrity is not guaranteed.

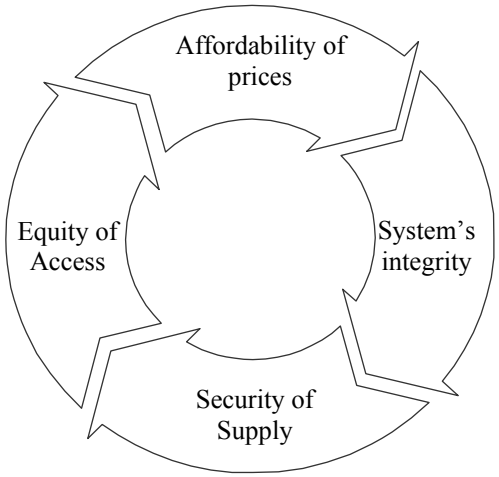

Figure 4 *Elements at risk in a reform context*

The vulnerability of these four elements at risk is particularly important in the urban water sector. It results from the combination of several factors, namely:

1. existence of natural monopolies in certain segments of the sector,
2. low price elasticity of demand (for primary uses of water), and
3. important externalities related to the provision of water services.

We can confirm that the main concerns posed by the sector's reform (refer to Part I), which are the sustainability of capital investments and universal provision of a SGI, are indeed important components of the identified elements at risk, and are themselves at risk in the new environment.

3.2.1 Sustainability of Capital Investments

The total costs of running a water system encompass operating costs and capital costs. In this context, *capital investment* is meant to cover capital costs, which are related to base service levels, new quality expenditures, service improvements, and balance of supply and demand.

The execution and efficacy of capital investments is thus essential for the overall quality and integrity of the system. The output quality of such investments can be measured by *indicators* such as the performance of the system, percentage of leakages, asset conditions, and safety conditions.

In the UWS, capital investments are also named *specific investments* because the water supply and sanitation infrastructures and equipment closely correspond to Williamson's definition of asset specificity. A treatment plant or an underground water network cannot be redeployed into a different activity.

Some features of the reform have put the *sustainability* of capital investment at risk. Prior to reform, the public monopolist was the sole responsible for these investments throughout the integrated value-chain and for the entire duration of the assets' life. Disintegrating the network services may lead to a possible loss of economies of scope, that is a loss of the advantages of co-ordinating the network's operation and expansion with the services provided over it (Newbery, 1999).

Structural and functional unbundling, delegation of management for limited periods, and private sector participation are some features of reform influencing incentives to invest. *Incentives* to invest in the new environment also depend on the purpose of investment (either new or renewal) and on its main characteristics.

The main *characteristics* of investments are:

- *predictability* (i.e., the ease with which the need for that type of investment can be forecast) (according to Alexander and Harris, 2005),
- *controllability* (i.e., the extent to which the utility can control expenditure on this investment, both in terms of volume and unit cost) (Alexander and Harris, 2005),
- *specificity* (i.e., the extent to which the invested asset can be redeployed into its next best application. Specificity may occur in physical assets, human assets, or be site-created), and
- *flexibility* (i.e., the degree at which the initial investment can be changed both in terms of quantity, timing and type of investment (according to Guthrie, 2006)).

The more unpredictable, uncontrollable, specific and inflexible the investment is, the higher the risk.

3.2.2 Universal provision of the Service of General Interest

Urban water services are of particular importance in society and are considered to be essential to the general public and the economy. Due to their specificities, water services may not be economically viable and are services which the market would not provide to the desirable extent under normal circumstances. Therefore, a more competitive environment and/or increased private sector participation may put the universal provision of the *service of general interest* at risk (e.g., by a selective expansion of activities to the most profitable segments or by raising tariffs to socially unacceptable levels).

For this reason, public authorities may impose public service *obligations* (PSO) on water providers to ensure that such services are provided under the conditions specified by public policies. PSO was historically provided and financed by a monopolistic public operator

without any competitive pressures. In a reform environment, authorities face the problem of organising the provision and financing of PSO.

The definition of PSO differs from case to case. For example in the European Union, there are great disparities in the formulation of public service obligations, ranging from the quality of the service supplied (e.g., in terms of continuity, reliability and pressure), to access to all citizens at every point of the national territory, to affordability of prices. One can nonetheless say that in general, PSO mainly refers to access and price conditions.

3.3. Risk allocation per institutional arrangement

After identifying what is at risk in the urban water sector, with a special emphasis on those created by the reforms, it is important to analyse how risks are shared between the parties. Risk allocation differs according to the *institutional arrangements* (Chong et al., 2006, Christiansen, 2006). The most common management arrangements[24] in the sector are:

- Direct Public (*DiPu*),
- Delegated Public (*DePu*),
- Delegated Private (*DePri*), and
- Direct Private, with Independent Regulation (*DiPri*).

Two additional categories are considered under delegated private management, namely delegation by Leasing (DM_{lea}) or by Concession (DM_{con}). The main difference between these two categories is that under concession the responsibility for investing in the infrastructure is transferred to the operator, while under leasing the responsibility remains with the public authority.

[24] The most common institutional arrangements in the sector are identified in the Part I General Introduction.

Table 6 presents the allocation of risks between the responsible and management entities, namely the public authority (PA) and the operator, which can be public (O_{pub}) or private (O_{pri}) for the identified institutional arrangements. The allocation of risks presented in the table results from the definition of each institutional arrangement.

***Table 6** Risk allocation per institutional arrangement*

Categories of risk		**Risk allocation**				
		DiPu	*DePu*	*DePri*		*DiPri*
				DM_{lea}	DM_{con}	
Endogenous	*Construction*	O_{pub}	PA	PA	O	O_{pri}
	Demand	O_{pub}	PA or O_{pub}[25]	O	O	O_{pri}
	Operational	O_{pub}	O_{pub}	O	O	O_{pri}
	Financial	O_{pub}	PA or O_{pub}[20]	O	O	O_{pri}
	Technical	O_{pub}	PA or O_{pub}[20]	PA	O	O_{pri}
	Regulatory	O_{pub}	O_{pub}	O	O	O_{pri}
	Social	O_{pub}	PA or O_{pub}[20]	O	O	O_{pri}
Exogenous	*Exchange rate*	-	-	-	O	O_{pri}
	Political	O_{pub}	O_{pub}	O	O	O_{pri}
	Force majeure	O_{pub}	O_{pub}	all	all	All

Legend:

DiPu	Direct Public Management	O	Operator
DePu	Delegated Public Management	O_{pub}	Public Operator
DM_{lea}	Delegated Management by Leasing	O_{pri}	Private Operator
DM_{con}	Delegated Management by Concession	PA	Public Authority
DiPri	Direct Private Management		

[25] It depends on the degree of autonomy of the management entity *vis-à-vis* the political authority.

Under *direct* management arrangements, all the risks are taken by the operator (being it public or private). Under *delegated* management arrangements, all depends on the type (and degree) of rights and responsibilities that are transferred.

Focusing on the risks created by the sector's reform (in colour in the table), the allocation of *technical risks* depends on who the responsible entity for the provision of the service is. Under concessions and direct private management, technical risks are transferred from the public authority to the operator.

As for *regulatory risks*, the allocation of these risks is by definition borne by the operator. This is, however, in contradiction with recommendations from risk-management theories, according to which the party that has more control over a given risk factor should bear this risk. Therefore, the public sector would be expected to carry risk classified as political and regulatory (Christiansen, 2006).

Social risks are ultimately borne by the consumers if they do not have access to the service (or according to the defined quality standards). According to some authors (e.g., Kessides, 2004), the State (that is, taxpayers) should bear this social commitment. In practice, regulation has an important impact on the social risk allocation, namely those concerning the financing of a minimum level of service. Thus, social risks can be (at least partly) transferred to the operator or even to certain categories of consumers. At this stage it is considered that social risks are borne by the responsible entity for service provision.

From the risks created by the reform of the sector, both the allocation of technical and social risks differs significantly across institutional arrangements. This is particularly important in the scope of this research since we focus on specific investment (related to technical risks) and the provision of the service of general interest (related to social risks).

3.4. Conclusion

There are several categories of risk at stake in the network industries, and in the water sector in particular. The sector reform creates new risks, or at least augments their probability and severity. In this context, *reform risks* are defined as any factor, event or influence resulting from the sector's reform that threatens the successful implementation of a transaction in terms of system's integrity, security of supply, equity of access, and affordability of prices. Within the scope of this thesis, we focus on capital investments (as a fundamental component of security of supply and system's integrity) and on universal service provision (comprising both equity of access and affordability of prices).

Individuals, businesses, and governments are willing to accept a certain risk in return for the perceived benefits from reform. This *acceptance* level depends on the information given on the hazard created by reform, as well as on the characteristics of the transaction(s). In the context of this thesis, the ultimate goal of risk management is to properly identify and clearly (re)allocate reform risks to the parties that are in the best position to mitigate them at the lowest costs.

However, one cannot reduce reform risks in its entirety because the reform process inherently has its benefits and costs. In terms of *benefits*, the process is expected to improve efficiency, increase capital productivity, decrease the prices to customers, as well as increase the investment in new technologies. In terms of *costs*, they pertain to the above identified risks. In order to mitigate these risks, it is essential to check whether new hazards and transaction costs created by the reform undermine capital investment and universal service provision. It is therefore essential to identify and analyse the vulnerability factors of these two elements at risk because of reform, as presented in the next chapter.

Chapter 4. Elements at risk because of reform: a vulnerability analysis

The reform of the Urban Water Sector (UWS) creates *new risks* pertaining to the sustainability of capital investments and the universality of service provision. Both these elements at risk because of reform are very important. On the one hand, capital investments are essential for the sustainability of the system and the quality of the service. On the other, the provision of urban water services is very important for society, and it is considered to be essential to the general public and the economy.

In this chapter, we draw together the issues that influence the *vulnerability* of these two elements at risk. Their identification and analysis provide essential information in terms of risk management. We also make a comparison across different institutional arrangements, in order to assess whether the hazards created by the reform affect positive or negatively these vulnerability factors.

The relevant unit of analysis is the *transaction*, i.e. the transfer of management, investment, or property rights. Contractual relationships between the parties in the system (e.g., the responsible entity and the service provider) become particularly important because they govern transactions. Moreover, contracts:

1. provide the specification of the service to be provided,
2. define the compensation mechanisms for the service provider, and
3. determine how risk is allocated between the parties.

In this way, the literature on Contract Theories, more precisely Transaction-Costs and Incomplete-Contract Theories, is used as a tool to design the framework for carrying out the vulnerability analyses.

4.1. Literature review on Contract Theories

The literature on *Contract Theories* is used as a tool to design the framework for identifying the main vulnerability factors of capital investment and universal provision of a service of general interest (SGI). We analyse two central schools of thought in the field of Contract theories[26], namely Transaction-Costs and Incomplete-Contract Theories.

These theories are based on different underlying assumptions and, therefore, focus on different dimensions of the contracts. For this reason, they can be viewed as complementary (Brousseau and Glachant, 2002). This section surveys the literature on Transaction-Costs Theory (section 4.1.1) and Incomplete-Contracts Theory (section 4.1.2), focusing on the results on asset specificity, non-contractibility, and renegotiation.

4.1.1 Transaction-Costs Theory

Transaction-Costs Theory (TCT) is a branch of New Institutional Economics[27]. The central focus of TCT is the assessment of alternative modes of organisation (and the associated types of contracts) efficiency. This assessment is based on the comparative efficiency with which alternative generic forms of governance structure – namely Markets, Hybrids and Hierarchies – economise on transaction costs (Williamson, 1996). The criterion for choosing the governance structure thus becomes the *minimisation of transaction costs*. This

[26] Incentive theory is another important branch in the field of Contract Theories. However, due to its unrealistic assumptions (i.e., perfect rationality, complete information, and reliance on perfect external institutions), we do not focus on this theory to build our framework.

[27] New Institutional Economics has two main bodies of literature. One focuses on the institutional environment (e.g., North). The other one focuses on the contractual relationship and on the different modes of governance (e.g., Williamson). Transaction-Costs Theory belongs to the latter one.

is relevant for this thesis because the reform of the sector refers to the implementation of alternative modes of organisation.

TCT has its origins in the "make-or-buy" decision (Coase, 1937), yet it has been increasingly applied in many other contexts where contracts are present. In TCT, the basic unit of analysis is the *transaction* as organised through an implicit or explicit contract.

Coase presented transaction-costs as referring to writing, executing, and enforcing contracts. Williamson (1973) expanded this definition to include new behavioural dimensions, namely opportunism (due to information asymmetry) and bounded rationality.

There are two types of *informational hazards*: asymmetry and uncertainty of information. Asymmetry of information occurs when one party to a transaction has more or better information than the other party. It creates two different informational hazards:

- adverse selection, which refers to a situation where contractual parties have asymmetrical information about their risk profiles, and

- moral-hazard, which refers to the risk that a party to a transaction has not entered into the contract in good faith, has provided misleading information about its assets, liabilities or credit capacity, or has an incentive to take unusual risks in a desperate attempt to earn a profit before the contract settles. It is not about the selection of the partner but about its overall performance.

Table 7 follows Williamson's broader definition and correlates the most significant informational hazards with different types of transaction-costs before (*ex-ante*) and after (*ex-post*) the contractual relationship is established.

Table 7 *Informational hazards and related transaction-costs*

Informational Hazards	**Related transaction-costs**	
	Ex-ante	*Ex-post*
Asymmetry of information		
- *adverse selection*	Signalling/screening	
- *moral-hazard*	Specification	Monitoring/audit Incentive/penalty schemes
Uncertainty of information		
- *contract incompleteness*	Design/Specification Negotiation	Renegotiation Dispute resolution

Transactions (Williamson, 1979) can be defined on the basis of their:

- frequency (F),
- uncertainty (U), and
- level of asset specificity (AS) involved (i.e., transaction-specific investment).

These characteristics have an influence on transaction-costs and, therefore, on the efficiency of the governance structures. The three attributes determine the following relationship (signs show the predicted impact of a positive variation of each characteristic on transaction-costs) (Ménard, 2005):

$$TC = f(F_{-}, U_{+}, AS_{+})$$

In the context of this thesis, we are particularly interested in analysing the results pertaining to asset specificity and uncertainty. Transactions that require a high level of specific investment create bilateral dependency. This, in turn, increases transaction hazards, as well as the potential for substantial increase in transaction-costs, a risk that needs to be dealt with. As a matter of fact, **important contractual problems arise in specific investment.**

Williamson (1985) emphasised the importance of transaction-specific investment and the consequent threat of hold-up, i.e., appropriation of economic rent. In a context of uncertainty, where contracts cannot be specified in a perfect and costless manner, opportunistic behaviour explains the threat of hold-up. The more specific the assets are, the higher the risk of hold-up[28] is, and the higher the potential costs. This is even more the case in a market with few available competitors (Hubbard, 2001), as it is often the case in delegated management tenders in the UWS. **Partners thus fear opportunistic behaviour in the presence of specific investment.**

There are different ways to mitigate this problem. Gilbert and Newbery (1994) observed that a repeated relationship between the parties, and in some ways long-term contracts[29], limits incentives for opportunistic behaviour. It is necessary that the parties can credibly commit to not deviating from their stated policies and behaviour. This approach relies on informal mechanisms such as trust and cooperation to resolve any dispute that may arise.

There are also more formal mechanisms related to up-front investments to write more complete contracts. One limitation is that hold-up is difficult to verify empirically, because all that is observed is the outcome of the behaviour and not the intent to appropriate rents (Jensen, 2004). As a consequence, contracts to prevent the hold-up problem may be unenforceable.

Another important insight from TCT, which as said cannot be separated from the hold-up issue, relates to the duration of the contracts. **The choice of contract duration is very important in the sense that it represents the balance between periodic contestability and adequate investment in specific assets.** Theory suggests that the greater the degree of

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[28] However, it is interesting to note that switching costs may cause a hold-up even if asset specificity is low.

[29] Long-term contracts have many properties that are attributable to a repeated relationship, such as compensation based on past performance.

specificity, the longer the required term of contract will be. Several empirical studies support the hypothesis that in the presence of relationship-specific investments, firms are more likely to use long-term contracts and vertical integration (Shelanski and Klein, 1995).

It is also important to make reference to the advantage enjoyed by the incumbent over its competitors due to imperfect transferability of (physical and human) capital, and imperfect measurability of the investment residual value (Williamson, 1976). Laffont and Tirole (1993) developed a model based on these assumptions. They argue that the threat of replacement lowers the incentives to invest, because the incumbent would not be able to transfer assets at a correct price. Their suggestion to overcome this problem is for the regulator to favour the incumbent at re-procurement. This could, for example, take the form of an extension of the contract, provided its performance is satisfactory.

Surprisingly, Affuso and Newbery's (2002) study about the British privatised rail industry suggests that neither horizontal consolidation nor longer franchise contracts promote discretionary investment. In fact, these authors argue that discretionary investment is stimulated by shorter rather than longer term contracts. The periodic competition for new contracts creates stronger incentives to investment, in an effort to create a positive image for the regulator and to build a first mover advantage *vis-à-vis* potential entrants[30]. It is important to mention that they analyse "spontaneous" investment, i.e., not deriving from contractual obligations.

[30] Different results in terms of the impact of exogenously determined modes of organization on investment decisions in the British rail sector are presented in (Yvrande-Billon and Ménard, 2005).

From this body of evidence, one can infer that the most important *contractual hazards* arising in asset specificity and uncertainty are:

- *threat of opportunistic behaviour* (mitigated by repeated relationships), and
- *threat of replacement* (related to the degree of contestability, i.e., to issues such as contract duration, asset transferability, and first-mover advantage).

The following section focuses on Incomplete-Contract Theory, specifically its results on non-verifiability and allocation of residual control rights.

4.1.2 Incomplete Contract Theory

Since the late 1980s, a new body of literature named *Incomplete Contract Theory* (ICT) extends some of the insights from TCT. Williamson (1976, 1985) and Goldberg (1976) had already considered limitations from incomplete contracts as a result of individual bounded rationality. They stress the fact that it is unlikely to anticipate every contingency at the time of contract design, especially in a highly uncertain context or in the presence of long contract duration. They also highlight the fact that frequent and competitive re-bidding of a concession is not realistic, especially if the contract anticipated substantial investments.

The *assumptions* of Incomplete Contract Theory differ from those of Transaction-Costs Theory in the sense that agents are rational and have symmetric information (Brousseau and Glachant, 2002).

ICT's main *concern* lies on considering limitations of contracts that fail to specify all possible contingencies. Incompleteness may be due to unforeseen contingencies, excessive costs of specification of a large number of contingencies, and inability of a third-party (e.g., courts) to "verify", *ex-post*, the real value of the variables central to the transactions (Hart and Moore, 1988).

Within the scope of this thesis, the most interesting *results* from the Incomplete Contracts Theory pertain to the consequences of (1) non-verifiability, and (2) the allocation of asset

ownership and formal control rights, namely in terms of residual control rights. As a matter of fact, these two features have a fundamental role in the management of risks in the sector.

An important application of ICT pertains to the **particularities of contracting a service**. Quality of the service can be difficult to measure and, thus, be non-verifiable (and, therefore, non-contractible). Uncertainty about demand is another particularity of contracting a service. For example, maintenance contracts in the sector may define that the service provider has to maintain the network and fix all faults during a certain period of time. The exact number of maintenance activities depends on uncertain factors, such as the weather conditions, or the state of the water pipes.

These two factors together create important contractual hazards. They are especially important for the provision of services of public interest (e.g., services that can cause serious environmental and public health externalities), where in general the service provider must agree to meet any level of demand (Jensen, 2004), and the authority must be able to prevent quality shading effects (which might be difficult if some features of the service are non-verifiable).

Another important result from ICT relates to **contract incompleteness and renegotiation**. Since complete contracts cannot be written, contractual parties cannot prevent themselves from renegotiating the terms if it is mutually beneficial to do so (Hart and Moore, 1988).

Even though renegotiation may improve efficiency *ex-post*, it also reduces *ex-ante* efficiency incentives (if only one party has to invest *ex-ante*, and the control rights are shared between both parties). If one party's incentive to make a relationship-specific investment is more important than that by the other party, it should own the asset (i.e., have the control rights over the *ex-post* decisions that are non-contractible *ex-ante*). It can also happen that one party hides (or slows down the revelation of) information about anticipated efficiency gains in order to benefit more from renegotiation (e.g., Laffont and Tirole, 1993). From these, one can infer that the party whose investment incentive is relatively more important should hold the control rights.

Thus far, we have focused on contractual hazards, particularly on literature related to asset specificity, opportunistic behaviour, and contract incompleteness. In the following section, we present two main types of contracts and analyse their most important trade-offs in terms of incentives to perform and risk-sharing.

4.2. Contract design

In the previous section, Contract Theories were used to identify the main contractual hazards arising in the event of information asymmetry, uncertainty, and non-verifiability of information. The types and potential impact of contractual hazards depend on the specificities of the sector, the characteristics of the transaction, and the characteristics of the environment in which the transaction takes place. *Contract design* (i.e., the type of contract) is a major factor in managing the risks created by these hazards, because it defines different risk-allocation patterns.

Designing contracts means to balance the trade-off between *incentives and risks*. The operator's incentives depend on how residual claimants are shared. When there is no residual claimant, there is less incentive to reduce the costs or to improve quality. Increasing the operator's residual claimant means to make its gains dependent on performance, which consequently, corresponds to increasing its risks. As a consequence, the risk premium demanded by the operator to ensure its participation is also higher.

Different *types* of contract correspond to different risk-incentive trade-offs. There are two main types of contracts: fixed-price and cost-plus-fixed-fee contracts[31]. In practice, there are several intermediate cases, where the responsible entity agrees to pay only a fraction of all the costs to the operator. Thus, the operator is guaranteed a certain level of payment but it also bears some uncertainty. We concentrate the analysis on the two extreme cases.

[31] In this section, for simplicity reasons, we consider that the contract is signed between the responsible entity for service provision and the operator.

4.2.1 Fixed-price contract

In the **fixed-price contract**, price is defined *ex-ante*. The operator bears the risk of cost uncertainty (there are no reimbursements of cost overruns), charging the responsible entity a premium for bearing this risk. This type of contract presents high-powered incentives for productive efficiency. As a matter of fact, the operator captures the difference between the pre-defined (or bid) price and the cost incurred; thus the operator is rewarded for any cost-reducing effort it makes (Laffont and Tirole, 1993).

The opposite occurs in terms of incentives concerning quality; that is, the operator can increase profit by reducing quality (i.e., quality shading effects), especially where quality characteristics are not contractible and where the operator has to allocate efforts between different tasks (Hart et al., 1997, and Holmstrom and Milgrom, 1991).

Finally, renegotiation costs may be high because the operator will seek to be reimbursed for any contract variation. Therefore, the responsible entity has high incentives to invest in specifying the contract *ex-ante* in order to avoid renegotiations (Bajari and Tadelis, 2001).

4.2.2 Cost-plus contract

In the **cost-plus-fixed-fee contract**, the responsible entity covers the operator's actual costs and pays an additional fixed fee. The responsible entity bears the risk of cost uncertainty. For this reason, low costs of renegotiation are expected (the responsible entity reimburses all costs).

This type of contract presents low-powered incentives for productive efficiency (the responsible entity fully ensures the operator against cost uncertainty). It is thus susceptible to moral-hazard problems. However, cost-plus contracts are free from quality-shading effects. In fact, the opposite may occur, i.e. "gold-plating" (where the operator produces the highest quality possible because it is reimbursed for all the efforts). For this reason, these contracts are often used for cases where quality is important; or when services are difficult

to define and there is a high probability of costly contract renegotiation (Bajari and Tadelis, 2001).

4.2.3 Comparison

In Table 8, we summarise the main features of these two types of contract, namely in terms of incentives and risk-sharing regimes.

***Table 8** Main features from fixed-price and cost-plus contracts*

	Types of contracts	
	Fixed-price	*Cost-plus-fixed-fee*
Main characteristic	Price defined *ex-ante*	Operator's actual costs covered
Incentive for productive efficiency	High-powered	Low-powered
Incentive for quality	Low-powered	High-powered
Risk sharing in terms of cost uncertainty	Operator bears the risk	Responsible entity bears the risk
Potential problems	Moral Hazard (quality-shading) High renegotiation costs	Moral-hazard (productive efficiency) Gold-platting

However, as can be seen from the summarising table, there are other trade-offs beside the incentive-risk one to consider when choosing the type of contracts. On the one hand, the public authority should also consider the trade-off between *moral-hazard and risk* effects.

In *highly uncertain environments*, the risk-premium demanded by the operator to bear the cost-related risk is high and, in some cases, may outweigh the potential additional costs created by moral-hazard associated with insuring the operator. In these cases, cost-plus is more efficient than fixed-fee contracts.

On the other hand, the trade-off *between incentives and transaction costs* should also be considered (e.g., Bajari and Tadelis, 2001). The more complete the contract is (i.e. the

specification of the service to be provided), the less likely costly *ex-post* renegotiations are needed. However, more specifications impose higher *ex-ante* costs on the responsible entity. Highly complex tasks are difficult to specify, and have a high probability of requiring contract renegotiation. Cost-plus contracts are, therefore, more efficient in these cases. A fixed-price contract is not adequate when the service provided is complex because the benefits created by high-powered performance incentives could be dissipated by costly renegotiations.

In conclusion, contract design defines different risk sharing patterns corresponding to different levels of incentive creation, potential for moral-hazard, and degrees of transaction costs. In this way, **contract design influences the outcome of the transaction**.

Based on the identification of the main contractual hazards, and how these are related to risk-sharing in different types of contracts, we present in the following section a vulnerability analysis of the main elements at risk because of reform.

4.3. Vulnerability analysis of the main elements at risk

The previous two sections introduced the framework that provides the background to the vulnerability analysis of the main elements at risk because of reform, namely capital investment and universal provision of the SGI in the urban water sector. The vulnerability factors are indeed highly related to the identified contractual hazards, and their impact in certain institutional arrangements cannot be analysed independently from contract design. The identification of the main vulnerability factors, as well as the analysis of their impact in each institutional arrangement is made separately for each element at risk.

4.3.1 Capital investments

Capital investments in the urban water sector are highly specific (i.e., a high proportion of the costs is sunk), capital-intensive, and correspond to long-lived assets. We use the term specific investment because the water supply and sanitation infrastructures correspond to

the Williamson's definition of asset specificity, which is the relative lack of transferability of assets intended for use in a given transaction, to other uses.

The combination of **asset specificity and long durability** is one of the most important vulnerability factors of capital investment in the UWS. The long-term durability of assets increases the vulnerability created by asset specificity. Moreover, it also increases specification costs, consequently augmenting transaction costs related to contract design and enforcement.

One major implication of asset specificity and long durability is the **threat of opportunistic behaviour** (in a context of asymmetry of information) both by the operator and the public authorities.

Long amortisation periods enable the water company to maintain low tariff levels and to operate for years without recovering its fixed costs (Noll et al., 2000). In a context where the management is delegated (to a party whose private goals will differ from the public ones) for a limited period of time, long amortisation periods may trigger opportunistic behaviour by the *operator*. It may under-invest in the infrastructure for a long time before the consequences are visible. This is exacerbated if the delegated contract duration is shorter than the life of the asset. The limit is the moment when the operator begins to under-invest in maintenance and expansion of the network (Shirley et al., 2000).

In the case of opportunistic behaviour by the *public authority*, long-lived assets expose investors to the risk of hold-up. That is, authorities may be tempted to change the rules of the game during the executing of the contract (e.g., in response to popular pressures), knowing that (private) investors cannot withdraw easily from specific investments, which are characterised by capital intensity, durability, and sunk costs (e.g., Gómez-Ibáñez, 2003). Such attitude by the public authorities makes future negotiations to renew the investment highly unlikely.

Guthrie (2006) suggests that only the possibility of opportunism (e.g., unanticipated costs disallowances) affects investment decisions, even when this possibility is not realised. The

threat of opportunistic behaviour by the public authorities may also have positive effects. Firms that anticipate the possibility of cost disallowances will show greater caution when selecting projects (i.e., firms will only choose projects deemed as "used-and-useful").

High asset specificity and long-term durability also influence the third factor of vulnerability of capital investment, which pertains to **financial constraints.** These are, in fact, one of the main factors of change triggering the sector's reform. Financial scarcity may have different *sources*, such as the high fragmentation of the sector's structure, the constraints of public finance, and the underdevelopment of capital markets.

Firstly, the *fragmented* structure of the sector is explained by the local character of water natural monopolies, meaning that there are many small size management entities (in contrast to other network industries where there is one national incumbent).

Secondly, we consider the crisis in *public financing*. In the EU, public finance decisions (taxes and spending) are now closely linked with the Maastricht criteria. Together with increasingly stringent environmental standards, these are pressing the traditional way of financing the UWS through the public budget.

And thirdly, the underdevelopment of *capital markets* (Haarmeyer and Mody, 1998b) is also an important source of vulnerability, especially in developing countries. In many countries, capital markets are not adequately developed to source long-term domestic funds, and thus whatever debt can be raised is usually in foreign exchange and carries significant exchange rate risks (Baietti and Raymond, 2005).

Finally, another important factor of investment vulnerability is the **uncertainty related to the real conditions of the network** due to underground assets. The high degree of uncertainty about the network renders the valuation of assets more difficult (Haarmeyer and Mody, 1998b). This has two consequences: on the one hand, it is harder to elaborate investment plans; on the other, asymmetry and incompleteness of information lead to imperfect asset measurability and transferability at the end of the contract.

Uncertainty over the real conditions of the network is particularly important because it:

- increases the writing, renegotiation, and (re-)tendering costs,
- reduces incentives to invest, and
- gives the incumbent a first-mover advantage *vis-à-vis* potential new entrants.

The identified factors of investment vulnerability are affected by the features of reform. Asset specificity and durability, as well as uncertainty over the real conditions of the network, do actually increase the vulnerability of investment in a context of reform. As for the fragmentation of the sector's structure and the constraints of local funding, they may be mitigated by particular reform features, such as regionalisation and the mobilisation of (private) capital into the sector. Finally, the threat of hold-up is only significant when the responsibility for investing in the infrastructure is transferred to an operator.

We now make a vulnerability analysis across institutional arrangements in order to assess whether the different features of reform affect positive or negatively the vulnerability factors.

Comparison across different institutional arrangements

An essential objective in risk management is to identify and clearly allocate the risks to the parties that are in the best position to mitigate them. In the current section, we compare the factors affecting the vulnerability of capital investment, and identify how these risks are shared between the actors in each institutional arrangement.

In Table 9, the positive and negative signs correspond to the influence of each factor on the vulnerability of investment. Factors intensify (+) or not (-) the investment's vulnerability. The identification of the risk-bearer, i.e., the responsible actors for investment, results from the institutional arrangements' definition, and not from the vulnerability factors.

Table 9 *Vulnerability factors of capital investments*

Factors of vulnerability	Institutional Arrangements				
	DiPu	*DePu*	*DePri*		*DiPri*
			DM_{lea}	DM_{con}	
Asset specificity & durability	-	-	-	+	-
Opportunistic behaviour					
- by operator	-	-	-	+	-
- by public authority	-	?	-	+	+
Financial constraints	+	?	-	-	-
Asset valuation	-	-	-	+	+
	O_{pub}	PA or O_{pub}[32]	PA	O	O_{pri}
	Risk bearer				

Legend:

DiPu	Direct Public Management	O	Operator
DePu	Delegated Public Management	O_{pub}	Public Operator
DM_{lea}	Delegated Management by Leasing	O_{pri}	Private Operator
DM_{con}	Delegated Management by Concession	PA	Public Authority
DiPri	Direct Private Management		

Compared to other institutional arrangements, the main factors affecting the vulnerability of specific investment under *Direct Public Management* are the constraints of public finance. Specific investments are capital intensive, long-term, and represent sunk costs, which municipalities facing budgetary constraints find difficult to cover.

The fragmentation of the sector's structure still intensifies the vulnerability of investment, especially when financial resources are scarce. In some cases, the fragmentation of the sector's structure is being attenuated by a trend towards the concentration of local systems under the same management structure.

[32] It depends on the degree of autonomy and responsibility delegated to the public operator.

In selected countries, the financing factor has been attenuated by Cohesion Funds (in Europe) or development aid (in developing countries). The responsible entity for capital investments is the public operator.

The analysis regarding *Delegated Public Management* highly depends on the public operator's degree of autonomy, and the types of functions that are delegated. If the public operator is completely autonomous, yet the responsibility for investment remains with the public authority, then the analysis is very similar to Delegated Management by Leasing.

In the event that the responsibility for investment is transferred to the public operator, it may face the risk of opportunistic behaviour by the public authority, such as in the case of the private operator under concession. However, asset durability and asset valuation are not so much a problem under Delegated Public Management because, in the majority of the cases, the responsibility for investment is delegated for a long period of time, and the threat of operator's replacement is relatively low.

The analysis of *Delegated Management by Leasing* is similar to Direct Public Management in the sense that the responsibility for capital investments remains with the (local) public authority. One difference may lie in the lower importance (i.e., weaker vulnerability) of the financial constraint factor due to efficiency gains at the operational level, obtained by a greater autonomy and transparency of the operator.

As for *Delegated Management by Concession*, there is a delegation of responsibility to invest to the operator (which can be private or public) for a certain period of time. This raises the vulnerability of capital investment in different ways. Due to asset specificity and durability, contract specification costs are higher than in institutional arrangements where there is no transfer of such responsibility (i.e., for direct management and leasing). The same rationale applies to transaction costs related to contract renegotiation and (re-)tendering, which are by definition negligible when there is no contract to delegate investment's responsibility.

There is the threat of opportunistic behaviour by the operator, which might under- or over-invest depending on the contractual incentive schemes. Yet, there is also the threat of opportunistic behaviour by the public authorities, exposing the operator to the hold-up risk, which increases the vulnerability of capital investments.

As for financial constraints, the analysis is not conclusive. Some authors consider that the private sector is able to mobilise more capital, and in a faster and cheaper way than small local public entities do. This is due, on the one hand, to the crisis of the public finances and, on the other, to restructuring measures that in many cases come with the delegation by concessions (e.g., full cost recovery).

The assessment of specific investment's vulnerability in the *Direct Private Management* case highly depends on the efficacy and independence of the regulator. Although there is no need to write a contract, regulatory functions call for some type of specification and valuation of assets.

In terms of opportunistic behaviour, the risk to the operator are mainly related to regulation, namely the definition of a lower than expected regulatory asset base (and, consequently, on lower cost allowances). The threat of opportunistic behaviour by the operator is relatively low, as long as the regulator allows for full-cost recovery of operational and capital costs. The responsible entity for capital investment is the private operator.

After having analysed the vulnerability factors of capital investments, the following section focuses on another element at risk, which is the universal service provision.

4.3.2 Universal provision of the Service of General Interest

The vulnerability of the provision of the service of general interest is also affected by the reform of the UWS. In the present section, we analyse its main vulnerability factors. Given that operational performance pertains to the level and quality of the service provided (e.g., average hours of service, population served, average pressure in the distribution

system, water quality), contract operational performance can be used as a proxy to provision of SGI.

One factor of vulnerability pertains to the **nature of the good**. As a matter of fact, the urban water services are considered a quasi-public good because, politically, access to the service cannot be denied (i.e., non-excludability of the service). Also, the quality of the service is of utmost importance. The problem is that operational performance (i.e., service quality) may be difficult to predict *ex-ante*. Even though there are very precise performance indicators in the urban water sector, these are not easily contractible due to high uncertainties related, for example, to the weather and the quality of underground assets. Therefore, certain attributes of operational performance can be non-contractible making the level of public service provision difficult to guarantee. This is particularly relevant in the event of delegated management and the consequent writing of a contract.

Another factor of vulnerability is the **threat of opportunistic behaviour by the operator**. It can take two forms, namely "cherry-picking" and socially high tariffs. Firstly, the fact that some segments of the sector are not profitable (at a regulated price) may lead the operator to "*cherry-pick*" the most lucrative segments of the market, putting the provision of the public service at risk. This is especially the case when the competitive pressure rises, as well as in the event of private sector participation.

Secondly, the operator might try to increase prices to *socially unacceptable* levels (according to the political authority) because users are captive. On the one hand, captivity is justified by the nature of the good (i.e., it is an essential good) and, on the other, by the non-availability of substitutes (at least for its primary uses).

Finally, one needs to consider **financial constraints** as another vulnerability factor for public service provision. One aspect relates to *municipal* financial constraints (already mentioned as a source of capital investment's vulnerability), which are particularly important when the municipality is the operator.

A second aspect is the new wave of policy reforms pushing towards *full-cost recovery*, thus making cross-subsidising a non-viable solution of finance in the new environment. However, the implementation of full-cost recovery may be restrained by regulated prices (in order to ensure price affordability), consequently putting at risk the provision of public services. This is relevant in the event of private sector participation and delegated management, but also for autonomous public operators (who are forced away from cross-subsidies and towards increased transparency of costs). At last, more stringent (environmental and quality) standards also increase costs, pushing prices up.

In sum, the identified factors of universal service provision's vulnerability are intensified by the reform. The threat of opportunistic behaviour by the operator and the nature of the service are particularly important when there is the need to write down and enforce a delegation contract, as well as in the event of private sector participation. Financial constraints are intensified in all reform scenarios (the combination of regulated prices, full-cost recovery, and attack on cross-subsidisation, which used to be an important source of finance, may be difficult to manage and implement). In the following section, we compare these vulnerability factors across alternative institutional arrangements.

Comparison across different institutional arrangements

Parallel to the analysis made for capital investment, this section compares the factors affecting the vulnerability of the provision of the SGI, and identifies the actors who bear the responsibility for providing a universal public service across alternative institutional arrangements (Table 10). In this section, the division between lease and concession contracts is not considered because it refers to different risk-sharing outcomes in terms of capital investment, and not public service provision. Again, the identification of the risk bearer for universal service provision results from the institutional arrangements' definition, and it is independent from the analysis of the vulnerability factors.

Table 10 *Vulnerability factors of universal service provision*

Factors of vulnerability	**Institutional Arrangements**			
	DiPu	*DePu*	*DePri*	*DiPri*
Nature of the service	-	-	+	+
Opportunistic behaviour				
- cherry picking	-	-	+	+
-high tariffs	-	-	+	+
Financial constraints	+	+	?	?
	O_{pub}	O_{pub}	*depends*	O_{pri}
	Risk bearer			

Legend:

DiPu	Direct Public Management	O_{pub}	Public Operator
DePu	Delegated Public Management	O_{pri}	Private Operator
DePri	Delegated Private Management		
DiPri	Direct Private Management		

Compared to other institutional arrangements, the main factors affecting the vulnerability of universal service provision under *Direct Public Management* are financial constraints. These are due to municipal budgetary constraints, and the pressure to end cross-subsidies. Traditionally, cross-subsidies have been an essential source of public service finance. There are several types of cross-subsidisation:

- high-income customers subsidises low-income ones,
- urban customers subsidise rural ones, and
- energy (or other network industry) subsidises the water business.

The latter type becomes unavailable for finance as other network industries are liberalised. As for the former two types, they become unavailable because environmental and allocative concerns are increasingly influencing policies in the sector, and pushing towards full-cost recovery. The responsible entity for the public service provision in this institutional arrangement is the public operator.

The analysis regarding *Delegated Public Management* is similar to the previous one, in the sense that the public operator remains the responsible entity for the public service provision. One difference lies in the fact that the pressure towards the end of cross-subsidisation is even stronger than under direct public management, due to a greater autonomy and transparency of the operator. The same applies for institutional arrangements with private sector participation. In these cases, the main issue is the definition of the regulated price.

It seems that the main issue to consider when analysing the universal service provision vulnerability is the ownership of the operator. One cannot expect that a private operator acts as a public one. A private operator won't enter non-profitable segments and won't provide a public service without a profit, unless it is externally incentivised to do so (meaning if it is compensated for its loss). This can be done in two ways:

Firstly, under *Delegated Private Management*, incentives can be created in the contract between the responsible authority and the operator. Everything depends on the type of contract.

- In a fixed-price contract, the operator bears the risk of revenue and cost uncertainty (pertaining to public service provision). Precaution needs to be taken because there is the threat of opportunistic behaviour by the operator, which may be prone to reduce quality in order to increase profits.

- In a cost-plus contract, the public authority bears the risk related to the provision and finance of the public service. Performance-based contracts may be a good solution if targets are easily enforceable.

Secondly, under *Direct Private Management*, incentives can be created by the regulator. Again (as for capital investments) the assessment of the service provision vulnerability highly depends on the efficacy and independence of the regulatory agency.

4.4. Conclusions

Transaction-Costs and Incomplete Contract Theories give important insights on the factors that influence capital investment and the provision of a service of general interest. *Incentives*, which have an influence on the outcomes of transactions, are correlated with the way risks and transaction costs are shared between the parties.

These theories also suggest that the allocation of *reform risks* between the parties depends upon the characteristics of the transaction, the costs of writing, monitoring, and enforcing the contract, and the threat of opportunistic behaviour from the parties to the contractual relationship.

The vulnerability factors affect **capital investment** in different ways and degrees, depending upon the institutional arrangement. All other things being equal, delegation management by *concessions* is the most vulnerable arrangement in terms of capital investment. This is because delegation for a limited period of time intensifies the investment vulnerability due to the specific characteristics of the water assets. It also exposes partners to opportunistic behaviour. Moreover, the main risk bearer is the concessionaire, who is not the owner of the assets and whose responsibilities are limited in time. This leads to the next conclusion.

In principle, a specific-investment related risk is better taken by the *operator* because it has access to better information about the system and the real conditions of the network. Moreover, it is in the operator's best interest to have an efficient system to run the service. However, the incentive to invest in specific assets is weakened if the asset is not owned by the operator (i.e., if control rights do not coincide with property rights), as well as by limited delegation periods. Also, the private incentive to invest may not exactly correspond to public goals. In the event that the operator is not given adequate conditions to invest (e.g., in terms of return on capital or adequate institutional environment), the onus of risk bearing should be taken away from the operator, for example through the creation of an infrastructure-related investment pool.

As for the **universal provision of a service of general interest**, its vulnerability analysis is particularly important in a context of reform because water services may not be economically viable, and are services which the market under normal circumstances would not provide to the desirable extent.

Private sector participation and the end of *cross-subsidisation* appear to be the main issues affecting the vulnerability of the public service provision. On the one hand, one cannot expect that a private operator is willing to provide a public service without a profit. When prices are regulated, private operators will have an incentive to increase efficiency only if they can capture some of the related gains. On the other hand, the pressure to end cross-subsidisation increases the vulnerability of public service provision by constraining the financial options of operators.

The identification of the vulnerability factors for these two elements at risk because of reform is an essential step in order to understand more fully which partners are in the best position to bear reform risks in the different institutional arrangements.

In Part III, we present the empirical analysis, which focuses on risk-sharing patterns in various institutional arrangements, as well as the importance of the vulnerability factors in each arrangement. We also explore whether operators' strategies are aligned with the presented evidence. These are necessary steps before proposing in Part IV institutional solutions that tackle the problems highlighted by each arrangement. The goal is to minimise the vulnerability factors and, consequently, enhance incentives to invest in specific assets, which meets public policy objectives set for the sector.

PART III. EMPIRICAL ANALYSIS

The reform of the urban water sector (UWS) challenges the traditional risk patterns of the industry and calls for new approaches to risk management. New categories of risk are created by the introduction of competitive pressures, the participation of the private sector, the unbundling of functions, as well as the greater autonomy of management entities.

The most important elements at risk resulting from the sector's reform are capital investments and universal provision of the service of general interest (SGI). Their vulnerability is particularly important in the UWS, due to a combination of factors, such as natural monopolies, sunk costs, low price elasticity of demand (for primary uses of water), and strong environmental and public health externalities related to service provision.

In Part III, we aim at identifying empirically (1) the risk-sharing patterns presented in the theoretical analysis (that correspond to different institutional arrangement), and (2) the importance of the vulnerability factors of the main elements at risk because of reform in each arrangement.

This empirical analysis is broken down into three chapters. The first one (Chapter 5) comprises a questionnaire survey targeting a large number of management entities worldwide. The questionnaire (see Annex 1) is structured into five topics based on the contents of the preceding chapters of the thesis, namely:

1. identification of the institutional arrangements,
2. characterisation of contracts and contracting relations,
3. identification of risk-sharing patterns,
4. identification of the funding sources and factors of vulnerability of capital investment, and

5. identification of funding sources and factors of vulnerability of universal provision of the SGI.

In the second chapter of Part III (Chapter 6), we analyse in more detail a set of case-studies illustrating different institutional arrangements in four countries. It involved interviews with key actors in each case, such as regulators and senior managers. Case-studies follow the same structure of the questionnaire analysed in the previous chapter.

Finally, in the third chapter of Part III (Chapter 7), we focus on operators' strategies. The results presented in this chapter were developed by the author in the context of the Euromarket project[33]. The analysis is based on ten case-studies, which were prepared together with project partners[34]. The relevant references are made in the boxes presenting the case-studies. It is important to underline that the case-studies in this chapter, which served as basis for producing the results on operators' strategies, are *not the same ones* as those presented in Chapter 6. The main objective is to verify whether operators' strategies are aligned with the trends and evidence collected in the first two chapters of this empirical analysis.

[33] The author played a leading role in the coordination and research activities of this 3-year European project on the Liberalisation of the Water Sector. Her main tasks and responsibilities were: reports and articles co-authoring; final book co-edition; biannual newsletter co-edition; validation of final reports' coherence; management of relationships with stakeholders; management of final deliverables; planning and organisation of 10 workshops; organisation of the final conference.

[34] The author thanks project partners from EPFL, TU Delft and University of Zaragoza for their contribution in the development of the case-studies. The results of this work were published in (Luís-Manso et al., 2007a).

Chapter 5. Questionnaire: Risk-Sharing and Vulnerability Analysis

The analysis made in this chapter is based upon a questionnaire structured according to the results developed in Part I and II of the thesis (*Box 4*). The **objective** is to identify trends in terms of risk-sharing patterns and the main elements at risk because of reform (i.e., capacity investment and universal provision of the service of general interest).

Box 4 Structure of the questionnaire

	Main topics in the questionnaire	Builds on
1	Institutional arrangement	Chapter 1
2	Contracts and contractual relations	Chapter 1
3	Ownership of infrastructure	Chapter 1
4	Public subsidies	Chapter 4
5	Funding sources and vulnerability factors of capital investment	Chapter 4
6	Funding sources of operating costs	Chapter 4
7	Vulnerability factors of service provision to low-income customers	Chapter 4
8	Patterns of risk-sharing	Chapter 3

In April 2007, the questionnaire was *sent out* to 250 operators worldwide (Figure 5), more precisely to selected individuals, in the majority of cases, members of the organisations' executive board. The database of contacts was built through an extensive search on the internet, in the participants' lists of conferences, and in water-specific journals. It was translated into four languages, namely English, French, Portuguese, and Spanish. Before sending out the questionnaire to all the contacts in the database, five selected operators

agreed to answer a preliminary version in order to test the coherence and clarity of the questions.

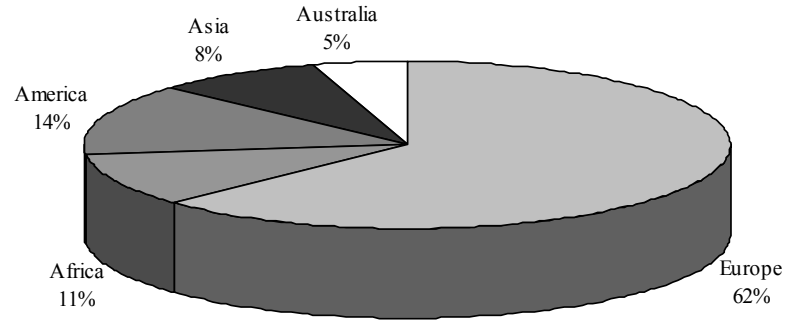

Figure 5 *Geographical location of the recipients*

Twelve percent of the total number of questionnaires were returned and considered as valid *responses*. The following figures illustrate the heterogeneity of responses in terms of the operators' geographical location across continents and the types of institutional arrangements. In Figure 6, one can see that the majority of the responses are from European countries (67%), followed by African and American countries (17 and 10%, respectively). Asia and Australia are the less represented continents with 3% of respondents each.

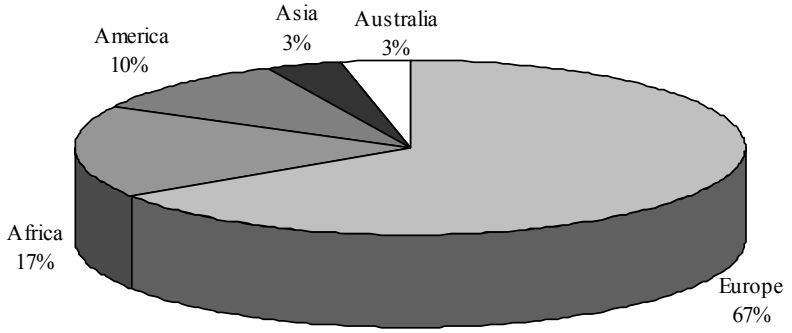

Figure 6 *Geographical distribution of respondents*

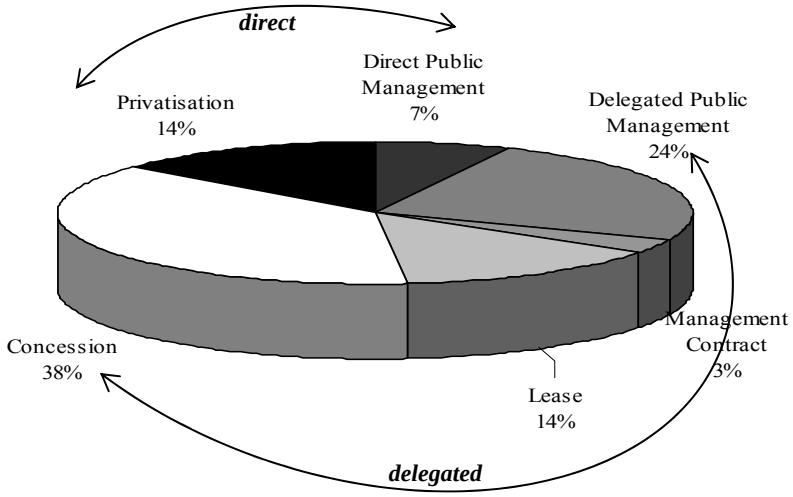

Figure 7 *Institutional arrangements of respondents*

As for the institutional arrangements, Figure 7 shows that about 20% of the respondents are *direct* management arrangements (public and private), and 80% pertain to *delegated* management arrangements (public and private). *Concessions* account for the larger number of responses for a single institutional arrangement (about 38% of the total responses), followed by *delegated public management*.

In the subsequent sections, the main results are presented following the structure of the questionnaire. Many respondents asked for anonymity because they considered the topic to be very sensitive. This request is, of course, respected throughout the research.

5.1. Evidence in terms of risk-sharing

One objective of the questionnaire is to verify the results presented in Chapter 3 related to the main types of risks in the UWS, as well as how they are shared between the different actors across institutional arrangements.

Significant evidence is that, in many situations, either it is *not clear-cut* who the responsible risk-bearer is, or the risk is taken by several actors. In the interviews, we were

able to confirm that when one type of risk is shared between several actors, it is often difficult to define the extent of each actor's responsibilities[35].

A significant trend identified by the questionnaire is that in the cases where management is delegated - i.e., delegated public management, lease and concession arrangements - the majority of the risks are shared between the operator and the entity that delegates this responsibility. This is especially the case when there are contracts ruling the transaction[36].

About 50% of the respondents identify *consumers*/*customers* as actors sharing some risks. This is very marked in all English and African cases, although for different reasons highlighted in the interviews with local respondents. These are: (1) additional costs are transferred to final prices (in England), and (2) the quality of the service including access worsens (in Africa).

A more detailed analysis of specific types of risk also enables the identification of some trends. There seems to be more clarity about risk-sharing in the case of **business risks** than in both **reform** and **exogenous risks** (according to the classification presented in Chapter 3 of the thesis). In the former case, about 65% of the total respondents identify very clearly only one actor as being responsible for business risks, which (as expected) is normally the operator.

Finally, it is important to mention that *insurance* is very seldom mentioned. In the few cases it is mentioned, insurance pertains to exogenous risks (mainly political and environmental). The most common cases are the provision of financial protection against

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[35] This can be due to an incomplete definition of responsibilities or to insufficient knowledge of contractual clauses by the interviewees.

[36] There are cases of delegated public management where there is no contract, for example when local public authorities delegate the responsibility for managing the water systems to a municipal company or an autonomous municipal service for an unlimited period of time.

the loss of, or damage to, real and personal property caused by such perils as fire, theft, explosion, vandalism, and malicious mischief, as well as short-term pollution event coverage.

5.2. Evidence in terms of capital investment

The importance of capital investments is paramount for the sustainable operations in urban water systems. In chapters 3 and 4 in Part II, capital investment was identified as being one of the most important elements at risk because of some features of the sector's reform.

For about 83% of the respondents, the management entity is actually responsible for capital investments. This corresponds to direct (private and public) management, delegated public management, and delegation by concession arrangements. One can thus count on a significant number of the total responses to shed some light on the trends involving **capital investments**.

As expected, *contract duration* in the cases where the responsibility for capital investment is delegated (i.e., concessions) is higher than when this responsibility in not transferred (i.e., management and lease contracts). Table 11 presents these averages, excluding management contracts because there is only one case in the set of responses which could bias the results. In this single case, the duration of the management contract was 3 years (which is in accordance with the identified trend), yet there has been a long-term relationship between the two partners of the contract (i.e., this is not the first contract they signed together).

Table 11 *Average duration of lease and concession contracts*

Institutional arrangement	**Contract duration in years** (on average)
Lease	23
Concession	32

Given the fact that lease contracts do not include the transfer of investment rights and, therefore, do not involve very high asset-specific investments, it is somehow surprising that the average duration of these contracts is so long. In literature, the duration of lease contracts is identified as being, on average, 8 to 15 years (see, for example, OECD, 2006, Cowen, 1997).

In the questionnaire, a group of five questions directly targeted capital investment (*Box 5*), mainly with the purpose of identifying the reasons justifying these investments, their funding sources, and the factors increasing the risk of making this type of investments.

When questioned about the **reasons** justifying capital investment, it is interesting to notice that operators under direct management arrangements (either public or private) choose, on average, a *larger* number of available options than those under delegated management arrangements (with the transfer of investment responsibilities). This suggests that operators under *direct management arrangements*, where there is no time limit for being responsible for investments, have a longer-time perspective on asset management. Other alternative explanations, such as the possibility that concessions would only become attractive in water systems with relatively lower investment requirements, were ruled out during interviews[37].

The most frequent reason justifying capital investments is capacity expansion (named by 80% of the operators), followed by quality of the service improvements, and - in particular in European countries - higher environmental standards.

[37] It was an interview with an expert in contract management and local authority's capacity building in particular. There is also evidence from France (Carpentier et al., 2006) suggesting that 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.).

Box 5 Questions on capital investment

5A. Has your organisation made any important capital investment (i.e., investment on a fixed asset such as in the infrastructure) in the past 5 years?

Yes
No, yet we are responsible for investing in capital equipment
No, it is not our responsibility to invest in capital equipments

5B. Were these investments made to meet contract requirements?

Yes
No
In part

5C. What are the reasons justifying capital investments? (Several possible options)

Capacity expansion
Modernisation
Age of stock
Environmental standards
Quality of the service standards (other than environment)
Reduction of operating costs
Others. Please specify

5D. What are the sources of financing for capital investment? (Several possible options)

Revenue
Equity finance
Bond finance
Loan
Subsidise loan
Public subsidy
European Funds
Project Finance
Others. Please specify

5F. Decisions to invest in capital (equipment, infrastructure) involve risk. Please mark in order of importance, what you consider the most important factors increasing risk to be (1=very important, 2=important, 3=of some relevance, 4=irrelevant)

Long amortization periods
Short duration of the contract
Risk that authorities change rules, prices, or cost allowances
Difficulty in assessing real conditions of underground assets
Lack of financial resources
Other. Please specify

It is interesting to note that the **funding sources** for capital investments are very diverse, especially when compared to sources for covering operational costs (such as employment, energy, and materials). Capital investments in the sector seem to be very dependent upon public subsidies and subsidised loans. As a matter of fact, about half of the operators identified some type of subsidy (either grants or subsidised loans) as an important financial source for covering capital investments. This is true for all institutional arrangements but privatisation, and across all continents, especially in Africa where public funding and subsidised loans were selected by the totality of the respondents. There are other possible funding sources, such as bonds (in Europe and Australia) and project finance (Annex 2), but they do not seem too widespread.

Among the **factors** identified as being very important in increasing the risk of capital investments, *regulatory risk* (i.e., the risk that authorities change rules, prices, or cost allowances) seems to be the most important. It is actually named by two-thirds of the operators as being very important in all but direct public management arrangements (as expected because under DPM there is no unbundling of the regulatory functions). This is particularly true for operators in Europe and Latin America, as well as for concessions.

About a third of the respondents identified the *lack of financial resources* as very important in increasing the vulnerability of capital investments. This does not come up to our initial expectations, as the lack of financial resources is often named as one of the main problems in the sector.

Also, about a third of operators have identified *long amortisation periods* as a very important factor increasing the risk of capital investments, even when there is no contract. What is interesting to note, is that the large majority of these respondents (about 70%) operate under delegated public management.

As for the importance of *contract duration* in putting capital investments at risk, it is only named by about 20% of the operators, which represents 30% of all contracts. At first this is striking because one would expect contract duration to be a constraint for capital investments due to the assets' long amortisation periods. Yet, in practice, the average

duration of concessions contracts is also long (which compensates for the long amortisation periods).

Finally, *uncertainty about the conditions of the underground assets* is only named by 15% of the respondents. When questioned in more detail about the fundaments of this type of uncertainty, several interviewees acknowledged that information asymmetry is more significant than the actual uncertainty about the conditions of the assets.

5.3. Evidence in terms of universal provision of the SGI

Universal service provision is another important element at risk because of reforms. In the questionnaire, two questions targeted the universal provision of the water services (*Box 6*), mainly with the purpose of identifying the main funding sources, and the factors guaranteeing universal coverage of the **service of general interest**.

The **funding sources** for covering operational costs are used as an indicator of the sources for the universal provision of water services. This is highly representative in developed countries, where access levels to the service are close to 100%. Yet, for developing countries, access is a problem and the results are only valid for the percentage of the population that is connected and served by water services. Lack of access can be due to *unaffordable fees* or to *unavailability of network capacity*. In the latter case, universal access to the service and capital investment are highly correlated.

All operators identified *revenue* as the main (and on many cases only) source for funding operational costs. About 50% of respondents have also identified the use of *cross-subsidies* as being a very important source for funding low profitable areas and poor consumers. The use of block tariffs, which vary according to the volume of consumption, and cross-subsidies between different types of consumers (e.g., domestic and industrial) are particularly common forms of cross-subsidies. On average, delegated public management arrangements are the ones that diversify the most in terms of types of cross-subsidies,

mentioning not only block tariffs and types of consumers, but also cross-subsidies between different types of businesses and regions.

Box 6 Questions on service provision

6. How does your company cover operational costs (e.g., employment, energy, materials)?
(Several possible options)

- Revenue (tariffs) covers all operational costs
- Revenue (tariffs) partially covers operational costs
- Cross-subsidies
- Block tariffs (depending on consumption)
- Type of consumers (domestic, industrial)
- Regional (urban subsidise rural consumers)
- Other business segments subsidise water business
- Public subsidies
- Other. Please specify

7. Which of the following factors are, in your opinion, important to guaranteeing the provision of water services to **low-income customers**? ***(1=very important, 2=important, 3=of some relevance, 4=irrelevant)***

- Existence of subsidies to cover service provision to the poorer
- Possibility to use cross-subsidies
- Prohibition to cut off service provision due to non-payment
- Flexibility in terms of service quality (e.g., hours of access)
- Other. Please specify

As for the **factors** that are important to guarantee the universal service provision, the question focuses on the provision of water services to low-income customers, which is the most vulnerable group when the universality of the service is not guaranteed. The existence of *specific mechanisms* (in some cases subsidised by public authorities) to help customers in financial distress to pay their bills, as well as the possibility to use *cross-subsidies* are considered the most important factors. Amongst the mechanisms mentioned to mitigate the impact of tariffs on low-income customers are debt restructuring, rate reductions, and social subsidies.

It is interesting to note that of the operators that recognise receiving *public subsidies* (about 40% of the total), less than 30% justify them on the grounds of water services provision to poor consumers. About 80% of these operators receive subsidies to cover capital costs. Nonetheless, when asked about important factors for guaranteeing the provision of the service for the poorest consumers, many operators replied that it is the existence of public subsidies. This is valid in all continents and for all forms of institutional arrangements. Again, one has to keep in mind that water services provision to the poorest consumers may imply the expansion of the network and, therefore, significant capital investments.

5.4. Concluding remarks

The development of this questionnaire was very important in order to verify the results presented in Part II of the thesis, i.e., in terms of risk-sharing patterns and elements at risk because of the sector reform. The questionnaire was sent out to senior managers, who have a deep knowledge of the sector, as well as of the relationships between their organisations and the other entities involved in the sector. Discussions with several of these managers after receiving the responses to the questionnaire gave us more confidence on the results. In this sense, the identified trends are significant and must not be neglected.

One of the most significant trends is that, in practice, *risk allocation* between the actors is not as clear as the patterns identified in Chapter 3 of this thesis[38]. This is especially the case for the risks created by the sector's reform and those exogenous to the transaction.

Regarding *capital investment*, it is interesting to note that there is a *diversity of funding sources*, yet they are, for the majority of cases, *still quite traditional* (i.e., public funding, equity, and loans). More innovative funding alternatives, such as municipal bonds and project finance, are not very developed in the majority of cases. There is still a strong

[38] These results were based on the theoretical definitions of institutional arrangements with a straightforward allocation of responsibilities.

dependency upon subsidies from local governments, European funds, and international cooperation agencies, especially in what refers to capacity expansion (expansion of the network and treatment capacity).

Another significant trend is the *weight of regulatory risk* as a factor increasing the risk of capital investments. As a matter of fact, regulatory risk is more often named as a very important factor putting capital investment at risk than it is the lack of financial resources.

Finally, one must mention the weight operators give to *cross-subsidies* as a very important factor guaranteeing the universal provision of water services. This cannot be neglected in the discussions regarding full-cost recovery.

In the following chapter, we present a set of selected case studies with the purpose of strengthening our empirical analysis. The majority of the selected cases belongs to the European Union (EU) for comparability reasons, but also because about 65% of the respondents to the questionnaire are from this region. One case from Africa is also presented mainly with the purpose of underlining the similarities and differences between developed and developing countries

Chapter 6. Case-studies: Risk-Sharing and Vulnerability Analysis

We present five case-studies illustrating different institutional arrangements in England and Wales, France, Portugal, and Mozambique. The cases range from the separation of the responsible and the management entities (i.e., delegated management) to their integration (i.e., direct management); and from the separation between managerial and regulatory responsibilities with the creation of a sector regulator to regulation by contract. Moreover, delegated management by lease and concession contracts are differentiated because they correspond to cases where the responsibility for operations and, in the latter type, investments, is delegated to a different actor in the larger water system.

Case-study 1 (CS1) illustrates the only type of institutional arrangement in England and Wales, that is a *direct private arrangement*. The private operator is the owner of the assets and provides water and sanitation services to about 1.6 million people.

Case-study 2 (CS2) illustrates the most common institutional arrangement in France, that is *delegated private management by leasing*. The private operator belongs to a large TNC and provides retail water supply services to about 2.68 million people.

Case-studies 3 and 4 (CS3, CS4) are examples of two different types of system in Portugal. CS3 illustrates a multi-municipal system, where a public operator was awarded a *concession* to provide bulk water services to about 600 thousand people. As for CS4, it illustrates a municipal system, where a private operator won the *concession contract* to provide water and sanitation services to about 115 thousand people.

Finally, case-study 5 (CS5) exemplifies the most significant institutional arrangement in Mozambique after reform, that is *delegated private management by leasing*. A private operator majority-owned by an international firm provides water supply services to about 670 thousand people.

The following table presents the selected cases and their main characteristics. Due to the fact that some operators requested to remain anonymous, the identities are not revealed.

Table 12 *Presentation of the selected case-studies*

Case Studies	***Country***	***Institutional Arrangement***	***Type of Service***	***Ownership of operator***	***Population served (appr.)***
CS1	England & Wales	Direct Private Management	Water and sanitation services	Private	1'600'000
CS2	France	Delegated Private Management by Leasing	Water supply (only retail)	Private	2'680'000
CS3	Portugal	Delegated Public Management by Concession	Water and sanitation services (only bulk)	Public	600'000
CS4	Portugal	Delegated Private Management by Concession	Water and sanitation services	Mixed	115'000
CS5	Mozambique	Delegated Private Management by Leasing	Water supply	Private	670'000

In general terms, case-studies follow the same structure as the questionnaire presented in the previous chapter. The objectives set for this chapter are:

1. to show the water sector's reform is a reality in several systems,
2. to illustrate the diversity of institutional arrangements,
3. to identify risk-sharing patterns,
4. to identify the vulnerability factors of the main elements at risk because of the reform, and
5. to identify the major regulatory challenges across institutional arrangements.

Case-studies are grouped on a national basis. The main characteristics of each country's urban water sector are described at the beginning of each chapter. The first four case-studies belong to the European Union (EU). The main instrument of the European water policy is the *Water Framework Directive* [COM 2000/60/EC from December, 22]. It established a common regulatory framework for all the member states, at least concerning

environmental issues. As for the ownership (of infrastructures and operators) and the structure of the sector, the European Treaties are neutral. Therefore, each country remains responsible for its legislation on the ownership, type of management, institutional structures, and distribution of competences[39]. This means that, in practice, a diversity of institutional arrangements characterise the European urban water sector.

Then we describe the context of each case-study, including the institutional framework and type of contractual arrangements. After that, we present the risk-sharing patterns between the main actors in each case, and identify the vulnerability factors of capital investment and universal provision of the SGI.

The data for the case-studies was gathered through desk research of secondary sources, such as company reports, supplemented by primary data collected from operators through a questionnaire and selected interviews to important actors in the systems. We will start out by presenting the English and Wales case-study.

6.1. England and Wales: the strong Economic Regulatory Agency

England and Wales (E&W) is one of the most commonly referred models in the urban water sector. The distinguishing features of the E&W model are the complete privatisation of the sector, and the creation of a strong independent economic regulatory agency, the Office of Water Services. More details on the English model are presented in section 6.1.1, before the case-study illustrating a direct private management arrangement in section 6.1.2.

[39] The only exception is if the management of the service is delegated to a third party, where the principles and rules on public procurement and concessions must be respected [COM (2004) 327 final from April, 30].

6.1.1 The English and Wales model[40]

The national government sets the national policy framework for water and sewerage services. In England, the Department for Environment, Food and Rural Affairs (Defra) is responsible for all aspects of water policy, including water supply and resources, and the regulatory systems for the water environment and the water industry. In Wales, it is the National Assembly for Wales (NAW) that has statutory and policy responsibility for matters related to the water industry.

The reform of the water sector in England and Wales represents one of the most profound cases of reform worldwide, with the **privatisation** of the WSS services. First, the 1974 Government Act changed the scope of action from the local to the regional level with the creation of 10 Regional Water Authorities (RWA), which were responsible for managing the entire water cycle.

By the end of the 1980s, there was a great demand for resources to rehabilitate the network, which proved to be an impossible enterprise for RWAs due to the financial austerity imposed by the government. Following these financial constraints and some ideological reasoning, RWAs were transformed into Public Limited Companies (PLC) and were sold out in 1989 (Water Act). From then on these new private corporations were held responsible for the provision of the services and became the owners of the infrastructures.

Regarding **regulation**, the 1989 Water Act established three regulatory bodies in order to implement and enforce the national policy: the Drinking Water Inspectorate (DWI) which monitors water quality; the National Rivers Authority for environmental performance, and was later on turned into the Environment Agency (EA) which monitors river and

[40] The description of the English Model in this section (6.1.1) is partially based on the Euromarket project, mainly on Deliveries 2 and 4. The main results of the project are published in (Finger et al., 2007).

environmental pollution; and the Office of Water Services (OFWAT), to set the price regimes.

The DWI is responsible for assessing the quality of drinking water, taking enforcement action if standards are not being met and appropriate action when water is unfit for human consumption. It also investigates complaints from consumers and incidents which affect or could affect drinking water quality. Its investigations of incidents can lead to the prosecution of water companies.

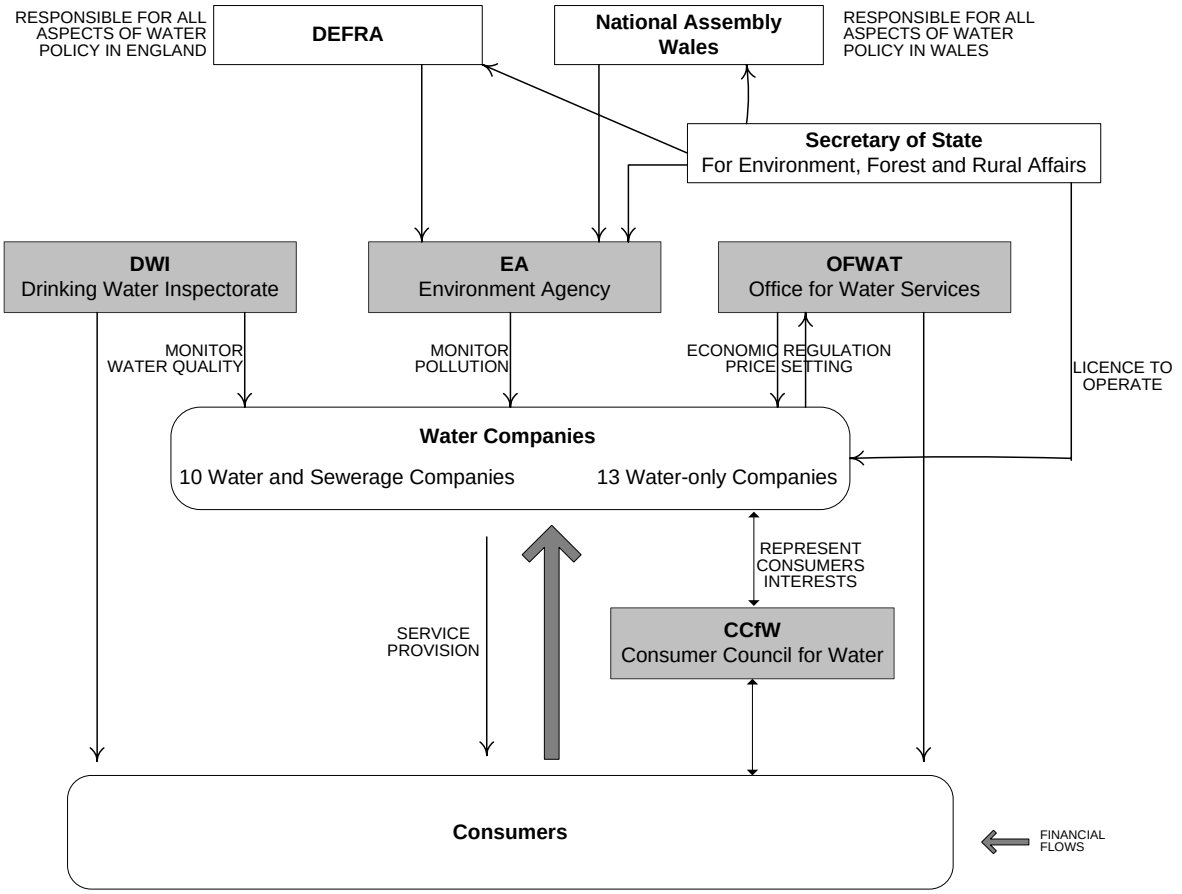
The EA has the duty to conserve, augment, redistribute and secure the proper use of water resources. It is the central body responsible for long-term water resources planning.

The OFWAT is the economic regulator of the industry. It sets limits on prices, ensures companies are able to carry out their responsibilities, protects the standard of service, encourages companies to be more efficient and to meet the principles of sustainable development, helps to encourage competition where appropriate, and makes comparisons between the companies to help raise the standards of those that need to improve[41].

More recently, in 2005, the Consumer Council for Water (CCWater) was set up to represent consumers' interests and to investigate their complaints about the water company. Figure 8 presents the main *actors* on the sector in E&W.

[41] From http://www.ofwat.gov.uk/ [in June 2007].

Figure 8 *Main actors in E&W model*



Source: adapted from Finger, Allouche, Luís-Manso (2007)

Main features of the model

Privatisation

Private companies are currently responsible for the provision of water and sanitation services. The 1989 Water Act provided for the privatisation of the RWAs by selling their shares to the public. The newly-floated companies became owners of the entire water and sanitation systems, and became statutorily responsible for water and sanitation services in their areas (appointed by the Secretary of State). They were group-holding companies sharing similar corporate structures, in which a subsidiary water and sewerage company

(WaSCs) assumed the main operational responsibilities. As far as the already existing private water companies were concerned, the Act preserved their status and areas of supply. They were appointed to supply water services (only) within their own areas under Licence in the same way as the ten WaSCs. Currently there are 10 water and sewerage companies and 13 water-only companies.

The overall structure described above has remained in place to the present day. There have been a number of mergers, but only involving smaller companies, as the ten large companies are still separately owned (although not necessarily by the same owners as in 1989). The main change, which continues to impact the industry, is the change of ownership. Companies change owners relatively frequently and some are no longer listed on the London Stock Exchange, as they have been bought by companies based outside the UK.

Strong Economic Regulation

OFWAT is an independent regulator, which was established in 1989 when the industry was fully privatised, and which is accountable to Parliament (and not a Minister). In the absence of effective market competition, OFWAT bases its decision on setting price limits and standards of services on *comparative competition*. The application of price cap regulation, combined with yardstick competition, constitutes a prominent feature of the system.

OFWAT regulates prices based on the investment programs of the regulated companies, and the performance of all competitors. It uses a *price-cap system*, taking into account the general retail price inflation, performance standards, and efficiency and service levels. The price (or revenue) cap is set every 5 years.

Individual customer tariffs are approved on an annual basis. The regulator verifies if the proposed tariffs are discriminatory or preferential and if they are environmentally efficient. Customer bill stability is another important criterion.

OFWAT can seek court orders to insist on performing a duty. If the company does not comply, it can ask the court to appoint a special administrator.

The Water Industry Act 1999 made the interests of the consumer become OFWAT's first priority, removed companies' powers to disconnect due to non-payment of charges, and limited the circumstances in which companies can compulsorily meter consumers.

Most common institutional structures

Direct private management is the only institutional arrangement in the E&W water sector. Private companies are responsible for the provision of water and sanitation services. They are statutory undertakers with duties and responsibilities set out in primary legislation. However, they do not have exclusive rights and they are not considered as legalised monopolies. The regulator can terminate an appointee's licence as a water/sewerage undertaker but this requires a long notice period.

The companies have access to the international financial markets. There have been a number of financial restructurings as companies have sought to reduce their cost of capital by replacing equity with debt finance. One company - Dwr Cymru - is now wholly debt financed. Five other companies are now very highly geared (two WaSCs and three WoCs). Gearing across the industry has increased from zero to almost sixty per cent since privatisation in 1989. Only a few small water only companies have gearing ratios below forty per cent.

Conclusion

In England & Wales, the existing institutional arrangement with a privatised system and strong regulation is not questioned in its essence. The strong regulatory system implemented is perceived as a powerful counterpart to the interests of private operators.

The focus of discussions normally lie on the high funding requirements pertaining to the modernisation of the old network and the improvement of wastewater treatment in order to raise local water quality (very important because water abstraction is essentially made from

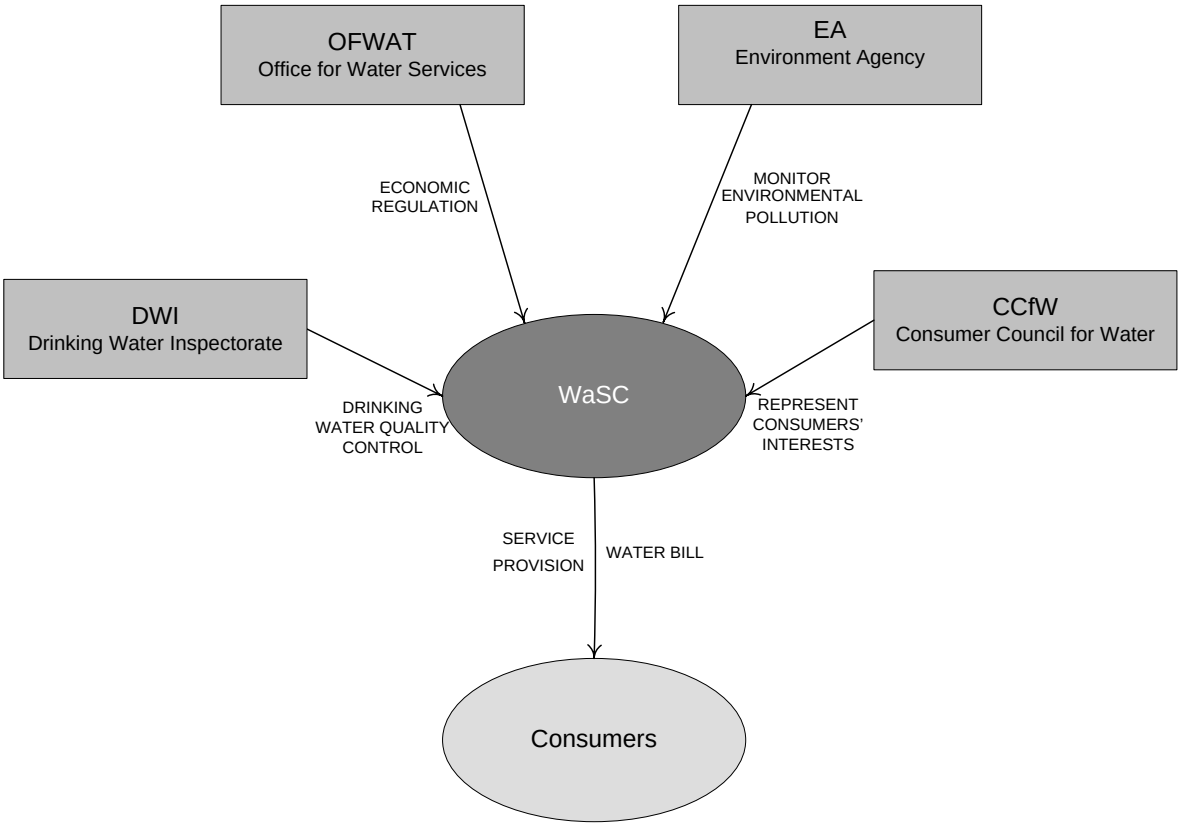
surface waters). Because costs are supposed to be totally recovered through tariffs, the fear is that increased tariffs may threaten the affordability of water charges. The following section presents a case-study that highlights these topics.

6.1.2 Case-Study 1: Direct Private Management

Case-study (CS1) illustrates the most common institutional arrangement in England, a direct private arrangement. The water and sewerage company (WaSC) was created in 1989, following the privatisation of the regional water authority. It belongs to a large UK group focused on water, sewerage, and waste management businesses.

The WaSC, together with the four regulators, constitutes the most important actors in the system (Figure 9).

Figure 9 *Main actors in CS1*



OFWAT is the economic regulator. It regulates the water prices, the company's investment programme, the cost of capital, and the operational and environmental obligations. It also compares the company's performance on a wide range of parameters such as efficiency, customer service, and environmental performance. The *Environment Agency* is responsible for water abstraction licensing and the regulation of discharges. The *Drinking Water Inspectorate* sets and enforces drinking water quality standards. Finally, the *Consumer Council for Water* represents consumers.

Risk sharing

The risk-sharing patterns in CS1 are *very clear*, with the WaSC taking all the risks, in the majority of cases alone. Part of these risks may be ultimately transferred to customers via price increases, but only if OFWAT considers they are caused by exogenous factors to the company (and if they have strong implications on profitability).

Business risks are taken by the WaSC, in other words by the private operator. The most important risks are the failure to deliver the capital investment programme, the failure to raise sufficient funds to finance its functions, the failure to recover customers' debt, and the failure to deliver operating cost savings implicit in the regulatory review for the current period (2005-2010). These are particularly important issues for the WaSC because the price cap is only revised every 5 years.

As for the **risks created by the reform**, *regulatory risks* are particularly important for the operator mainly for two reasons. On the one hand, there is the risk that price controls on the turnover of the company's business could adversely affect profitability. On the other hand, environmental regulations and quality standards could increase the company's costs and adversely affect profitability.

When it comes to *social risks*, the WaSC cannot cut off the service due to non-payment. It is therefore obliged to provide the service even if it will not be reimbursed. For this reason, the recovery of customers' debt is a particularly important strategy for the WaSC which has created specific schemes to help the poorest customers to pay their water bills.

Capital investments

The WaSC is the *operator* and the owner of the infrastructure and, legally, the sole responsible for all capital investments. The existing regulatory framework supports this endeavor in the sense that one of the regulator's primary duties is to ensure that private companies can finance themselves by earning a reasonable rate of return on capital.

In recent years, the company has been facing significant upward cost pressures as a result of the need to meet *new environmental legislation*. More specifically, the main focus of the WaSC since privatisation has been on improving wastewater treatment and its disposal. Upward costs also result from the need to fully maintain the necessary asset base to meet consumer service expectations. *Maintenance costs* have been particularly important, with water mains rehabilitation accounting for 40% of capital investments in 2006.

Besides more stringent environmental standards and the modernisation of old capital stock, the WaSC has also identified *expansion of capacity*, *improvements in the quality of the services*, and *reduction of operational costs* as very important factors justifying capital investments. By choosing such an exhaustive list of reasons for capital investments, the WaSC denotes a long-term perspective on asset management, which is justified by the fact that it is also the owner of the assets.

Traditionally, the WaSC finances its capital investments from operations and debt financing. The company does *not receive any subsidy* from the Government or the European Union (unavailable for privatised companies). Nevertheless, it has benefited from the attractive conditions of EIB loans, used for projects that support the sustainability of environmental and customer service standards set by the EU and national legislation.

In the WaSC's perspective, the most important **factor** putting capital investments at risk is the risk that the government may decide to increase the extent of the operator's liabilities. One specific example is the current debate on the operators' adoption of all privately-owned household sewers and surface water drains which, according to the government, aims at clarifying responsibilities and creating a more sustainable and integrated sewer

network[42]. Difficulty in assessing real conditions of underground assets is also identified as being important. On the contrary, long amortisation periods of investments and the lack of financial resources are not considered to be very significant.

Universal service provision

Almost the totality of the population in the system is connected to the network and is served by drinking water and wastewater treatment works (more than 99%). The quality of the drinking water is also good, with very good compliance levels to DWI standards.

With the 1999 Water Industry Act *prohibition to disconnect* domestic water supply when there is no payment, the outstanding customer's debt due to non-affordability became a major issue for the WaSC. Apart from this prohibition, the 1999 Act put other protections in place for particular groups: it prohibited companies for using discharge-limiting devices to enforce payment, gave the powers to the Secretary of State to make provision for the protection of vulnerable groups, and finally, gave the right to domestic customers to opt for a measured charge.

To protect itself from debts, the company has established a charitable trust and hardship funds to assist customers in severe financial difficulties. A customer care programme was launched in order to advise customers in greater need about water use, household budget management, and special payment plans to which they are entitled. These schemes are funded by the WaSC revenues and can only be made available to customers in financial distress because it is legally acceptable to use cross-subsidies (in this particular case, mainly between types of consumers and urban and rural regions).

The overall Income Support payment provided by the State is also deemed to meet water and sanitation charges, even though it is not specific to these services. This is a personal

[42] For more details see (DEFRA, 2007).

allowance related to particular household circumstances and that is granted to cover day-to-day living needs.

Conclusion

This case-study presents a somewhat singular example in the urban water sector, corresponding to the private ownership, responsibility, and operation of the urban water system. For this reason, the *allocation of risks is very clear*, with the operator taking all of them.

Reform risks are particularly important for the operator. On the one hand, the economic regulator has a strong (discretionary) power regarding essential tasks for the functioning of the system, such as the approval of investment plans and price setting. On the other hand, there is a prohibition to disconnect consumers due to non-payment. The possibility to use cross-subsidies to cover the costs of providing the services to customers in financial distress is, therefore, essential.

From the regulator's perspective, it is crucial to have *access to good information*, which is controlled by the regulated company. The provision of good relative performance indicators - which help to address the information asymmetry problem - across regulated companies, becomes a major challenge for the regulator.

Nowadays, operating revenues and debt financing are the sources for covering the private company's *capital costs*. It does not receive any subsidy for covering its capital investments. However, one cannot neglect two important facts. Firstly, by the time of privatisation, the debt of the regional authorities was paid with the public budget and it did not get transferred to the privatised companies. Secondly, it is a major duty of the regulator to guarantee that private companies can finance themselves.

6.2. France: Regulation by Contract

France represents another commonly referred-to model in the urban water sector, due to the long-term experience of private sector participation in the management of the water systems. The French model is based on competition *for* the market and contract-based regulation (more details in Section 6.2.1). One case-study presented illustrates delegated management by leasing (Section 6.2.2), which is the most common institutional arrangement in the country.

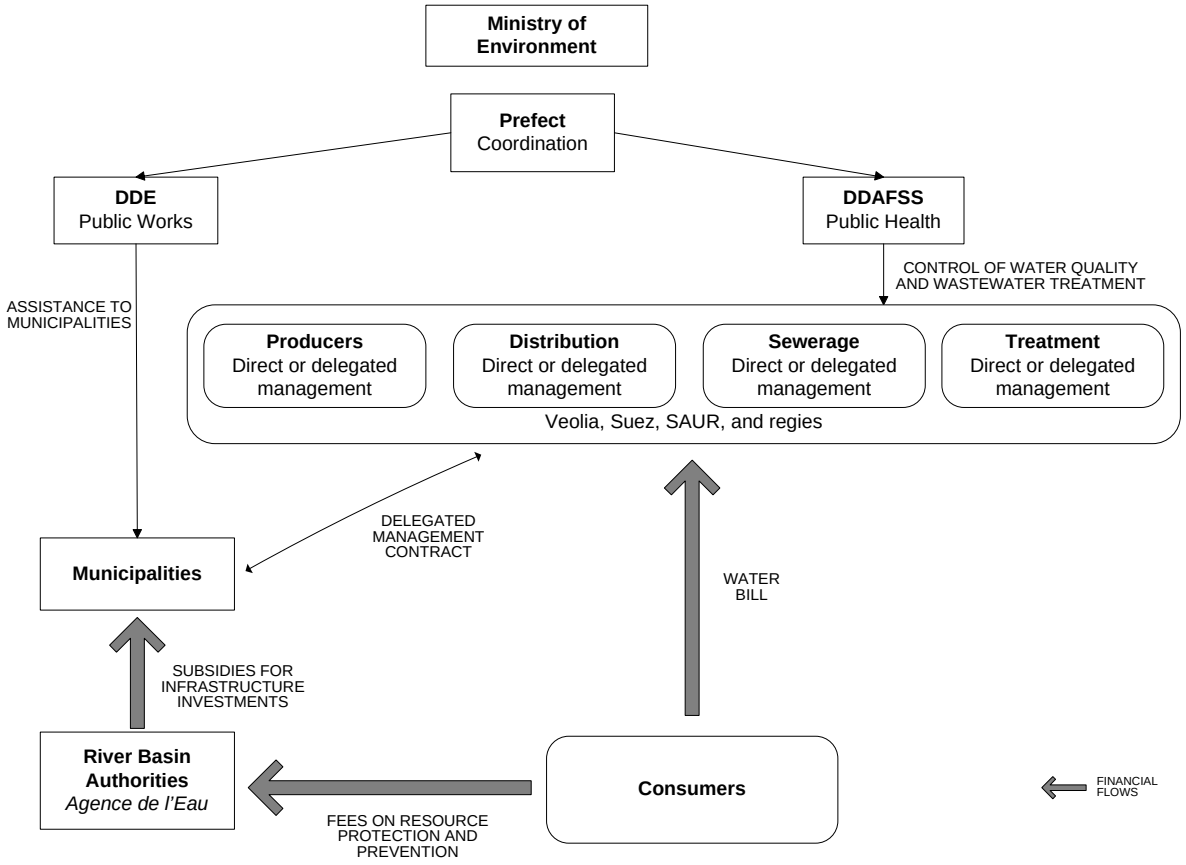
6.2.1 The French model[43]

In France, municipalities (about 36 000) are responsible for the organisation of drinking water supply, and wastewater collection and treatment. A group of municipalities may decide, on a voluntary basis, to team themselves up with inter-municipal cooperation structures: inter-municipal syndicates, municipalities or town communities. Municipalities (and syndicates) have a choice between either directly managing the services of water and wastewater treatment themselves or delegating such management to other specialised firms whilst preserving the ownership of public infrastructures.

The municipality and the management entity are the two main actors in the sector (in direct public management these are the same entity). At the national level, there are different committees and inter-ministerial missions responsible for defining, examining, and coordinating the policies from the different Ministries (Environment, Health, Public Works, and Agriculture). Figure 10 presents the main actors in the French urban water system.

[43] The description of the French Model in this section (6.2.1) is partially based on the Euromarket project, mainly on Deliveries 2 and 4. The main results of the project are published in (Finger et al., 2007).

Figure 10 *Main actors in the water sector in France*



Source: adapted from Finger, Allouche, Luís-Manso (2007)

Main features of the model

Public-Private Partnership

About 75 per cent of the French population is supplied by some form of public-private operation (Renzetti and Dupont, 2003). The most important private companies operating in the water sector are Veolia Environment, Suez, and Saur, which have approximately 8.000, 5.000 and 7.000 municipal contracts, serving 26, 14 and 10 million people in France. About 12 other small private companies operate at local and regional levels. These three companies have become world leaders in the sector.

Public-private partnerships are normally ruled by *different types of contracts*, such as lease (*affermage,* in French), concession, and management contracts. In lease contracts, private firms operate a facility but the municipality remains responsible for investments. In concession contracts, private firms not only operate but are also involved in funding infrastructure rehabilitation and expansion.

More than 80% of the delegated management contracts are *leases*. Therefore, in many cases, the municipalities remain responsible for investments. They can benefit from subsidies on capital investments (Boyer and Garcia, 2002), especially from the River Basin Authorities, which raise revenues from water abstraction and pollution charges. There used to be a National Fund for the Development of Water Conveyance to finance water and wastewater infrastructure in rural areas, but it ceased to exist in 2005.

Regulation by contract

There are two co-existing regulatory governance systems in France. In the first, the sector is regulated through ownership when municipalities remain the operators of the system, and there is no unbundling of the regulatory and managerial functions. In the second, regulation is arranged for in the contract when water services are delegated to the private sector. In this case, water tariffs are fixed in the contract and evolve according to a "cost-plus" formula, which accounts for the evolution of input prices. These tariffs can only be modified through contract amendments that must be approved by the municipal council. There is no regulatory agency for water supply and wastewater treatment.

The French delegation contracts have a strong discretionary element (Gómez-Ibáñez, 2003) because they are based on the *intuitu personae* principle. This principle means that negotiations for the delegation of the service are conducted freely on a bilateral basis between the parties, based on trust. Moreover, the oligopolistic nature of the French water market raised many doubts about the effective degree of competition. For these reasons, during the 1990s several laws were passed to tackle the lack of transparency and competition (*Box 7*).

Box 7 The oligopolistic nature of the sector and main legal instruments

During the 1990s, several laws were passed which had consequences on the sector. Firstly, the *Sapin Law* from January, 29th 1993 focuses on the prevention of corruption and the transparency of public procedures. It states that the award of contracts and their renewal must be subject to competitive rules. Moreover, the local authority has to specify the scope of the work and the conditions in which it sets the objectives in terms of water volumes, prices and service, and to publicly diffuse the information on tenders.

Secondly, the *Barnier Law* from February, 2nd 1995 focuses on the reinforcement of environmental protection, but it also sets new rules regarding contracts between public authorities and private firms. It fixes the maximum duration of contracts at 20 years, and requires management entities to publish an annual technical and financial report and make it available to the public.

Thirdly, the *Mazeaud Law* from February, 8th 1995 on public procurement and delegation of public services limits the possibilities for contract extension. It also allows regional accounting chambers to monitor water services' accounts with the purpose of increasing the transparency of public services.

Most common institutional arrangements

Two types of institutional arrangements co-exist in the UWS in France, namely direct public management, and delegated private management.

In direct public management (*régie*, in French), the local authority is the owner and the responsible entity for investing and operating the urban water systems. The local authority manages the service with its own staff and has the obligation to balance revenue and expenditures. Water services need to have separate accounts. It is common that local authorities outsource part of their services (e.g., billing) - this intermediary case is called *régie intéressée* or *gérance*.

Direct public management arrangements are common in small rural communities. Larger cities tend to delegate their water services to the private sector. Nonetheless, there are also cases of large cities that maintain direct arrangements, such as Strasbourg, Tours, Reims, Nantes, and Amiens.

In delegated private management (*gestion déléguée*, in French), municipalities fully or partly delegate their water services' responsibilities to a private company, through a contract. In the past thirty years, local authorities have increasingly delegated the management of their water supply and wastewater treatment services to private firms. The two most important types of contracts (Elnaboulsi, 2001) are:

1. **Lease** (*affermage*, in French), where the private company rents the facilities from the commune, and is responsible for operation, maintenance, and management of the service. The municipality, which remains the owner of the system, is responsible for capital expenditures for new projects, debt service, tariffs and cost recovery policies. The private company is responsible for operation and maintenance expenditures as well as billing, collecting and financing management work. Leaseholders must pay the municipality a rental fee included in the price of water services fixed in the contract, billed and collected by the private company. Lease contracts are generally set up for a period of 10-12 years. Today, more than 80% of the delegation contracts in water supply and in sanitation are lease contracts.

2. **Concession**, where the private company is responsible for the services including operation, maintenance, and management, as well as capital investments for rehabilitation and expansion works. The firm is remunerated directly by the customers (through the price of the water). The municipality remains the owner of the assets. When a concession contract expires, all works and equipment are returned to the local authorities. Concession contracts are set up for a maximum duration of 20 years (since the Barnier law from 1995).

Conclusion

The French model of water supply and sanitation organisation and management is characterised by the co-existence of direct and delegated management arrangements, with a significant percentage of delegation contracts. These *contracts with private operators* have increased in number because of growing technical standards, which call for increasingly

complex know-how and important investments that municipalities have difficulties dealing with alone.

The majority of the delegation contracts are *lease* contracts, which means that municipalities remain responsible for new capital investments. According to some interviewees, there is an increasing use of lease contracts with concessional clauses, where the private operator has to make part of the investments in the network. The new French Law no. 2006-1772 on Water and Aquatic Environments from December 30 introduces a new obligation which is particularly important in this respect. It states that in the event that a delegation contract transfers the responsibility for renewal or other major works to a different operator, a projected program of works with an estimation of the costs must be attached to the contract.

One of the reasons frequently pointed out to justify the small number of concession contracts in France (as compared to lease contracts) is that public subsidies were normally awarded to public operators. The new Law also tackles this issue by stating that public aid to municipalities or other territorial entities responsible for drinking water and sanitation cannot be given according to the mode of organisation or management of the service.

Finally, one of the main criticisms often made to this type of sector organisation is that there is a certain *inertia and irreversibility* in the actual delegation process (Baert, 1999). Nearly 90% of contracts are renewed to the same concessionaire (ENGREF, 2001). This means that the actual degree of competition tends to be low. The very nature of the competitive process is questioned because even though local authorities are bound by the 'Sapin' Act to launch periodically an invitation to tender, they are not bound to select the final set of bidders or the ultimate winner according to objective and predefined criteria (Yvrande-Billon, 2006). In the following section, a case on delegated management by leasing is presented.

6.2.2 Case-Study 2: Delegated Management by Leasing

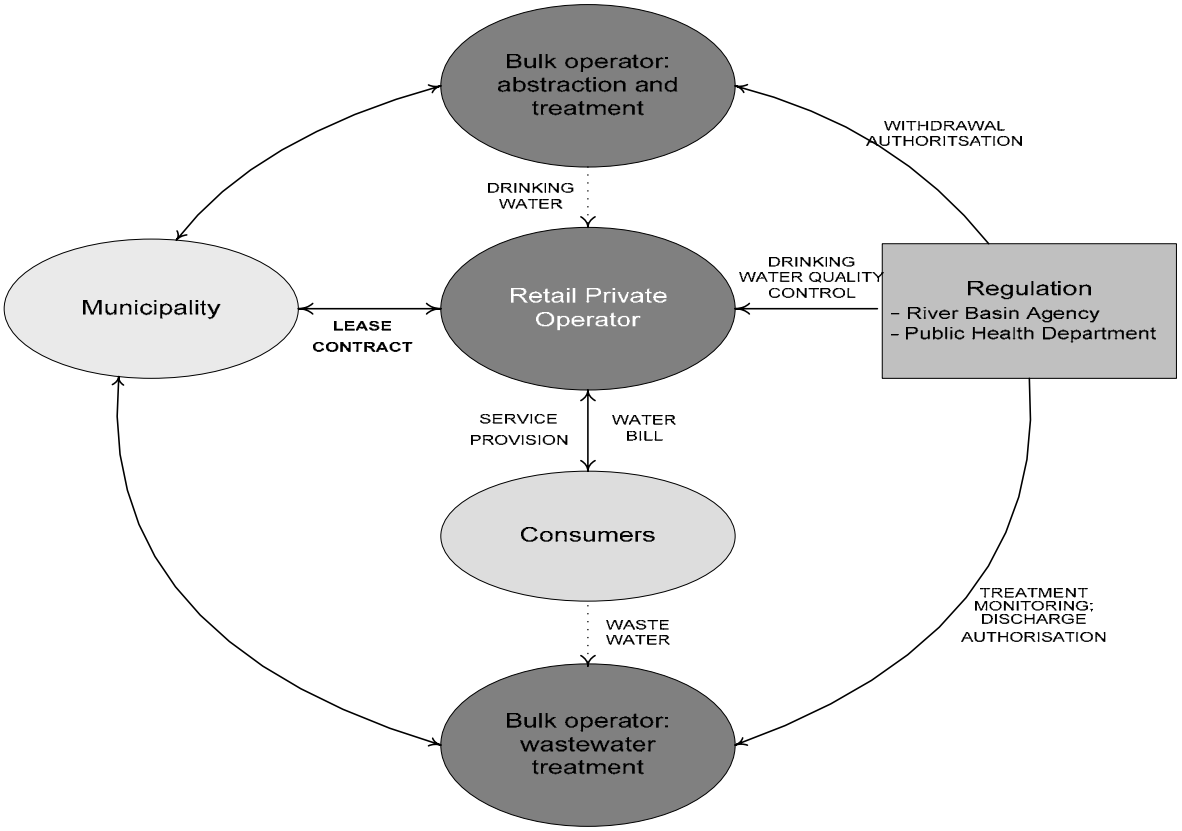
Case-study 2 (CS2) illustrates the most common institutional arrangement in France: delegated management by leasing. It is the *municipality*'s role to define the organisation of the sector in its territory, coordinate the actions of the management entities (in the event that there is more than one in the same territory), define prices, control drinking water standards and, finally, monitor the management entities' performance.

In 1985, the municipality decided to delegate the management of the retail water supply system to a *private operator* for 25 years. The contract was awarded (by direct negotiation) to a wholly owned subsidiary of a large multi-utilities company. The private operator became responsible for the transport and distribution of drinking water to consumers, the maintenance and replacement of water pipes, mains and other equipments in the network, the control of the drinking water quality, as well as billing and customer management.

Prices are defined by the municipality according to the local specificities of the water resources, and the tariff structure defined in the contract. About 38% of the water bill corresponds to drinking water supply, 32% to sanitation, and the remaining 30% to taxes and fees (e.g., to the River Basin Authorities).

The *main actors* concerned by drinking water services include the municipality, the retail private operator, the bulk drinking water operator, the bulk wastewater treatment operator, the River Basin Agency, the Public Health Departments, and consumers (Figure 11).

Figure 11 *Main actors in CS2*



Risk sharing

In the framework of this case-study, the allocation of risks between the actors is quite clear. **Business risks** are taken by the operator, with the exception of demand risks that are shared between the operator and the municipality. As a matter of fact, from the tariffs collected to the customers, the private operator has to pay an additional charge to the municipality. A decrease in water bills means a decrease in this charge, which may jeopardise the funding of capital investments which remains a responsibility of the municipality.

The same risk-sharing pattern between the private operator and the municipality applies for **reform risks**, in particular regulatory and social risks. Firstly, a change or reinterpretation of rules may, on the one hand, modify the operator's revenues or, on the other, call for new capital investment by the municipality (e.g., more stringent environmental standards).

Secondly, the costs to provide the service to the poorest costumers is shared between the private operator and the municipality, by means of special schemes and subsidies targeting households at risk (more details below).

As for **exogenous risks**, the parties to the contract only find environmental/*force majeure* risks relevant, and the private operator is insured against them. There is no international funding or borrowing so exchange rate risks are not applicable. Regarding political risks pertaining to political interferences, expropriation, nationalisation, war or civil disturbs, the operator finds these are irrelevant in the stable political context they operate.

Capital Investments

The private operator is not the owner of the infrastructure and, due to the nature of the contract it is not responsible for new[44] **capital investments** in the system. Nonetheless it has to make capital investments, in order to *modernise* and *replace old infrastructure* and equipment, and to *improve the quality of the service* and the *environment*. The main funding sources are revenues and subsidised loans. In this respect, the operator has received subsidised loans from the River Basin Agency (also called Water Agency) in order to replace lead water pipes.

The municipality remains the responsible entity for new capital investments. Water bills (which are collected by the private operator) are an important source of funding for capital investments. Subsidised loans and direct subsidies from the Water Agency are also relevant, especially concerning investments directly related to water protection and quality.

The main **factors** identified by the actors which put capital investments at risk are the *long amortisation periods* and the *incomplete nature of the contract*. As a matter of fact,

[44] New capital investments appear in opposition to capital investments in maintenance and replacement of old infrastructure.

contracts are not exhaustive in terms of the investment requirements for the private operator.

Universal provision of the SGI

In France, drinking water supply and sanitation services are considered as public services. Being a public service means that there must be equal access for all consumers, and continuity of supply both in terms of quantity and quality. In the CS2 system, access is not a major issue with approximately 99.9% of the population connected to the network. As for drinking water quality, frequent laboratorial analyses attest for its good quality.

Having said this, it is important to mention that according to French Law, water services are public services that have to be supported by the customers. This means that if there are no "good will" reasons justifying the non-payment of the water bill, *the operator may cut the service off*, yet not before notifying and giving the customer an additional opportunity to repay the debts. In this particular case, the operator still informs the customer about all the existing possibilities (and corresponding application rules) regarding special solidarity schemes.

Even though there is no formal social water pricing, the operator has developed *special schemes*, such as debt rescheduling, targeting the customers in financial distress. About 4 per cent of the total customers benefit from these schemes. There is also a special fund jointly financed by the municipality and the private operator, which is specifically dedicated to subsidising the poorest households. The municipality selects the beneficiaries and defines the amount of aid given. The public authorities' intervention is indeed considered by the private operator to be the most important factor guaranteeing the universal provision of the service.

Because water services are considered to be public services, it is not possible to adapt service quality standards to the level of customers' affordability (for example, in terms of volume or hours of access *per* day).

Conclusions

The main feature of this case-study pertains to the *risk-sharing patterns* where the majority of risks are being shared between the partners of the contract, i.e. the private operator and the municipality. One of the main problems pertains to the lack of detail in the contract both in terms of requirements and performance measures, which may create *ex-post* adaptation problems.

The municipality remains responsible for new capital investment. One interesting feature is that part of these investments is subsidised by *funds originally collected in the sector*. It is somehow a form of cross-subsidisation in the sense that all customers contribute to this Fund via water tariffs, which is to be used in areas of greater environmental and quality need.

In terms of the provision of the Service of General Interest, the main issue is *affordability of the service* to the poorest customers. To tackle this problem, the private operator and the municipality work together in putting up special schemes targeting customers at risk.

The main challenge for the future is about *contract renewal*. There was no competition for awarding the present contract. However, the Sapin Law passed in 1993 changed the legal framework and, as a result, the attribution process for contract renewal due in 2010 will differ. According to the new law, the municipality has to publicise and consult potential bidders before the conclusion of the renewal.

The number of agreements leading to a change in operators is rising at national level. However, probability is high that the existing operator is renewed for another term (in 80 to 90 per cent of cases, according to Guérin-Schneider and Lorrain (2003)). This does not mean that there are no effects from competition. If the number of bidders is not limited by the lack of clarity of the award criteria (explained by the prevalence of the *intuitu personae* principle, which exempts the municipality from adopting the selection rule of the best bid) or by the existence of collusion behaviours, the incumbent may reduce its price in order to win the contract at renewal (Yvrande-Billon, 2006).

6.3. Portugal: a hybrid model

Portugal presents yet another approach to the water sector reform, combining public and private sector participation in the management of the systems, as well as regulation by contract and a sector-specific regulator. In this chapter, two case-studies in Portugal are presented. They illustrate the most common institutional arrangements in the UWS after the 1993 reform. But first we will present the Portuguese model for UWS organisation.

6.3.1 The Portuguese model[45]

Traditionally, *municipalities* were fully responsible for the UWS, from drinking water production to wastewater treatment. However, in 1993, significant changes occurred in the Portuguese legislation. Two Decrees defined a new institutional framework for the management of water and wastewater services. According to Decree 372/93, the private sector could participate in these services. Decree 379/93 regulated WSS management, making a distinction between municipal and multi-municipal systems. Between the multi-municipal systems, a further distinction between retail and bulk supply[46] was made.

Also, the *Institute for the Regulation of Water and Solid Waste* (IRAR, in Portuguese) was created to be responsible for the regulation of water and wastewater. As for environmental regulation, five *Regional Directorates for the Environment* (under the control of the Ministry of Environment) delivered licenses for water withdrawals and discharge.

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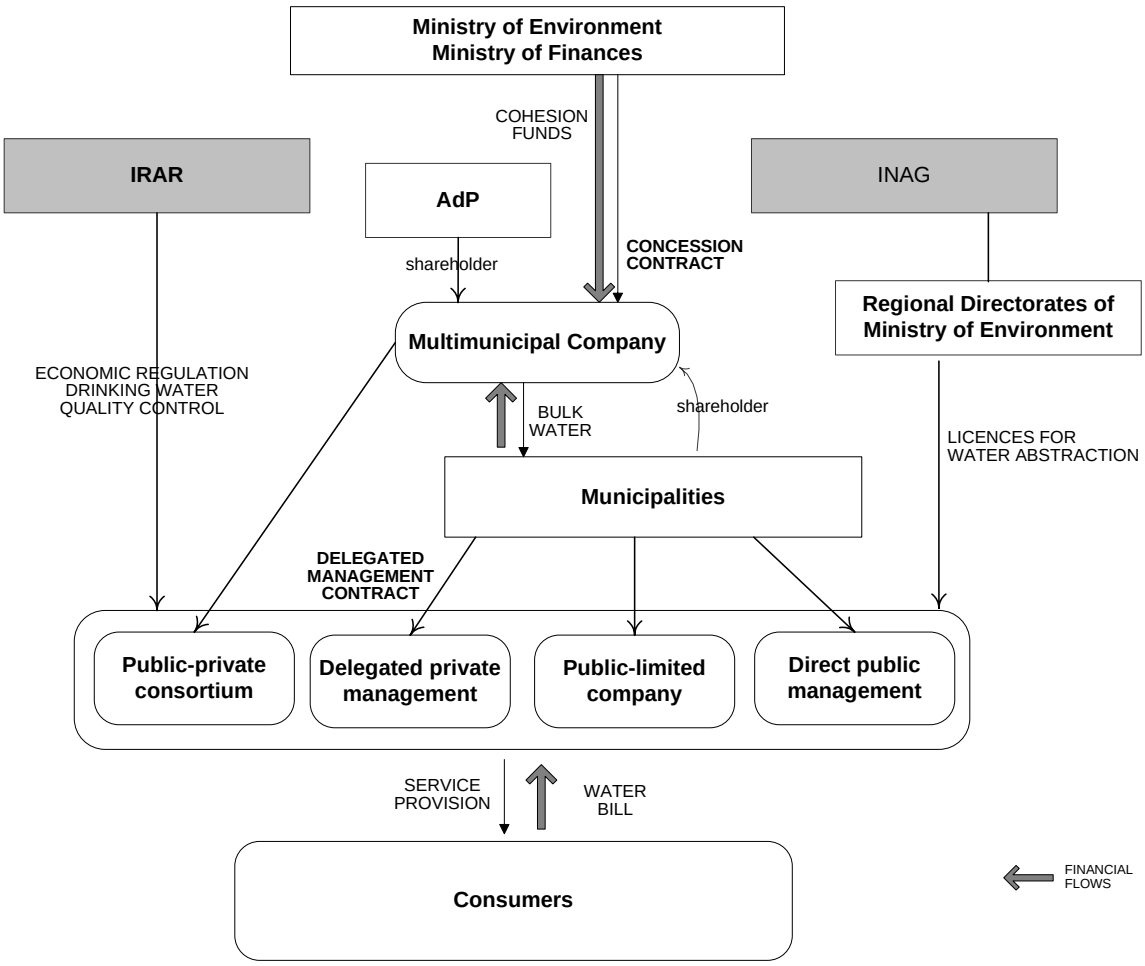
[45] The description of the Portuguese Model in this section (6.3.1) is partially based on the Euromarket project, mainly on Deliveries 2 and 4. The main results of the project are published in (Finger et al., 2007).

[46] Retail activities are denominated "low pressure" activities ("*baixa*" in Portuguese) and refer to water distribution and sewerage services. Bulk activities are denominated "high pressure" activities ("*alta*" in Portuguese) and refer to water production and wastewater treatment.

However, their boundaries did not correspond to water basins and water was only one of their competences. Figure 12 illustrates the main actors in the UWS after reform.

Figure 12 *Main actors after reform in water sector in Portugal*



Source: adapted from Finger, Allouche, Luís-Manso (2007)

Main features of the model

Multi-municipal and municipal systems

Multi-municipal systems "serve at least two municipalities and require investments that are predominantly to be made by the State given reasons of national interest"[47]. The main distinguishing feature of multi-municipal systems is that the State is responsible for capital investments (and not the municipalities). Although initially multi-municipal systems were identified as bulk-supply systems, they can also refer to retail systems.

For each system, a company subject to private law (provided that the public owns the majority stake) is created and is held responsible by the State, under the form of a *concession*, for their operation and maintenance. These concessionaire firms are created by decree, and up to 49% of their shares may be opened to private capital.

A State-owned holding company - *Águas de Portugal*, AdP - was created in 1993 in order to develop the multi-municipal systems. AdP channels European funds, and it is the major shareholder of the multi-municipal companies. The remaining of the shares may be owned by local municipalities or by private capital. Today, besides multi-municipal companies, AdP, through its Aquapor subsidiary, has also won concession contracts in partnership with the private sector to manage municipal systems.

Municipal systems are all other systems, including those managed through an association of municipalities, herein named inter-municipal[48] systems. As a matter of fact, many municipalities are still fully operating their WSS services. Municipal systems may be directly managed by the municipality, or their management can be delegated to a public

[47] Decree-Law 379/93 of 5th November.

[48] Inter-municipal systems are only associations of municipalities and not companies as it is the case of multi-municipal systems.

entity, a private entity, or to an association of users. If the management remains municipal (or inter-municipal), there are different forms of organisation, namely:

- *municipal services*, which deal with WSS but are not specialised structures (they also deal with roads, solid waste, etc.), and have no separate budget;

- *SMAS*, which are structures under the control of the municipality but devoted to WSS. They have their own budget but not juridical status, and the municipality power is still very strong (e.g., on tariffs and loans). Financial transfers between the WSS services and the municipality occur frequently (the principle of cost recovery is not implemented at all);

- *municipal enterprises*, which are new corporate structures, organised as private enterprise but municipally-held. Management rules are more entrepreneurial and there are less financial transfers between municipal and water services' budgets.

Private sector participation

According to Decree 372/93, the private sector can participate in the UWS, namely in contracts for the management of municipal systems, and in the form of a minority stake in the capital of the multi-municipal systems' concessionaires.

The most important private firms operating in Portugal are: CGE-Portugal (owned by Veolia Environnement), AGS (owned by Somague-Environnement), and Indaqua (owned by Mota-Engil, Soares da Costa, and Hidrante). In 2003, about 20 municipalities corresponding to about 22% of the total population had delegated the management of the service. However, if we exclude concession contracts with Lusagua and Aquapor, which are subsidiaries of the AdP public consortium, the proportion of population supplied only by private operators is less than 5%.

IRAR, the sector regulator

IRAR is the regulator for water, sewerage and waste disposal. It is independent from its parent ministry (the Ministry of Environment) since it is financed by operators' taxes.

IRAR regulates concession contracts between multi-municipal systems and the State (about 18 contracts) and also between municipalities and private operators (about 20 contracts). Its powers are giving advice, issuing recommendations, preparing regulations, reporting on the performances of the systems, and supervising the economic balance of the whole sector. The exception is the control of drinking water quality where it was assigned the full responsibility for all water services (and not only concessionaires).

Concerning the pricing policy, IRAR can issue non-binding opinions on tariffs in the concession of multi-municipal and municipal systems. In terms of entry in the market, IRAR issues recommendations about the awarding process of multi-municipal or municipal concessions. As for investment policy, it can issue an opinion about the concessionaires' investment plans. Finally, in terms of the service quality regulation, IRAR proposes regulatory standards and gathers information on quality levels of the services, which is used for comparing the different concessionaires. This information is published regularly and is intended to create competitive pressures through benchmarking.

When compared to other regulatory agencies in Portugal (e.g., for telecommunications and electricity), IRAR has been assigned similar objectives, yet its powers are far less extended (Martins and Fortunato, 2002).

Most common institutional structures

Three types of institutional arrangements co-exist in the UWS in Portugal after reform, namely direct public management, delegated public management, and delegated private management.

Direct public management can only be found in municipal systems. Local authorities directly manage the systems through municipal or municipalized services, and own the

water assets. The tariff structure is decided by the municipal board. The responsible entity corresponds to the management entity. Moreover, municipalities who directly manage their water systems are not subject to IRAR's regulation.

Delegated public management is present in municipal systems (when a municipal company is created) and in multi-municipal systems (when a concessionaire company is created to manage the multi-municipal system). The management entity is the municipal company in the case of municipal systems, and the concessionaire company created by the State in the case of multi-municipal systems. In the latter case, the concessionaire owns the infrastructure during the period of the concession. At the end of the concession the infrastructure becomes the property of the State. In municipal systems the same occurs with the exception that, by the end of the concession, the infrastructure becomes property of the municipality. Finally, in multi-municipal systems, the State is responsible for financing investments. A partial privatisation of the concessionaire (through a minority stake) is seen as a way to diversify financial sources.

Delegated private management is permitted only in municipal systems, where local authorities delegate the management through a bid. It can be a concession (contract with investment requirements for the concessionaire), a lease (contract with no investment requirements for the concessionaire for a maximum period of 15 years), or BOT contracts (when a single facility or a group of assets have to be built). The management entity, in case of delegated management contracts, is the private operator. In concession contracts the responsibility for the provision of the service is held also by the private operator.

The concessionaire has the right to set the tariffs and to demand payment for the respective tariff, yet the municipality must give its prior approval. The tariff's structure is defined in the concession contract. The concessionaire must regularly present investment plans to be approved by the municipality. The concessionaire owns the infrastructure during the period of the concession and at the end of the contract the infrastructure becomes the property of the municipality.

Conclusion

The 1993 reform is changing the way the water sector is organised and regulated in Portugal. The reform looks for efficient trade-offs across different layers and regulatory governance mechanisms. On the one hand, there is a partition of responsibilities between the various levels: the *local* level is in charge of water distribution and sewerage, the *regional* level is in charge of water production and wastewater treatment, and, finally, the *national* level provides and channels funds (from the EU) to multi-municipal systems (when there are reasons of national interest).

On the other hand, there is a *mix of regulatory governance mechanisms*, ranging from concession contracts to the creation of a sector regulator, with coercive powers in terms of drinking water quality and diffusing information in other areas of economic regulation.

The following sections present two case-studies illustrating new forms of organisation resulting from the 1993 reform, namely delegated public management in a multi-municipal system, and delegated private management in a municipal system.

6.3.2 Case-Study 3: Delegated Management by Concession

Case-study 3 (CS3) illustrates a delegated public management arrangement in a *multi-municipal system*. It aims at pointing out the main issues in terms of risk-sharing, and the main factors of vulnerability of capital investment. Because this case refers to bulk activities, the analysis of the vulnerability factors of universal service provision is not made.

The multi-municipal company was created by decree in 2000. The shareholders are AdP, which is the state-owned holding company, the Regional Association of Municipalities, and 15 municipalities.

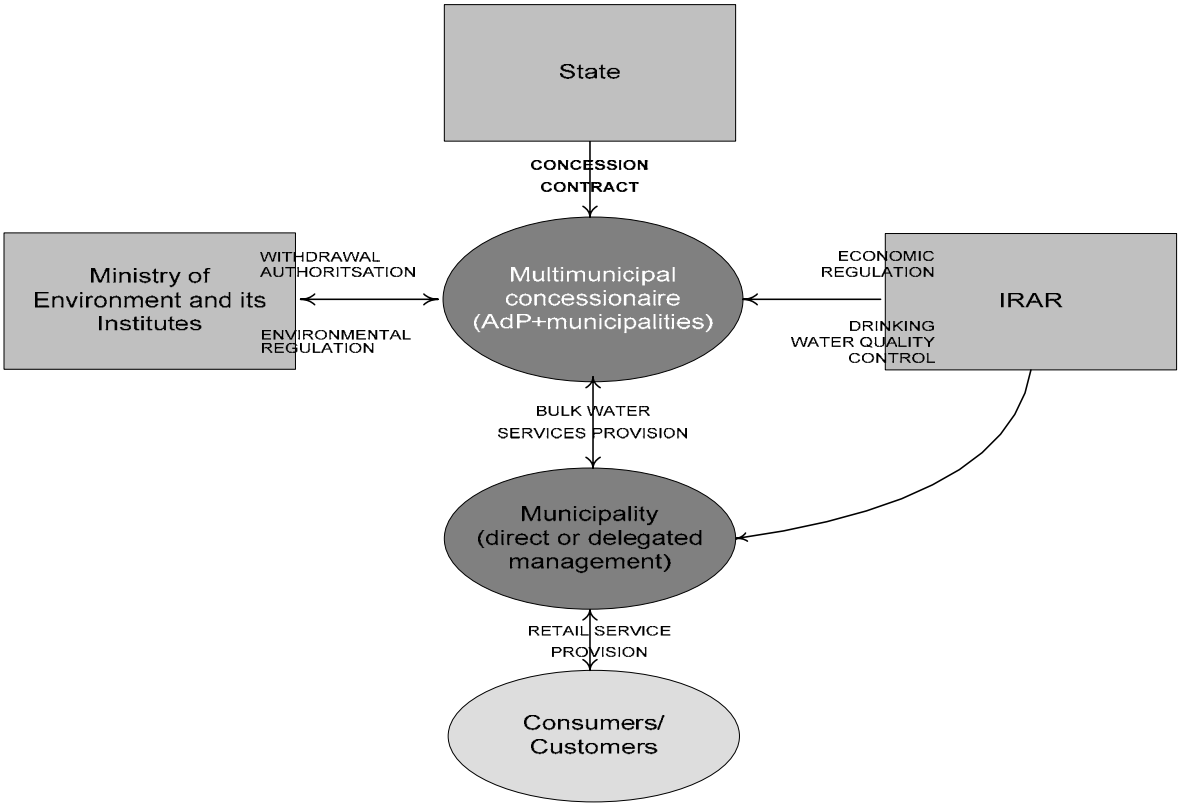
The company was directly awarded a *35-years concession contract* to manage and explore a multi-municipal system comprising 15 municipalities. The contract does not foresee any

financial transfer from the concessionaire to the conceding entity (i.e., the State). All the benefits arising from tariff collection have to be transferred to the supplied municipalities.

The system pertains to *bulk activities*, i.e. drinking water production and wastewater treatment. The responsibility for water distribution and wastewater collection remains with the municipalities. In the majority of these cases, retail drinking water and sanitation services are directly provided by the respective municipalities or by water-specific municipal services. In two cases, water services were delegated to a private/mix operator.

The main actors concerned with water services are the municipalities, the multi-municipal company, customers, IRAR, the Ministry of Environment and its institutes (Figure 13).

Figure 13 *Main actors in CS3*



Risk sharing

The most interesting result from the analysis of this case study is that there is a *strong dispersion of responsibilities* among the different actors. Apart from this general comment, there are three other, more specific, remarks.

Firstly, the concessionaire only bears the traditional **business risks**. And, even for these risks (i.e., construction, demand, operational, and financial), it shares responsibilities with other actors such as the municipalities.

Secondly, **reform risks** are taken by other actors in the system than the concessionaire. Social risks are taken by the municipalities, which are the responsible entities for retail water services. As for regulatory risks, it is interesting to note that they are somehow understated by the concessionaire, because in multi-municipal concessions tariffs are approved following a cost-plus model where shareholders have a guaranteed return-on-investment.

Thirdly, the consumer is identified as the main risk-taker in terms of **exogenous risks**. The main reason is that they bear the costs in terms of higher tariffs, service disruptions, and lower quality of the service resulting from macroeconomic, political, or *force majeure* events.

Capital investments

The concessionaire has an extensive investment plan for the duration of the contract. These investments are mainly **related to** the *expansion* of capacity, especially in the wastewater systems, but also to adapt the systems to more stringent *environmental and service quality standards*. The decrease in *operational costs* is another very important reason justifying capital investments, as pointed out by the concessionaire.

Cohesion Funds and the loans from the European Investment Bank (EIB) represent a significant share in terms of **funding sources** of capital investment. Revenues, equity, and commercial loans are the remaining sources.

There still is an important *dependency on subsidies* to cover part of capital expenses. This dependence is explained by the same facts that were the basis of the creation of the multi-municipal companies. As a matter of fact, these companies were created and awarded a concession in systems with heavy investment requirements, considered to be of national interest. For this reason, they are the privileged recipients of Cohesion Funds.

The concessionaire considers the *lack of financial resources* (including delays in the reimbursement of funds), the risk that *authorities reinterpret* or create new rules affecting the costs and/or revenues, and the *resistance to increase tariffs* as being the most important **factors** increasing the risk of capital investments.

There are also other factors delaying investments, such as the slow process of public interest licences' attribution. These licences are necessary when works in the drinking water and wastewater systems require using private property.

Conclusion

This case-study presents particular features, which somehow *de-characterise* the essence of a concession arrangement. It is true that the concessionaire (for the management of the bulk water systems) is responsible for investing in the infrastructure. Yet, these investments largely depend on funds channelled by the State because they are considered to be of public interest.

The dry-up of these *public subsidies* may jeopardise future capital investments, especially in a context of resistance to increase tariffs. This point is particularly sensitive because the customers (i.e., the municipalities that buy the bulk water services) are also shareholders of the concessionaire.

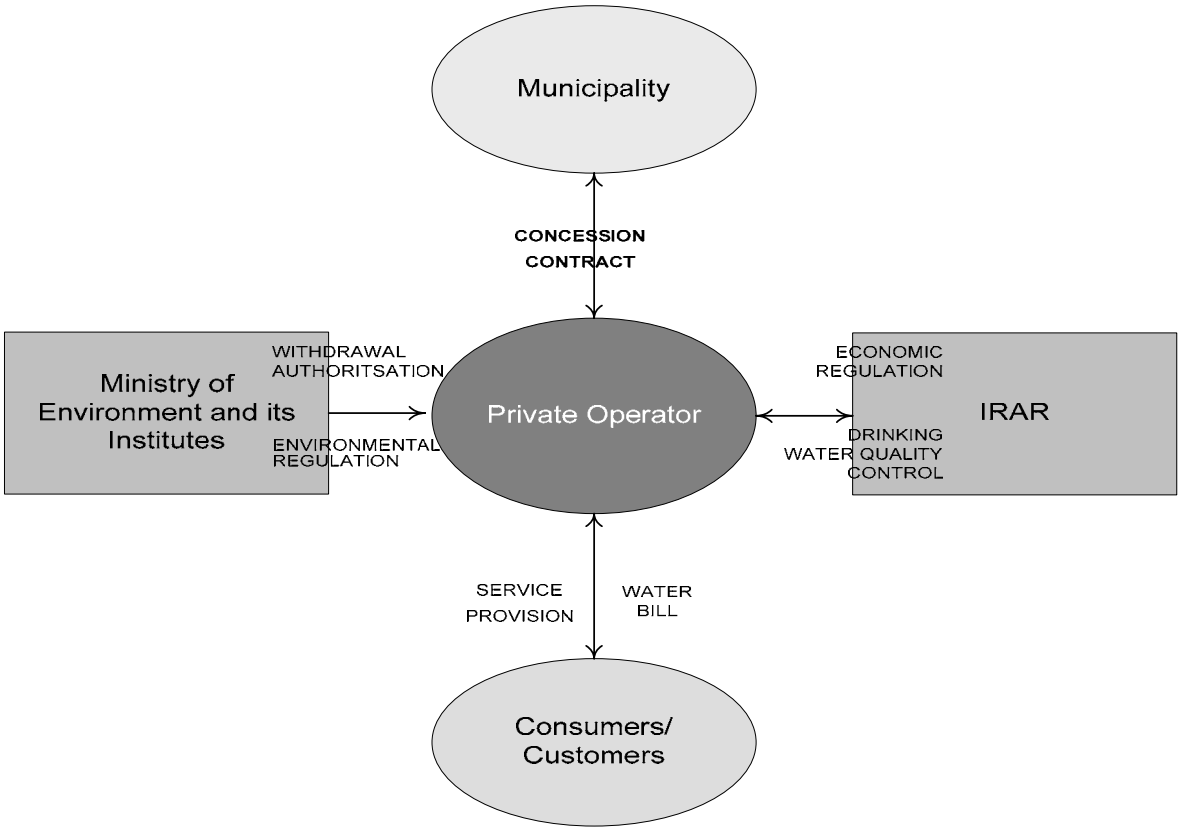
Finally, the *uncertainty* related to the real conditions of the network is not considered relevant because a significant part of the network is relatively new and still under expansion, especially the waste water systems.

6.3.3 Case-Study 4: Delegated Management by Concession

This case-study illustrates a delegated private management arrangement in a *municipal system*. The local council decided to delegate WSS services to a private operator through a competitive tendering process. A private company won the bid and signed in 1997 a *25-year concession contract* with the municipality to provide water services. The company's shareholders are a subsidiary of the state holding AdP (60%) and a subsidiary of a private holding company (40%).

The concession contract comprises the development of all the necessary activities to secure the supply of water services in the entire municipality territory, including the maintenance and conservation of infrastructures. The municipality and the operator are the main actors in the system (Figure 14).

Figure 14 *Main actors in CS4*



The municipality's duties are to approve tariffs according to the tariff structure in the contract, and to approve the investment plans of the operator. As for the operator, it is responsible for the provision of water services, the maintenance and conservation of infrastructures, as well as customer management. The operator pays a fee to the municipality that is supposed to cover *new* capital investments. Other important actors concerned with water supply services include the IRAR and the Ministry of Environment and its institutes.

In the following sections, the main trends on risk-sharing, as well as the most important vulnerability factors of capital investment and universal service provision are presented.

Risk sharing

There is a *strong diffusion of responsibilities* between the various actors in the large water systems, as it is the case in CS3. The main actors bearing the risks are the operator (demand and operational risks), the consumer (financial, regulatory, and exogenous risks), the municipality (construction and social risks), and the State (social, political, and *force-majeure* risks).

It is surprising that, even though it is a concession contract, **construction risks** are taken by the municipality. A closer look at the contract shows that new works pertaining to the extension of the systems to connect new users, as well as new investments required for respecting sanitary and environmental rules, are the responsibility of the municipality.

In terms of the **risks created by the reform**, the same fact explains that *regulatory risks* are also taken by the municipality and, ultimately, by customers through higher tariffs. As for *social risks*, they are jointly born by the operator, the municipality, and the State, which cover the special mechanisms to help financially-stressed consumers.

Regarding **exogenous risks**, in particular *exchange rate*, *political*, and *environmental risks*, the operator has the expectation that higher costs are covered by higher tariffs. However, this may not be the case if the customers' unwillingness to pay for higher tariffs limits

increases in the water bill. Exogenous risks are also taken by the State, which ultimately has to guarantee the public service. The operator highlighted the rising importance of environmental risks, especially due to climate change and its consequences in terms of water availability.

Capital investment

According to the contract signed between the municipality and the new operator, the concessionaire is responsible for maintaining and repairing the water mains and pipes as well as the systems' infrastructures, including the good functioning of electrical, electronic, mechanical and electromechanical equipments. However, new capital investments remain the responsibility of the municipality. This *drains* the substance of the concession and it gives the contract the characteristics of a leasing.

New capital investments justified by the expansion of the service or by new environmental or sanitary legislation are to be defined and specified by the concessionaire, yet they remain the responsibility of the municipality (which has to cover the costs). In some of these cases, the municipality may directly award the execution of works to the concessionaire.

In this context, the main **reasons** justifying capital investments by the operator are *modernisation* of equipments and infrastructures, reduction of *operational costs*, and improvement of the *quality of the service* (mainly reliability).

Revenues and commercial loans are the most important **funding sources** for the concessionaire's investments on capital. On the municipality side, capital investments are funded by the payment made by the concessionaire, but there is also a strong dependency on European funds. The lack of funding sources for capital investments is identified as the most important factor putting capital investments at risk in these systems. The concessionaire has often expressed dissatisfaction about the late execution of investments by the municipality.

Universal provision of the SGI

The provision of drinking water and sanitation services is the responsibility of the concessionaire. The coverage rates are particularly high, namely 99% and 95% of the population for drinking water and wastewater treatment, respectively.

It is part of the consumers' rights to be provided with good quality water services that have no service disruptions. The regular control of the quality of the water provided in the system is in accordance with the Quality Monitoring Program approved by IRAR, the regulator. About 99% of all the laboratory analyses conducted in the first half of 2007 respect the standards fixed by law (Law-decree 243/2001). The cases where the results did not respect the legal values were analysed in detail, and it was concluded that these were one-off cases that did not persist in subsequent controls.

There are *different tariffs* for drinking water according to the types of consumers, namely domestic, commercial and industrial, non-profitable organisations, State, and local authorities. As for the sewerage and sanitation tariffs, they should at least cover the maintenance costs of the infrastructure, as well as specified fixed costs. The tariff is defined according to drinking water consumption volume and type of consumer.

The concessionaire may negotiate drinking water contracts with special tariffs, as long as every customer under the same circumstances may benefit from the same conditions (that is, it cannot be discriminatory). In exceptional cases, very *low-income households* may benefit from a highly subsidised tariff (funded by the concessionaire revenues). The Social Security Services need to attest the very low-income level of these households.

It is possible by law to *cut off service provision*, in particular due to non-payment, as long as the customer is previously informed and is given the opportunity to repay its debts. In special cases, customers may be authorised to reschedule their debts and pay them off in six months maximum.

Conclusions

At first, this case-study was meant to illustrate delegated management by concession. The available documentation makes several references to the signature of a concession contract between the concessionaire and the municipality. However, a closer look at the contract clauses shows that the municipality is responsible for more risks than it would be expected in a concession, in particular construction and regulatory risks. As a matter of fact, the municipality remains responsible for capital investments in the expansion of the infrastructure and its capacity, as well as those due to new environmental and sanitation standards.

The new capital investments are funded by the fee that the concessionaire pays to the municipality, but this does not cover the totality of the costs and the importance of *European funds* is highly acknowledged.

There are high coverage rates both in terms of water supply and sanitation with satisfactory drinking water quality results. From the interviews it became clear that *cross-subsidies* (mainly volumetric and across types of consumers) are widely used. Even though it is permitted by law to cut off the service due to non-payment, there are several mechanisms to protect low-income customers. The most important are: (1) special tariffs for the lowest-income households, and (2) special payment schemes for customers in financial distress.

6.4. Mozambique: under the influence of the World Bank

Mozambique is a country of 18 million inhabitants in Southern Africa. It is considered as one of the poorest and most indebted countries in the world, resulting among other factors from a 17 year-long Civil War that lasted until 1992. The existing water supply infrastructures date back to the 1960s and 1970s. These systems need both maintenance and expansion, but there is a general lack of funds to do so. There is a low and, in some cases,

non-existent coverage in terms of water services. Moreover, tariffs are normally very low, and there is a high level of uncollected revenues.

In 1995, the Council of Ministers issued a Resolution defining a National Water Policy. The design of the Policy was assisted by the *World Bank* (WB). Moreover, numerous donors set their own preconditions before contributing to investments. The proposed programmes emphasized in particular the need for decentralisation and private management of the urban water system (e.g., IMF, 1998). The following section presents the Mozambican model in more detail.

6.4.1 The Mozambican model[49]

According to the National Water Policy, water resources management must be *decentralised* to autonomous entities, at the water basin level, and water services to the provincial level. Moreover, the Government is to withdraw from the delivery of the services and focus exclusively on defining priorities, guidelines, and the minimum levels of service provision. This Policy also mentions the participation of the private sector in the provision of water supply and, furthermore, it stipulates that water prices should reflect its economic value.

In 1998, the **Framework for Delegated Management** (FDM) gives effect to the principle of decentralisation and establishes delegated management (Decree No 72/98). It recognises that water supply is inefficient and that it thus needs restructuring. The Framework is a coordinated set of entities and legal mechanisms that structures the participation of firms under private law in the provision of water supply services.

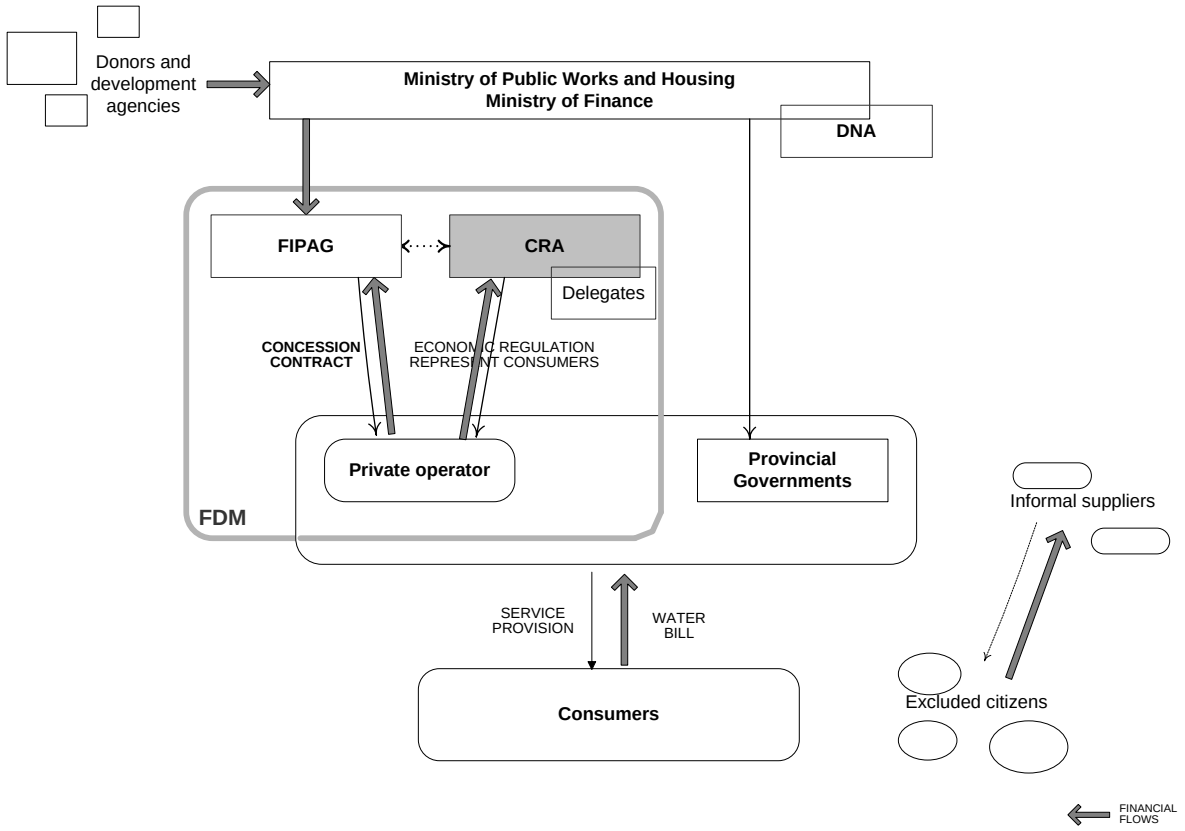
The reform of the sector creates two different types of systems. The first type includes the systems under the Framework for Delegated Management, mostly for major urban cities.

[49] This section is partially based on (Luís-Manso and Finger, forthcoming).

The assets and the responsibilities for service provision are transferred to a newly created public fund (FIPAG), which is in charge of delegating the management of these systems to private operators. The second type refers to the remainder of the territory and results from the decentralisation of water system responsibilities to provincial authorities.

The most important *actors* participating in the sector are illustrated in Figure 15. The Ministry of the Public Works and Housing is responsible for the overall policy formulation, rule making, and promotional activities in the sector. Its agency, the National Water Directorate, is responsible for strategic management of water resources, the implementation and extension of the Framework for Delegated Management, as well as the mobilization of financing resources.

Figure 15 *Main actors in the water sector in Mozambique*



Under the Framework, two important entities are created. Firstly, the Investment and Assets Fund for Water Supply (**FIPAG** in Portuguese), which is the public owner of the water supply assets under delegated management. Secondly, the Water Regulatory Council (**CRA** in Portuguese), which is the sector regulator and, as such, is responsible for regulating the water supply services, as well as for guaranteeing the interests of the users who fall under the delegated management framework. In addition, there are Municipal Delegates, who are local representative of the CRA, have the role to maintain communication links with local authorities and consumers, as well as to identify consumers' needs and areas at risk. The following section presents the main features of the model created by the Framework for Delegated Management, which are delegated management and private sector participation, as well as the creation of FIPAG and CRA.

Main features of the model

Delegated management and private sector participation

FIPAG is the only empowered entity to sign delegated management contracts with a private operator. The largest urban water systems in the country are already under the Framework of Delegated Management, and a series of *management* and *lease contracts* were already signed with a private operator. They last 5 and 15 years, respectively.

It was decided that a single international bidding process was to be done and that the winner consortium would sign different contracts in five different urban water systems (for reasons explaining this decision, see Ricketson, 1998). Lately, four other cities were included in the same framework and new contracts are being negotiated.

Initially, the process of delegation has had some drawbacks, especially when the lead participant abandoned the private consortium during the first years of the contracts. Nevertheless, the negotiations between the remaining partners and public authorities resulted in the signing of new contracts, which was considered a success due to the difficult context of the country.

FIPAG

FIPAG is a public body assigned with the authority to represent the Government as a partner to the contract. FIPAG is also the *owner* of the assets under the Framework for Delegated Management. It is responsible for planning and implementing investment programs in these water systems, including rehabilitation and expansion, for contracting private companies to manage services, and for monitoring the private operators. FIPAG also has operational responsibilities in the case of management contracts.

The main challenge for FIPAG is that it does not have the ordinary characteristics of an investment fund, which may deviate the Fund from its important functions of evaluating investment needs and gathering the necessary funds. It actually plays the role of both operator (for management contracts) and lessor (for lease contracts).

CRA

CRA is a national public entity with financial and administrative autonomy. Its main functions are *economic regulation* (namely to approve tariffs proposed by FIPAG and to guarantee the sustainability of the system), consumer protection, mediation between the partners of the contract, and advice to the Government (e.g., in term of contract design and operator's activities).

The main challenges for CRA pertain to the fact that its decisions are not binding, except for tariffs, and the existence of an overlap of responsibilities with FIPAG when it comes to monitoring operators' performance and to guarantee the sustainability of the system.

Most common institutional structures

The legal framework for the water sector in Mozambique foresees two types of institutional arrangements, namely direct public management and delegated private management.

Direct public management

According to the National Water Policy, the management of water services has to be decentralised to provincial authorities. This is especially the case in smaller towns and rural areas, where provincial governments become responsible for providing water services to the population.

Because these systems do not belong to the Framework of Delegated Management, the authorities are not entitled to delegate the management to a private operator (only FIPAG is). However, there are other types and degrees of private sector participation. For example, local provincial governments are increasingly contracting out specific tasks to local private firms (normally via service contracts). Due to the same reason, the operators of these systems are not subject to the rules of the regulator, whose jurisdiction is limited to the systems under the Framework.

Delegated private management

Under the Framework for Delegated Management, assets are transferred to FIPAG (and not to municipalities), which becomes empowered to delegate the management to private operators. FIPAG can sign concession, lease and management contracts. In practice, there are only two types of contracts: lease and management contracts.

Under *lease* contracts, the private operator is responsible for operating and maintaining FIPAG facilities, billing and collecting tariffs, at its commercial risk. The operator retains part of the tariff, and has to pay a fee to FIPAG and to CRA.

Under *management* contracts, the operator is responsible for operating and maintaining FIPAG facilities, and for billing and collecting tariffs on behalf of FIPAG. Customers are under contract with FIPAG and not the private operator. The private operator receives a management fee, part of which is linked to the operator's collection performance.

Conclusion

The example of Mozambique illustrates the case of a water sector reform in a developing country facing important financial constraints to improve its water systems and serious water-related public health problems.

The Mozambican water sector reform was heavily influenced by *international development agencies* and donors, and occurred in an almost complete regulatory void. To recall, the creation of an independent regulatory agency and the development of its regulatory capacities were only done *ex-post*, i.e., after the main delegated management contracts had been designed, which created inefficiencies in the regulatory activity.

Two important outcomes of reform are *decentralisation* and *delegation of management*. The responsibility for water provision is increasingly being delegated to the provincial level, without however simultaneously delegating the ownership of the infrastructures, and the corresponding allocation of the required financial means. The decision to delegate the management can only be taken by the government, by allocating the system to the Framework of Delegated Management. We are therefore in the presence of two completely different regulatory governance mechanisms. The following section illustrates a case of delegated management.

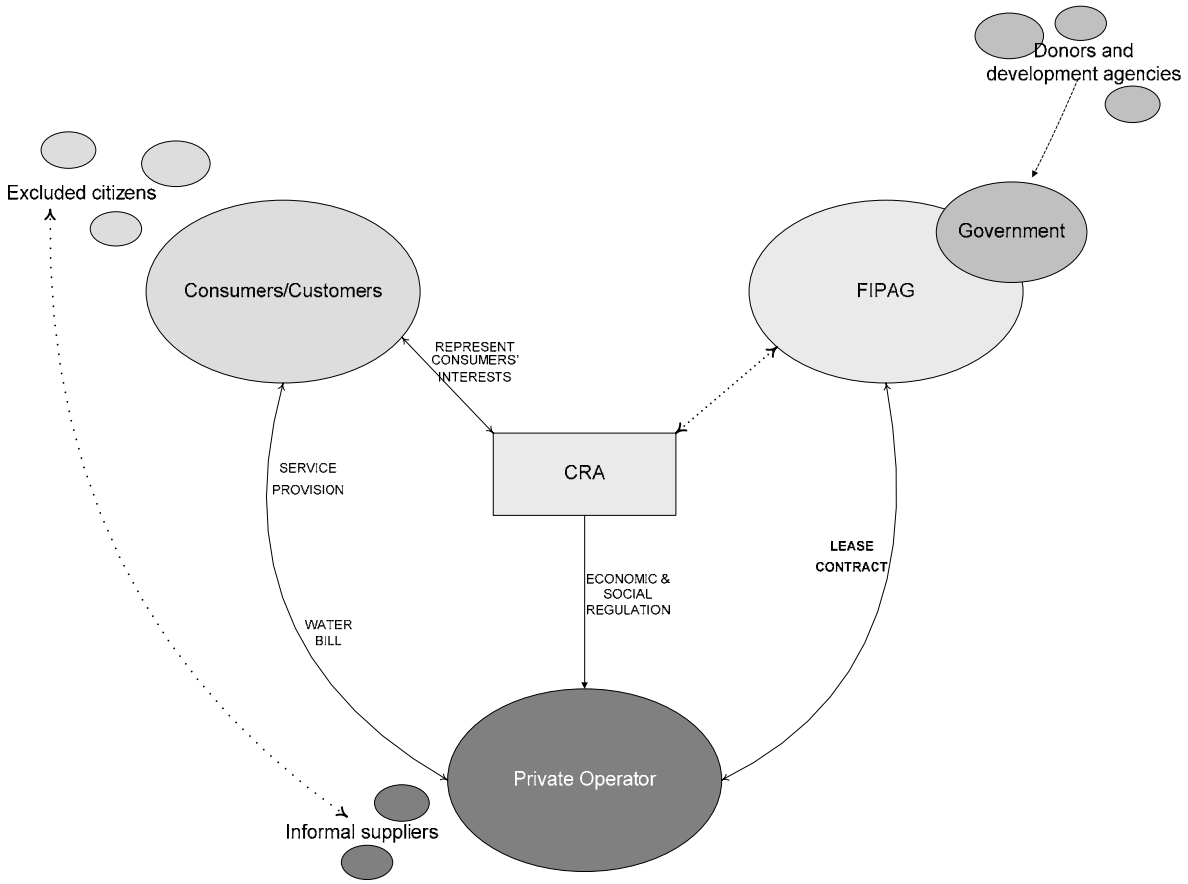
6.4.2 Case-Study 5: Delegated Management by Leasing

This case-study illustrates a delegated management arrangement by leasing in Mozambique. After an international competitive tender, a 15-year *lease contract* was awarded to a single private consortium, composed of national and international companies. All infrastructures and water assets remained under public ownership, more precisely owned by FIPAG.

The private firm is responsible for operating water supply facilities, conducting specified renewals and extensions (acting as a contractor to FIPAG), and billing and collecting customers' tariffs (at the firms' own commercial risk). Part of the tariff is used to pay rental

and regulatory fees to FIPAG and CRA, respectively. The main actors in the system are presented in Figure 16.

Figure 16 *Main actors in CS5*



Following the same structure of the previous case-studies, we now focus on risk-sharing, capital investment, and universal provision of the water supply services.

Risk sharing

In the context of the lease contract signed between the private operator and FIPAG, there is a *clear risk-sharing pattern* between the partners in terms of **business risks**. The private operator runs the business at its own demand, operational, and financial risk. As for FIPAG, which is the asset owner and the responsible entity for capital investment, it bears the construction and investment risks. However, a considerable part of these risks is

transferred to tax-payers because tariffs do not cover the totality of capital investments, and the loans from multilateral development agencies are repaid with the public budget. Ultimately, the poorest and most vulnerable groups in society bear these risks because efforts (and aid) are diverted to pay the debt.

Regulatory risks are shared between the partners of the contract. The risk pertaining to the reinterpretation or creation of rules affecting current costs (or revenues) is borne by the private operator, while those affecting capital costs (or revenues) are borne by FIPAG.

The major problem in this water system pertains to **social risks** because poor sectors of the population are taking all the costs which translate into no access or poor water quality. As a matter of fact, less than 50% of the population is connected to the network and benefits from water services. Despite the joint effort from all stakeholders to provide drinking water to all through public fountains, there is still a long way to go.

Exogenous risks, apart from exchange rate risks that are taken by the operator, are shared between the partners of the contract. As the first years of the contract show, *force majeure* risks pertaining to weather events are particularly important due to the strong vulnerability of the systems and the population. Ultimately, it is the poorest citizens that suffer the most because they have no alternative sources of reliable drinking water supply.

Capital investments

FIPAG is the responsible entity for **capital investments** in the systems under delegated management, as it is the case of this one. Its autonomy and responsibility includes the financial and investment management for the rehabilitation and expansion of water assets, as well as the maximization of existing assets' efficiency.

The main priority of the system is to increase service coverage rates. Therefore, the main **reasons** justifying capital investments are capacity *expansions* and *modernization* of old assets and equipments.

The *lack of financial resources* is the most important **factor** increasing the vulnerability of capital investments. As a matter of fact, there is a heavy dependence on international aid, with capital investments being mainly funded by capital grants provided by cooperation aid and subsidized loans from multilateral development agencies.

The uncertainty of the conditions of *underground assets* is another factor increasing the vulnerability of capital investments. It is important to remember that a significant part of the existing network was built before the country's independence (mainly in the 1960s and 1970s).

Finally, stakeholders also identify *regulatory risks* as being a very important factor affecting decisions about capital investments. There are mainly two reasons for this. Firstly, it is the regulatory agency that approves final prices and proposes new areas for expansion of the network (i.e., influences investment plans). Secondly, it is not clear in the existing regulatory framework who the responsible entity for the infrastructure expansion plans and investment programs is, as these responsibilities are shared between CRA and FIPAG. This can create inefficiencies and conflicts, which so far have only been avoided because the heads of both entities have had the good will to cooperate. However, a change in the composition of the boards in any of these two entities may jeopardise the established equilibrium.

Universal provision of the SGI

Only 43% of the population is provided with water supply services. Together with an even lower access rate to adequate sanitation, it makes the levels of mortality due to water-born diseases in the region very high. The situation is particularly serious in peri-urban areas, where the population growth is high. *Access rates are low* due to scarce capacity (i.e., the infrastructure is not developed) and non-affordability reasons.

For the population that has access to the network and that is served by the private operator, operational costs are covered by the *tariffs*. Tariffs are volumetric and differ according to

the type of consumers, namely domestic, commercial, industrial, and public. The private operator may cut off the service due to non-payment.

As for the remaining population, there is a great dependency on *informal markets* and public fountains, which are a way to provide safe drinking water services to populations in areas which are not served by the household network. The problems with informal markets are the quality of the water provided and the consequent risks it poses in terms of public health.

Since the signature of the lease contract, several partnerships were developed between FIPAG, the private operator, the regulator, the municipalities, NGOs, and the local population in order to improve the management of public fountains, in particular by increasing the participation of local communities. *Public-private-community partnerships* are considered to be the only viable solution to solve the master challenge of providing drinking water services to the poorest citizens.

The main recommendations in terms of public fountains management defined by such partnerships are: (1) to implement a commercial attitude for the management of the public fountain; (2) to put an efficient monitoring scheme of the fountain's operator into action; (3) to set a lower water price for public fountains than the price of informal markets; and (4) to involve the local community in deciding on the payment schemes.

Conclusion

This case-study illustrates a reform process heavily influenced by the *World Bank* and international donors, as it is the case in other developing countries. The reform envisaged decentralisation, delegation of management, and private sector participation. Following an international competitive bid, a private operator was selected as a partner to a 15-year lease contract.

The *framework* implemented to delegate the management to the private operator is singular, with a national public entity owning the assets and being responsible for gathering the necessary funds for capital investments, which is at the same time the lessor to the contract.

The main *positive aspects* of this case are the self-sustainability of the existing system in terms of operations and management (that is, the private operator does not receive any subsidies); there is a good balance of powers (and understanding) between the different institutions in the Framework; and the private operator is presently taking responsibilities in other urban water systems in the country, although with fewer responsibilities and risks.

On the contrary, there are also important *drawbacks*, which may not be related to the organisation of the system but need to be taken into account. One is that a significant part of the population is excluded from drinking water services. The other is that due to serious financial constraints in the country, there is a strong dependency on public aid and subsidised loans from development agencies, especially for funding capacity expansions.

6.5. Comparative analysis and concluding remarks

The cases presented in this chapter show that **reform is a reality in several water systems**, with changes ranging from the introduction of competition to private sector participation (PSP), and the creation of regulatory agencies. It is important to emphasise that although reform is a reality in all these systems, it differs significantly from case to case (Table 13).

The degree of *private sector participation* differs considerably across countries, from the total transfer of management rights and asset ownership to the private operator in England, large-scale participation of private operators in delegated management contracts in France and, increasingly, in Mozambique, to limited participation in multi-municipal companies in Portugal. In all countries but England and Wales, asset ownership is public.

It is worthwhile to mention that an important part (not to say the majority) of the private sectors operating in the three European countries is national. Although French TNCs are present in Portugal, there is also a strong presence of Portuguese private groups in

managing the sector. On the contrary, the shareholders of the private operator in Mozambique are mainly owned by a foreign company.

As for the *type of competition*, there has been an effort to introduce competition for the market in France, Portugal, and Mozambique. However, the *intuitu personae* principle in France, the direct award of concession contracts in multi-municipal systems in Portugal, as well as the direct award of management contracts in the most recent cities joining the FDM in Mozambique have limited its implementation.

In England and Wales, there is no competition for the market but, in contrast, there has been an effort to introduce effective market competition (but only for customers who are likely to buy more than 50 mega litres of water a year). However, the English system relies mainly on comparative competition, by including operators' performance information in the price control regime. The Portuguese regulator also performs benchmarks but its activity is limited to the operators under delegated management contracts. Moreover, prices are fixed in the contracts and do not depend directly from benchmarks.

In three of the four countries analysed, a *regulatory agency* was created at the time of reform, namely OFWAT in England and Wales, IRAR in Portugal, and CRA in Mozambique. Their attributions differ both in terms of area of influence and coercive powers. OFWAT is unquestionably the regulator with more coercive and discretionary powers, and its authority is extended to all water systems in the country. As for IRAR, its coercive powers are limited to drinking water quality controls. In terms of economic regulation, its powers are more restricted and its authority is limited to systems under concession contracts. Finally, CRA has coercive powers in terms of price, however and similarly to IRAR, its authority is limited to the systems under the Framework for Delegated Management.

Table 13 *Comparison of sector reform features across case-studies*

Country	***Private Sector Participation***	***Assets Ownership***	***Type of competition***		***Regulatory Governance***		***Special features***
			For the market	***Comparative***	***Regulatory Agency***	***By contract***	
E&W	√	Private (operator)		√ +	√ +		(Effort to introduce) competition in the market
FR	√	Public (local authority)	√ -			√	*Intuitu Personae*; TNCs
PT	√	Public (local authority)	√ -	√ -	√ -	√	Bulk/retail separation; 2 different systems: municipal and multi-municipal; Cohesion Funds
MOZ	√	Public (provincial authority or FIPAG)	√ -		√ -	√	2 different systems: in or outside the FDM; World Bank

Legend:

E&W	England & Wales		
FR	France	√	Yes
PT	Portugal	√ -	Yes (with limits)
MOZ	Mozambique	√ +	Yes (with strong powers)

Apart from the creation of a sector specific regulator, *regulation by contract* is also a common mechanism of regulatory governance in the water sector. It is interesting to note that in two of the analysed countries, namely Portugal and Mozambique, the two regulatory governance systems coexist[50].

The comparison of the reform features across the different case-studies has already anticipated the fact that there is a large **diversity in terms of institutional arrangements**. Except for the English case where there are only direct private management arrangements, in all other countries different arrangements co-exist (Table 14).

Table 14 *Types of institutional arrangements across case-studies*

Country	***Direct Public Management***	***Delegated Public Management***	***Delegated Private Management***	***Direct Private Management***
England & Wales				
France				
Portugal				
Mozambique				

Legend:

 Co-existence of different types of institutional arrangements

 Only one type of institutional arrangement

In *France*, the local authorities may choose whether to directly manage the water systems or to delegate it to a private operator. Delegated private management contracts are mainly leases with a relatively long duration.

[50] Although in practice this is not very common.

In *Portugal*, in municipal systems, the local authority may choose whether to directly manage the system or to delegate it to a public or private operator. In multi-municipal systems, the management is delegated to a publicly-owned company where private partners can only have minority stakes.

Finally, in *Mozambique* there are also two types of systems. In the systems under the FDM, the management is delegated to a private operator, while in the systems outside the FDM the provincial authority is increasingly becoming responsible for the management of water systems.

Risk-sharing patterns differ from case to case. When there is a *contract*, it is quite clear that partners share the majority of the risks. Problems arise when unpredictable or uncontrollable events (e.g., exogenous risks) jeopardize the established balance between the partners. This is aggravated the more incomplete the contract is.

In the case of full *divestiture*, the private operator bears the majority of the risks alone, but ultimately it expects to transfer the extra costs related to these risks to the customer. However, the transfer depends upon the regulator's perception of the reasons creating these risks, in particular whether they are endogenous or exogenous to the operator. This makes regulatory risks particularly important for the main risk bearer in the system.

Social risks are very significant in the developing country case because they are mainly borne by excluded consumers, with all the consequent public health costs. The risk that the service of general interest is not provided to all is aggravated by exogenous risks due to the high vulnerability of the water systems as well as the consumers. Considering that most cities in developing countries already have pressing needs in terms of water services, the expected growth rate of (peri-)urban population for the coming decades (UNFPA, 2007) will only aggravate the problem.

Capital investments and the universal provision of the service of general interest were identified in Part II as being the main elements at risk because of the sector's reform. From the case-studies, one can say that *regulatory risks* are a particularly important factor

increasing the **vulnerability of capital investment**. The decisions regarding the definition of tariffs and the approval of investment plans (OFWAT in England and CRA in Mozambique), the implementation of more stringent standards (the European Union), the large discretion of local authorities (France), and the overlapping of functions between entities (Mozambique) do actually affect the decisions, the need, as well as the returns on investment.

The *dependency upon subsidies* and public aid for the expansion of capacity follows next in terms of factors increasing capital investment vulnerability in the case-studies, especially in France (public subsidies), Portugal (European Funds), and Mozambique (Multilateral Development Agencies and international donors).

The exception is the English case, where private operators do not benefit from any subsidy. However, one cannot neglect that in Europe, as is the case in other developed regions, the process of developing the infrastructure network has taken one or two generations. It was highly subsidised by public funds and across regions (from urban to rural areas), and it benefited from long periods of economic growth.

Today, the implementation of *full-cost recovery* policies in developed countries mainly refers to operational, maintenance and rehabilitation costs, and not capital costs (into new infrastructure). Therefore, one has to question the request to implement full-cost recovery policies (including recovery of capital costs) that is often made for developing countries, where the population has typically lower ability to pay for the services.

Amortisation periods and *contract duration* do not come out as key factors in the case-studies because there are no real concession contracts. In all the examples considered, the operators have no responsibility related to financing and materialising capital investments.

As for the uncertainty related to the conditions of *underground infrastructure*, this is only considered as relevant in the cases where responsibilities are transferred to a different entity

(e.g., the private operator) and assets are not new (such as the English and Mozambican cases).

In terms of the **vulnerability of the universal provision of the SGI**, one has to distinguish two cases: non-provision of the service due to non-capacity of the system (calling for a need to expand the system) or to non-affordability of the service.

In the case-studies in Europe, risks are that customers *cannot afford* the water bill. However, in all the cases there are specific schemes funded by the operator (via cross-subsidies) to aid customers in financial distress or direct public subsidies to the poorest consumers.

The situation is more acute in the case of Mozambique, where non-provision is due to *non-affordability* but also to *non-capacity* of the system. A network of informal suppliers provides non-regulated services with significant quality and reliability limitations, which potentially pose public health problems. In this situation, the problem of non-provision of the service coincides with the lack of capital investments in the system.

Finally, it is important to identify the main **challenges of regulation** across the different systems (Table 15). When there are *contracts*, such as in France, the main challenges are to overcome the problem of information asymmetry and limited capacity of local authority to control operators' performance, as well as low contestability. These problems are somehow minimised when there is a regulatory agency performing benchmarking activities, as is the case in Portugal for systems under delegated management.

The main challenges for *regulatory agencies*, such as those in England, Portugal, and Mozambique, are the collection of good quality information (free from the operators' manipulation), as well as the definition of good relative performance indicators. In the specific case of the Portuguese regulator, non-binding decisions in terms of economic regulatory decisions limit its influence.

Table 15 *Major challenges of economic and social regulation across different systems*

Country	***Regulatory Governance***	***Major challenges***
France	local authorities contract	- overcome information asymmetry and limited capacities from municipalities to control the operator - low contestability
England	regulatory agency	- necessity of good quality information - good relative performance indicators
Portugal	local authorities contract regulatory agency	- overcome information asymmetry and limited capacities from municipalities to control the operator - lack of regulatory agency's coercive powers
Mozambique	provincial authorities contract regulatory agency	- clarify regulator's functions *vis-à-vis* partners of the contract, including FIPAG - lack of regulatory ladder

As for the regulator in Mozambique, the main challenges are the clarification of functions *vis-à-vis* the partners of the contract, in particular FIPAG's responsibilities in terms of contract and operator control as well as investment plans. The sector regulator was created after the delegation of management to a private operator. Contracts left little discretion to the regulatory body, which is neither a party nor a supervisor of the contract. It remains unclear what the regulatory body's exact responsibilities are.

The definition of a regulatory ladder, which consists of a series of actions that may be taken if the operator fails to comply with the regulatory and contract requirements, could also significantly contribute to reducing regulatory risks.

In the following chapter we present the final chapter of this empirical analysis focusing on operators' strategies. Operators are very important actors in the sense that they are monopolists in the local systems they operate in and, in many cases, also accumulate other essential responsibilities, such as regulation, planning, and policy-making.

Chapter 7. Operators' strategies: what to expect in a reform context

This chapter presents a study on operators' strategies in the UWS performed in the context of the Euromarket project[51]. The results are therefore *independent* of the questionnaire and the case-studies presented in the previous chapters, and aim at exploring whether operators' strategies are aligned with the above collected evidence.

The analysis is based upon ten case-studies[52] selected to illustrate different *types of operators* (Annex 3). The study focuses on European operators and, to a lesser extent, on their activities in developing countries. As a matter of fact, *European* companies are a common presence on bidding processes in the latter markets. In the majority of cases, the local private sector is not developed and foreign companies win the delegated management contracts.

We start out in section 7.1 by identifying the strategies per type of operator. Then, in section 7.2, we present a table summarising the main results, highlighting the factors related to operators' strategies that potentially affect capital investments and universal provision of the service of general interest (SGI). Finally, in section 7.3, we conclude by assessing the alignment of these strategies with the challenges posed by the sector's reform.

7.1. Strategies per type of operator

The concept of *strategy* is not consensual in nature and has significantly evolved during the past decades, influencing the development of business strategy theories. Strategy herein pertains to the definition of aims and objectives of an operator, on the basis of the

[51] The results were published in (Luís-Manso et al., 2007a).

[52] Case-studies are published in (Euromarket, 2004), available at http://www.epfl.ch/mir/euromarket.

recognition of opportunities and threats, and the response - including implicit and explicit (re)actions - to attaining these objectives. Both opportunities and threats come from external and internal forces to the operator, meaning it is important to consider the evolving environment, as well as the capabilities of the operator itself.

One can distinguish two main *difficulties* in coming up with a systematic and rigorous analysis of water operators' strategies. One difficulty pertains to the main specificities of the urban water sector, which prevent that theories from other sectors can be generalised (Schouten and Dijk, 2005).

The other main difficulty is the number and diversity of water operators. Only in Europe, it is estimated that there are roughly more than 30'000 water operators, providing water supply and/or sanitation services. Moreover, UWS operators are very diverse, ranging from small non-autonomous public entities to large trans-national corporations (TNCs), as well as encompassing regional, public, mixed and private organisations.

The strategies of water operators change from case to case and, in fact, different types of operators react differently and are exposed to varying realities and dynamics. For this reason, we identify the strategies per type of operators.

In this chapter we present the results according to size and ownership. In terms of size, intervals were chosen to single out the specificities of operators, which range from very small to very large corporations. One consequence of this is that the category representing middle-size companies is very broad and, thus, we separate the analysis into public, private and mixed medium-size companies. In terms of small-size operators, they are mainly publicly-owned, while large-size operators are only privately and mixed owned. We start out by small public operators' strategies.

7.1.1 Small public operators

In many countries, small, local public operators in the form of municipal services or municipal companies provide water supply and sanitation services, and even other services,

such as electricity and gas. Their *objectives* are normally formulated as follows: "efficient supply of services of a reliable quality, at an adequate pressure, at a reasonable price".

Small, local public operators operate in a setting, which is highly affected by public policy, and water management is considered to be a public task (*Box 8*). National, provincial and communal *regulatory frameworks*, including local environmental permits, provide a whole range of economic, social and ecological guidelines for these water operators. In fact, in a context of small operators, regulatory conditions are more easily established than for larger concessionary agreements, where conditions may be partly negotiated.

Box 8 N.V. Tilburgsche Waterleiding-Maatschappij (TWM)[53], Netherlands

TWM is a municipal drinking water supply company with the objective to supply water in a sustainable way, meeting the traditional operating conditions for public works. TWM is characterised as a public owned company with a strong focus on product quality and cost price. TWM's main shareholders are local authorities but it is an autonomous company. By and large the company is happy in the relationship with public authorities and the strategy is to maintain these good relations.

The management of TWM thus perceives the current contractual arrangements as adequate. As the structure of ownership shows, the municipality is a key stakeholder with direct influence on the company management. Political intervention through the Municipality Council is reflected in the management only weakly. Nevertheless, in 2003, the managing director had to withdraw in a conflict with the Municipal Council.

The level of compliance of TWM with the laws and regulations is currently regarded as good, but not relevant for the competitive position in the market, as there is no competition in the drinking water market. The management of the TWM does not see any advantages in having a free market for drinking water in the market for small users, as profit maximisation is not an objective.

[53] Box 8 is based on the case-study made by TU Delft in the context of the Euromarket project.

Funding systems involve a number of elements. An extraction fee is normally required for water production, which is to be paid to local or national governments. Customer price is based on cost plus a utility rate. The degrees to which revenues cover short- or long-term marginal supply costs, as well as environmental externalities depend very much on the situation. Smaller operators, as a consequence of their scale, may have high *per* unit cost for energy, and staff. These elements may drive strategies geared towards integration and expansion, to reap advantages of scale.

According to some interviewees, the boards of these operators see no advantages in introducing *competition* in the sector, especially regarding small users, and are happy in maintaining the existing privileged relationship with the public authorities. Of course this secures stability in their generally good labour conditions. Related to this is the objective to further develop a 'Socially Responsible Corporate Management' dimension as a means to underline the local connection with water consumers and voters. By linking these aspects to their local world and creating a sense of connectedness with the population, as users and citizens, these small water operators seem to distinguish themselves from the large, anonymous, trans-national operating firms. This may be interpreted as a strategic move to fend off plans for restructuring and liberalisation.

In some countries, competition is gradually developing in the market for *large industrial consumers*, which may choose to become self-reliant by abstracting their own water, or to go to other suppliers. In the long-run, the risk of losing large volume users is considered significant, with higher *per* unit supply costs and, consequently, prices as a result of under-utilised capacity. So water suppliers are developing separate strategies towards communal drinking water supply and sanitation and the service to large users.

It could be argued that depending on the quality of the water supplied and the wastewater released, small public operators consider more stringent *environmental standards* as a threat, or not. Indeed, when large investments are required, pressure may arise in the municipality to bring about restructuring, away from public ownership. Depending on circumstances, final prices may rise, reflecting the possibly higher level of environmental

and management costs to these firms. Also, local governments may be pressing the firms involved to increase their scale and scope, by means of associations of municipalities or mergers, in order to reduce costs and to facilitate environmental strategies (*Box 9*).

Furthermore, policies with respect to *River Basin Management* may – in addition to cost - become important drivers in the integration of operators into larger entities. The relevance of integrating water supply and sanitation activities is often acknowledged as an effective and low-cost strategy to enhance efficiency. So, in the future, these small firms may be incorporated into (public) regionally-oriented companies, and municipalities into multi-municipality companies, with common standards in respect of quality, hydrological, and environmental issues.

Box 9 Aguas del Prat Plc[54], Spain

Aguas del Prat Plc was set up in 1989 as a public entity to supply water to Prat de Llobregat - a city with a population of 65,000 inhabitants. The local council created this municipal service as a public management tool to improve the quality of the water service, consolidate the role of the public sector in providing basic services, and maintain autonomy in the management and planning of this area.

In 1999, faced with the growing possibility that private capital may enter the management of supply and sanitation systems, the municipal companies of Prat de Llobregat, Manresa, Reus and Mataró created the Integral Management of Waters of Catalonia Company (IMWC). The setting up of IMWC has allowed for the full use of synergies and an increase in individual representation. The objectives of this grouping of municipal companies are to: (1) define a common strategy and a common framework of action; (2) revaluate the benefits and advantages of public management of services; (3) exchange information about the evolution of the water sector; (4) analyse specific problems of the water sector in this geographical area; (5) analyse future opportunities; and (6) jointly participate in market activities related to water cycles and the environment.

[54] Box 9 is based on the case-study made by University of Zaragoza in the context of the Euromarket project.

The need for additional capital and management *expertise* may eventually drive these utilities to offer shares to private investors in return for cash. Indeed, the example of such a (partial) privatisation is provided by the local electricity and gas utilities in the process of restructuring, in which the local authorities' interest is clearly diminishing after having lost influence in day-to-day management.

For the moment, one may be tempted to say that all these strategies are guided by the characteristics of the sector and its evolution and not so much by the size, segment or ownership. In fact, the first conclusion is that there is no real specific strategy for small local public authorities. However, one cannot forget that there is a sort of mission that small local public operators have towards consumers (with regards to quality of services), which in fact could be interpreted as a form of strategy to counter larger groups. Finally, the perception of profit is also largely absent or, in other words, different, compared to other larger private operators.

7.1.2 Medium-sized operators

Medium-sized public operators

Throughout the past decade, there has been a clear trend towards the *concentration* of small public operators in the form of multi-municipal companies, association of municipalities and, in some cases, the creation of public holdings. The aim has been to search for the optimal size to exploit scale economies and allocate efficiently public funds.

Ownership, size and the legal form seem to influence the strategy of medium public operators. In terms of size, medium operators sometimes *extend* their operations outside their initial local markets[55] so as to benefit from scale economies. They do it, firstly, in

[55] This depends on the legal system. For example in Germany, the "principle of locality" restricts the actions of municipal entities outside their initial regions.

adjacent geographical areas, and later in non-neighbouring markets including expansion overseas. In fact, entities that have traditionally been publicly owned and managed on a municipal basis are becoming genuine commercial entities able to operate outside their initial regions. Nonetheless, for all of them, the initial market remains the most important in terms of population served and revenues. In general, the higher the degree of autonomy is, the larger the difference in terms of strategy between medium and small public operators is.

The expansion of operations to *international markets* has been restricted to developing and emerging economies and, in the majority of the cases, to countries presenting strong cultural and political ties to their domestic market (*Box 10*). This strategic geographical orientation, which has followed the strategy of large operators in the sector, is to a certain extent backed by multilateral development agencies as well as the domestic countries' cooperation and foreign policies. This makes the withdrawal of operations from these markets, in case of serious drawbacks, much more difficult in political terms (contrary to large private operators). In fact, in the majority of cases, the objectives of public enterprises are twinned with those of the national Government.

Box 10 Aguas de Portugal, SA

Águas de Portugal (ADP) is a public holding company created in 1993. ADP works in all segments of water supply and sanitation sectors, and its core market is Portugal, yet the Group also operates, through its subsidiaries, in Brazil, Cape Verde, East Timor and Mozambique.

The choice of creating ADP as a public holding company must be placed in the current context of extension of the systems, as well as an instrument to channel EU funds efficiently. The strategic choices of ADP are deeply correlated to the Governmental policies and strategic objectives. In fact, ADP was created to develop multi-municipal water and wastewater systems so as to rise in an efficient and sustainable manner the percentage of Portuguese households served by drinking water and wastewater systems. One can imagine that this model will evolve when most investments are achieved and EU funds are allocated.

The provision of water supply and sanitation services operated under a *de facto* monopoly is normally the core business of this type of operator. Nonetheless, some of these operators[56] are also competing for the provision of water services in systems open to some forms of competition (such as international bidding processes). In this case, medium and large private operators are perceived as the main *competitors*, yet the public ownership of the former may play a crucial role in obtaining the contracts. Amongst medium public operators' non-core business one can consider the provision of other environmental services, such as urban waste, and energy (Box 11).

Box 11 Canal de Isabel II[57], Spain

Canal de Isabel II (CIII)is a public company depending on the Autonomous Community of Madrid. It is a multi-utility with a firm basis in water services. The local government gave CIII the exclusive concessions to operate water and sanitation systems in 164 out of the 190 municipalities in the region. CIII has a good financial record since the 1980s, when, after a period of drought, it was allowed to invest in strategic infrastructures, financed by European funds, and to double water and sanitation tariffs.

Given its position in the Madrid water management system, the company's strategy to expand towards supplying other services and water systems depends mainly on its ability to prove that it is capable of supplying high quality services at a reasonable price. Local political decision-making is the main determinant in this process, where contracts are not awarded by public tender. In 2001, CIII did actually start a new stage of diversification and internationalisation of its activities by developing new businesses, focusing in Latin America. The energy sector is also a sector of special interest for CIII, which started operations in the generation, distribution, and commercialisation of electric energy and gas supply in Madrid.

[56] So far multi-municipal associations have been excluded.

[57] Box 11 is based on the case-study made by University of Zaragoza in the context of the Euromarket project.

Regarding the scope of the market, these operators consider that size is not important and that their most important objective is to provide a public service to every citizen in their local area of operation. They have indeed a *social strategy* based on cross-subsidies from heavily populated urban areas towards rural areas. This is made possible because their activity is considered a public service by the State, which has therefore granted the exclusivity to explore these systems.

The most important *threats* for medium public operators come from external factors, namely (1) the potential pressure to liberalise the water markets, (2) the claims in favour of non-discrimination of economic agents (e.g., implementation of the Treaty of Rome), and (3) the achievement of the objectives that were at the basis of the creation of these type of operators (such as the allocation of Cohesion Funds).

The establishment of stricter environmental and public health *requirements* is in general welcomed by these operators, especially because up to now they have been complemented with public funds for financing the required improvements. In fact, and in comparison to other typology of operators, medium sized public operators benefit the most from European credits and funds. Therefore, their main strategy towards the EU is to comply with the legislation, so as to obtain funds to develop water systems and the quality of their services.

Furthermore, these requirements have created *new opportunities* to get in rural and small town areas, which are facing difficulties to comply with the new requirements. In short, stricter requirements offer new opportunities for medium public operators to take advantages of their monopoly and economies of scale. Finally, their lobbying activities in relation to European institutions are usually developed through national governments.

Medium public operators are normally responsible for *capital investments* (i.e., networks and other infrastructures) and are committed to develop water systems. In sum, these operators are normally instruments of the State, provinces or municipalities in order to fulfil strategic objectives.

Medium-sized private operator

Private operators provide water services to one third of the European population. Even though large private operators have a stronger visibility and lobbying power, medium-sized private operators indeed provide water services to a bigger share of population than large ones do. Medium-sized private operators are normally the product of *privatisation* processes of formerly public operators, such as in England (*Box 12*), or the result of the diversification strategy of local private operators from other sectors into water (*Box 13*).

Box 12 Severn Trent Plc[58], England

Severn Trent was initially formed in 1974 as a regional, state-owned water authority based in Birmingham responsible for water management and supply, and waste water treatment and disposal, in the catchment areas of two of Britain's largest rivers - the Severn and the Trent. Since 1989, as a private operator, Severn Trent Water has invested heavily in replacing and repairing its assets and infrastructure. As well as complying with Government legislation on drinking water quality and river pollution, it sets its own internal standards on issues such as public health, leakage reduction, and other sustainability targets. The company's mission is to be a leading supplier of environmental products and services for the benefit of shareholders, customers, employees, and the wider community.

Severn Trent has an international branch focused on providing private sector management in Western Europe, where state-owned water authorities are being restructured. It operates in Italy, Belgium, Germany, and Ireland. Furthermore, Severn Trent Services works with funding agencies and governments to support sustainable development and capacity building in the developing world, Eastern and Central Europe.

Medium private operators have some common strategic features with medium operators in general, namely in terms of the expansion of activities to other geographical markets so as to benefit from economies of scale. For some of these operators, this is also a way of guaranteeing the sustainability of their businesses in the event of a competitive bidding process for their domestic market. For them, it is important that *non-discriminatory rules*

[58] Box 12 is based on the case-study made by University of Zaragoza in the context of the Euromarket project.

are respected whenever concessions are awarded. In many cases, private operators join their efforts in associations aiming at lobbying for their interests.

In the event of competitive processes, their main *competitors* are medium public and large private operators. Medium-sized private operators have normally the advantage of knowing the local market very well and, besides that, of participating in the bidding processes in collaboration with local financial and credit institutions.

Finally, it is interesting to note that the anti-privatisation movements have somehow ignored this type of operator. And this is even more bizarre since in many cases these operators are partially owned by the same large firms that are the object of heavy criticisms. The reason probably lies on the closer relationship these operators can build with citizens compared to large TNCs. And, in fact, medium-sized operators are highly aware of the important influence that the local civil society has on their businesses.

Box 13 Indaqua, SA[59], Portugal

Indaqua is a public limited company set up in 1994 with private shareholders (*Mota Engil*, *Teixeira Duarte*, and *Hidrante*, all national companies). Indaqua develops its main activities in the north of Portugal where the rates of connection and treatment were lower. Local authorities need to make large investments to broaden service coverage, favouring the concession of these services to private enterprises. Indaqua's main funding sources are the shareholders' capital (about 20%), and debt (about 80%), including financing arrangements from the EIB. Indaqua and the Portuguese Association of Environmental Businesses are lobbying to exert pressure on the national government so as to promote a model of progressive liberalisation of the market. Indaqua wishes this new management model to be based on the British model with an independent regulator and legislation that allows for the entrance of private capital in every segment of the water systems.

[59] Box 13 is based on the case-study made by University of Zaragoza in the context of the Euromarket project.

Medium-sized mixed operators

Medium-sized organizations of mixed public/private capital in the UWS have emerged in the past decades in several countries. This, however, often happened in response to emergency situations, in which new control structures and private capital were needed in public organizations to catch up with lagging investments in the systems and weak operational and environmental performance.

As ventures of *public-private participation*, local or regional authorities may retain significant amounts of shares, in addition to institutional (e.g., banks and pension funds) and other types of private investors (e.g., investors in the stock market) (*Box 14*). The strategy of these mixed local/regional monopolies is a combination of the orientations of the shareholder groups, each with its particular interest.

Box 14 ACEA SpA[60], Italy

ACEA was established in 1909 as the electricity company supplying public and private lighting for the Municipality of Rome. It was only in 1937 that it became *Azienda Governatoriale Elettricità e Acque* (AGEA) with the addition of drinking water services. During the 1990s, ACEA became one of the major Italian utilities and, since 1999, 49% of its capital is floating on the stock exchange. Independently from this type of arrangement, ACEA tries to establish partnerships with local authorities based on mutual trust rather than mere contracted obligations.

The Province of Rome and ACEA signed an agreement regarding management of integrated water services to come into effect on January 1, 2003. While acquiring the contract in its "captive" market in the area of Rome, ACEA started to engage in competitive bids in other regions, both as a partner in locally owned water operators and as a contractor.

[60] Box 14 is based on the case-study made by TU Delft in the context of the Euromarket project.

In many cases, public authorities directly award concessions to the operators, so there is no *competition* at least in the domestic markets. Some of them compete in bidding for concessions outside their domestic markets mainly for two reasons: (1) they might fear to lose their concession contracts in the domestic market; or (2) to profit from their secure monopolistic position in the domestic market so as to increase their scale in new markets.

The *financial* framework involves a number of elements. The operator normally operates on a cost-plus basis and the government refunds costs, occasionally subsidised by European funds. Normally, the compensation is based on reasonable shareholders' remuneration of capital investments. The "plus" component is set at such a level that the financial results are appealing to private firms, as investors and contributors of technology and knowledge.

In many cases, these firms may want to establish themselves as efficient, effective and reliable operators, rather than a governmental organisation or a pure for-profit firm. As a consequence of local or sector-related traditions and preferences, assets may be directly controlled by the operator or, in concessionary systems, by a public body. Public water policy, which remains exogenous to the operator, determines objectives, standards, guidelines and priorities.

Whereas it is not directly engaged in *political* negotiations, the operator still advises on the technical feasibility and costs of potential measures. As its remuneration and tasks are linked to the politically-defined objectives, a main goal is to influence investment priorities and the process of standard setting in respect to environmental goals. So, eventually, technical reports for policy-support are an important element in the relationship with the government. By convincing authorities that such objectives and standards should - and could - be enhanced, the requirement for additional activity and investment is ascertained.

In brief, private and public shareholders of the company have an argument to *expand activities* that are recognized as important by the public authorities, like environmental quality and security. They will do so by convincing authorities and the general public that this is feasible in an efficient manner. Outperforming existing norms may provide a

justification for, either, enhancing the norms further, or at least maintaining the level of costs allowances.

More stringent *standards* are expected to increase the importance of technological innovations. In addition, policies with respect to River Basin Management drive the integration of operators into larger entities, combining water supply and sanitation activities together. Such changes are particularly interesting from the perspective of this type of firm. The need for technological developments and new management approaches to the water cycle stresses the importance of soft engineering techniques. In the future, small municipalities – lacking knowledge and access to capital - may seek recourse from such mixed capital regional operators. So widening the range of services offered and deepening their quality and impact provides the main perspective for expansion to these operators.

These medium sized, regionally structured firms have the scale to develop and use more advanced *technologies*. Moreover, and equally important, through size they have the impact to be an effective, i.e. convincing, 'partner' to the local government in determining the outline of regional – or river basin level - water policies. Their size, and thus the scale at which technological solutions are applied, make these organizations an interesting objective for private technology and capital suppliers.

These *partnerships* are an option for the management of the water sector, with the advantages of private - like technology, capital, and dynamism – as well as public involvement - like low cost of capital, reliance, high standards, and legitimisation. Their limited freedom of action (e.g., in terms of strategy formulation) is perceived as their main weakness. However, the main strength of the mixed approach is the ability to focus on technological innovation, unhampered by short-term market conditions. Moreover, unlike what is often suggested, these firms might deliberately choose to be inefficient by combining an ambitious public perspective on high environmental and security standards, with the appetite for the "plus" flowing from the "cost" associated (as higher standards drive up the "plus" component).

7.1.3 Large (private and mixed) operators

Large operators are emerging as very important actors even though they only provide water services to about 15% of the world population. In terms of *ownership*, one can actually notice that there are no large public operators in this particular sector, and all are privately-owned, except one RWE, which is mixed. However, if one compares mixed and privately owned large operators, ownership does not seem to influence their strategy, either at home or abroad. Finally, in recent years there has been a trend towards the increasing participation of financial institutions in the ownership structure of these large operators.

One could divide the major large operators into three *markets*: the French, the British, and the German. These large operators participate in - and, in some cases, control - several small and medium operators in other countries. French corporations are clearly dominating at the European and world levels, namely Veolia Environment, Suez Environment (*Box 15*), and to a lesser extent SAUR.

Although one can identify common *characteristics* in terms of strategy among these operators, there are also important differences most probably explained by the dominant management models and the water market restructuring policies in their domestic markets. Among the common characteristics of these operators is that they are listed in the stock exchange, which creates considerable pressures in terms of financial results. Indeed, all these operators have implemented the same type of business model pertaining to the provision of a public service yet remaining profitable.

All large operators in the sector have *international activities* across different countries and even different continents. Nonetheless, for all of them, the European market remains the most important. Another important aspect is the prevalence in terms of importance of the domestic market, especially for operators created under the so-called British model.

Box 15 Suez Environment, France

Suez is owned by the *Groupe Bruxelles Lambert* (7.2%), employees (4%), *Crédit Agricole* (3.3%), CDC (3.2%), Cogema (2.3%), and the General Public (74.6%). It provides water services for about 125 million individuals daily, which makes it one of the world's leading players in the sector. Since 1997, Suez started as a conglomerate but then refocused its activities to become a global industrial group providing services in energy and environment for companies, individuals and municipalities.

Suez Environment is an operational unit and its strategy corresponds to the strategy of the Suez group for the specific sectors of water and waste. Its main objectives are to strengthen its offer of environmental services at local level and to promote the public-private partnership model of delegated management, with a focus on operating performance and results.

Europe is by far Suez's most important region: in 2003, about 77% of its revenues were generated in this geographical area. The strategy of SE has considerably changed since 2002. The collapse of the Argentine economy and the international stock market crisis induced the Suez businesses to refocus on its European base and more stable markets.

During the 1990s, large water corporations in general focused on acquiring markets in *developing and emerging economies*. This strategic geographical orientation was to a certain extent backed by multilateral development agencies. However, after some serious drawbacks, the focus of these international operators is now increasingly shifting to the more stable and regulated markets in developed economies, namely in Europe, where funding is available.

These groups normally operate in several sectors, such as energy and the environment (i.e., water and waste), and are therefore able to propose specific combined solutions to their customers. The choice to provide *multi-utility* services highly depends on the characteristics of the markets, yet there is a general consensus that multi-utility packages work better for industrial clients. The combination of water services and energy (electricity or gas) is probably the most common type of multi-utility package. Even though the characteristics of the systems are very different, the commonalities lie in the similarity of

the service, in the advantages of a joint front office and common administration. Another increasingly important type of multi-utility combines water supply and wastewater services – although the service contracts are normally separated, the clients are the same, which enables interesting cost savings.

All large operators have developed a multi-utility approach, yet the French TNCs clearly distinguish themselves from the British and German ones. It is only in the French case that water constitutes a dominant aspect in this multi-utility strategy. British operators focus on water, sanitation and environmental services, more than utilities in general. For German operators, water services represent a small share of business compared to electricity, gas, and environmental services.

For large multi-utility groups, the water sector is part of a diversification strategy whose purpose is to lower the risk of relying too extensively on one sector. Moreover, the sector is also seen as more stable compared, for instance, to electricity and gas, since competition is less fierce, enabling long-term financial stability.

Water markets differ considerably in terms of degree and type of competition. There is a general trend towards the concentration of operators, although not amongst the largest ones. Water supply is considered to be more competitive than sanitation. In water supply, the main competitive pressures emerge at the moment of the bidding procedures to get in the market, while in the sanitation sector the pressure comes mainly from technological and pricing issues.

There is a growing belief among large operators that the reliance on the private sector is increasing as more rigorous environmental and public health *standards* are being established, and public sector entities reach the limits of their resources and expertise. They therefore argue that stricter requirements create new opportunities. In this context, according to their viewpoint, the European Commission should: (1) monitor compliance with requirements; (2) implement and monitor its competition laws and policies; and (3) monitor the proper application of the Rome Treaty rules of non-discrimination.

Large operators generally consider *public-private partnerships* to be the best solution to face the major challenges of the sector. Their preferences clearly lie on specific types of contracts, namely lease and operation & maintenance (O&M) contracts. However, the dominant model of management within the home-market of these operators again influences these choices.

Large operators normally provide water services to individuals, companies, and municipalities. They believe water quality is the most important and valorised aspect for the consumer, followed by security of supply and, finally, price.

Regarding the scope of the market, these operators consider that *size* only becomes important outside their domestic markets where they do not have a strong physical or economic presence. Therefore, outside their domestic market, they only consider contracts in large urban agglomerations because fixed costs become too expensive for small contracts.

In recent years, several events have shown that citizens and *civil society* organisations could well have an important impact on these groups' overall strategy, leading to the setting up of several initiatives on ethical, environmental, and social issues.

Finally, large enterprises make it clear that they are not interested in controlling or owning *natural resources*. Differences emerge in terms of capital assets with, on the one hand, large operators attached to the French model arguing they don't want to be the owners of the infrastructures but, for the duration of the contract, they accept to be responsible for their protection and maintenance. On the other hand, large operators attached to the British model consider the ownership of the infrastructure as beneficial because, according to their view, it enables higher rates of return on capital.

7.2. Operators' strategies and elements at risk because of reform

In this section, we present a comparison of strategies per type of operator (Table 16). Moreover, we highlight for each type, the factors related to their strategy that potentially affect capital investments and universal provision of the SGI.

Table 16 *Comparison of strategies per type of operator*

Small publicly owned	
Types of strategy	Defensive in the sense of maintaining the *status quo* Political pressure for preventing liberalisation and PSP Enforce sense of connectedness with the population Long-term investment policies Specialised technical and local know-how Association with other small operators
Capital Investments	May be at risk due to shrinking public budgets Increasing costs related to environment and public health standards can be a threat related to pressure for restructuring
Universal Provision of SGI	The objective of these operators is to: - provide Public Services to citizens at a reasonable price - guarantee of the long-term quality of the systems - implement sector-related public policies
Medium-sized publicly owned	
Type of strategy	Defensive in the sense of maintaining public management Implement long-term investment policies Efficient implementation of public policies Emphasize specialised technical and local know-how Expansion outside initial local market
Capital Investments	More stringent standards are an opportunity if complemented with funds Lobbying from private operators to open up the markets may press these operators to invest (counter-strategy to prove their importance in the system)

Universal Provision of SGI	The objective of these operators is to: - provide Public Services to citizens - guarantee the long-term quality of the systems - implement sector-related public policies
Medium-sized privately owned	
Type of strategy	Aggressive: keeping captive markets through long-term contracts Motivate public-private partnerships Pressure to raise transparency in regulation and bidding Merging and strategy of alliances to increase scale Multi-utility approaches Emphasise specialised technical and local know-how Reinforce local links with population
Capital Investments	More stringent standards are seen as an opportunity to enter new markets if non-discriminatory rules are applied
Universal Provision of SGI	The objective of providing a public service with profit may lead to cherry-picking and to non-provision of the service to the poorest The effort to increase efficiency in operation and management may decrease the costs of providing the service
Medium-sized mixed ownership	
Type of strategy	Defensive in the sense of maintaining the status quo in their initial local market Motivate public-private partnerships Emphasise specialised technical and local know-how Reinforce local links with population Convincing authorities about the need to expand activities
Capital Investments	Efforts to improve efficiency may reduce costs and increase return-on-capital (higher incentives to invest) More stringent standards are seen as an opportunity based on the operator's technological and local know-how
Universal Provision of SGI	Application of sector-related public policies Guarantee of the long-term quality of the systems

Large-sized (private and mixed ownership)	
Type of strategy	Aggressive in the sense of obtaining captive markets through long-term delegated management contracts Motivate public-private partnerships Pressure to raise transparency in regulation and bidding contracts Long-term technological investment Multi-utility approaches Integrated (vertical and/or horizontal) contracts Development of international activities yet minimising financial and political risks (stable and regulated markets)
Capital Investments	These type of operators have a preference for managing the system (as opposed to own and invest) More stringent standards are seen as an opportunity (in the event of limited public resources and expertise)
Universal Provision of SGI	The objective of providing a public service with profit may lead to cherry-picking and to non-provision of the service to the poorest Anti-globalisation and anti-privatisation civil society movements are pressing these operators to set up social corporate policies

7.3. Concluding remarks

Four main conclusions can be drawn from this chapter. The **first conclusion** is that the factors of change pushing for the reform are *influencing the typology of operators* in the sector, as well as their strategies. The traditional characterisation of operators as municipal non-autonomous public entities changed over the past two decades. We can identify three important *trends* that should not be ignored when regulating the sector in a context of reform, namely:

1. Even though small and medium-sized public operators remain central providers, private and mixed-owned operators are increasingly important actors. This means that any policy and measure regarding capital investments and universal coverage of the SGI needs to consider that profit is the main motivation of private operators.

2. The evolution from non-autonomous to autonomous entities is a reality, in many cases accompanied by the delegation of management responsibilities to local or regional public operators, and sometimes to mixed or private companies. A higher degree of autonomy, including budgetary, means that new sources of finance are needed to cover investment needs.

3. There is a regionalisation of operators, i.e. operators are pursuing a strategy of mergers and alliances to increase scale. In fact, most operators believe that the water industry is moving towards more concentration of operators (yet not amongst the larger ones). By increasing their scale, operators augment their capacity to raise funding sources for their projects (e.g., through municipal bonds). In terms of regulation, the complexity of monitoring operators' performances and the quality of the service is lower for larger than for smaller and dispersed operators.

The **second conclusion** acknowledges that several issues limit the efficiency and flexibility of the market, and strongly condition the reform of the sector as well as the operators' strategies. The most significant ones are related to competition and the level of contestability in the market. These are:

1. The creation of *competition in the market* seems rather limited due to the specificities of the sector and, therefore, in a context of the sector's reform, the most common type of competition is *competition for the market*. This involves strategies that are focused on competing for contracts through bidding. After winning the contract, the service is still offered in a monopolistic way, where users are captive and regulators find it difficult to have access to the operators' private information.

2. *Long-term contracts* are a factor of inflexibility and inefficiency, yet they allow for stable planning horizons. This is essential if the responsibility to invest in the system is delegated to the (private) operator. However, this is not always the case, and the conservative strategies of operators (aiming to establish long-term relationships in the management of services) may not compensate for the lost flexibility and efficiency.

3. In many cases, competition and market options are limited to strategies of buying or participating in other companies. This is another strategy *for the market*, but in this case, without any competition with respect to the service itself, just a competition for the ownership of the operators. This creates oligopolistic structures and may open the ground for collusive behaviours with all its consequences, namely in terms of higher final prices.

4. Over recent years, *European and other public funds* have highly influenced the management and organisation of the water sector (especially sanitation, in Europe). These funds have usually been managed via local or regional institutions, being an essential part of the public operators' strategies (including municipal services). The dry-up of these funds may jeopardise the required investments in the future, and will certainly change the current strategies of these operators.

The **third conclusion** is that important features depend upon the respective market reform processes. Thus, size, ownership, and the reform context in the domestic markets highly influence the way of operating and (re)acting in relation to other stakeholders in the sector. We differentiate two cases: with and without (the pressure to) reform in the sector.

Where there are *no significant reform pressures*, operators have defensive strategies in terms of maintaining monopoly rights. They base their strategies on public service goals and a good relationship with their customers, but without taking into account their possible competitors. In fact, the perception of many of these operators is that the water sector is not very competitive. In the few cases operators feel some competitive pressures, they are mainly related to pricing and technology and not to attracting clients, nor to gain market share.

It is very common that small publicly-owned operators do not face significant reform pressures. It is increasingly common to find them in association with other small operators. They tend to emphasise their specialised technical and local know-how, and to implement long-term investment policies. They generally exert some political pressure for maintaining

the *status quo*. One of their strong points is the flexibility of their strategies to adapt to changing public policies decided by local or regional authorities.

Where there are *significant reform features*, public operators complement their public service objectives (with respect to users and local bodies) with strategies to fend off their competitors. For instance, small local public operators stress proximity aspects and the local nature of water services in order to counter the arrival of new operators. For private operators, their main objective is profitability in the long-term, taking into account the competition of other operators.

In this context, a specific and successful strategy of many operators is the *Public-Private Partnership* (PPP) strategy, based on sharing risks and liabilities with public entities. Water services remain under the final responsibility of public authorities yet under the effective management control by the operator. In certain cases, this strategy allows the allocation of concession contracts by direct negotiations without competition through public bidding.

Operators in such markets are normally aggressive in terms of obtaining captive markets through *long-term delegated management* contracts. Especially the largest operators tend to take multi-utility approaches and to engage into long-term technological investments.

Even in markets witnessing such reform processes, the *water sector cannot be considered very dynamic in terms of new entrants*. In Europe, there are comparatively more new operators in the sanitation sector than in water supply. This can probably be explained by the fact that there have been more new opportunities in the sanitation than in the water supply sector, following an increase in environmental and public health standards and concerns. Another reason for the lack of dynamics is the fact that competition in the water sector is very limited. In many cases, and due certainly to a search for stability, contract renewal is commonly to the advantage of the initial operator, and this is true whether one speaks of public or private operators.

Finally, the **fourth conclusion** relates to the contribution of these empirical findings to the management of reform risks. There is increasing evidence in this thesis calling for a *systemic approach* in the management of the new risks created by the reform. In this way, understanding the strategies of the monopolist becomes an essential condition.

It is important to acknowledge that in the water sector, the framework and the type of operational decisions (e.g., on pricing and product specification), are largely fixed by a third entity in the form of regulation. One of the most important strategies of water operators hence relates to the *management of regulation*. In the literature, the most common arguments state that operators under regulated environments can either take an adaptative/passive attitude or attempt to influence the public policy (i.e., to capture the regulator). Our statement is that water operators' strategies are being influenced and embedded in an interactive system, where they have an active role in defining the market *and* their business environment.

These results should not be neglected when defining the ways to mitigate the risks created by the sector's reform. In the following chapter, we propose a new role for regulation taking into account its function in reducing the vulnerability factors of the main elements at risk because of the reform, as identified in the previous chapters, taking into consideration the operators' strategies identified in the current chapter.

PART IV. MAIN RESULTS

The specificities of the urban water sector (UWS) hampered the liberalisation of the sector, at least liberalisation at the image of other network industries. However, evidence in many countries shows that the UWS is being reformed and some features that normally characterise liberalisation processes are now also present in the water sector (Chapter 6).

The process of reforming the sector has inherent benefits and costs. Very often, these benefits and costs are independently pointed out as justifications or criticisms for change. Enthusiastic agents of reform focus on its expected benefits, while its critics centre their attention on disadvantages and costs. The approach taken in this thesis has been to move away from this dichotomy of whether reform is good or bad. The objective is to know reform costs better and to identify possible forms of mitigating them.

So far in this thesis, we explained the need for regulating the sector in a context of reform (Chapter 2), established the link between the costs created by reform and new risks in the sector (Chapter 3), and presented a vulnerability analysis of the main elements at risk in the new context (Chapter 4). Then we checked this evidence empirically (Chapters 5, 6, and 7).

Based on these results, in Chapter 8 we will stress the importance of taking a regulatory governance approach before identifying mechanisms that are able to mitigate reform risks. These mechanisms are proposed based on their ability to tackle the vulnerability problems highlighted in each arrangement. To finalise, we present in Chapter 9 the main conclusions of this thesis and future research.

Chapter 8. Reform, Risk Management, and Regulatory Governance

The most common approach to *regulation* in the urban water sector (UWS) is:

1. to address specific regulatory problems rather than to take an integrated approach;

2. to consider competition and regulation as alternative options to achieving policy objectives (e.g., Robinson, 2001).

We challenge this approach by proposing a comprehensive framework for regulatory governance based on the results of this thesis. The main regulatory challenge is the definition of a *regulatory strategy* which takes into account market mechanisms, regulatory discretion, and self-regulation. The optimal regulatory strategy is about combining different components that align the incentive structure with the key regulatory objectives defined for the sector (adapted from Llewellyn, 2001), rather than deciding between regulatory discretion and market discipline, as well as public and private participation.

The *optimal* regulatory strategy varies according to the specificities of the water systems (e.g. geographical and demographic characteristics) as well as according to the institutional environment. Moreover, it changes over time depending on the key regulatory objectives defined for the system. Thus, no single regulatory strategy is the best in all situations.

The main forms of *regulatory governance* in the UWS are direct public management, regulation by contract, and the creation of a sector regulator. It is interesting to note that there are increasingly cases where different governance mechanisms are combined (e.g., Chapter 6, Ménard, 2005).

Moreover, we have presented evidence in Part III pointing out to the fact that, in general, operators are actively involved in defining the regulated institutional environment. In this way, one can say that, in the UWS, regulatory strategies are the product of the interaction of several – State and non-State – *actors*.

Governance does actually stand for the involvement of several actors in collective problem-solving. It poses the challenges of balancing multiple (eventually conflicting) interests and of reaching co-operation through formal and informal institutional mechanisms. This is, indeed, the underlying assumption of this chapter.

In the present chapter, we put forward a comprehensive *framework* for understanding regulatory governance in the context of reform. The reform of the sector represents a change in the institutional arrangement characterising a particular water system. Each arrangement corresponds to a different risk-sharing pattern and presents specific problems.

We start out by focusing, in section 8.1, on regulatory governance and the sector's reform. Then, in section 8.2, we identify the strategies of the main actors in the water system concerning the most important elements at risk created by reform. Based on these strategies, we propose in section 8.3 regulatory governance mechanisms that mitigate reform risks. Finally, in section 8.4 we conclude.

8.1. Regulatory governance and the reform of the sector

The main *challenge* in terms of regulatory governance pertains to reaching a balance between the partners' strategies so that the objectives set for the system are met. In particular, in a context of reform, it is important to assess the adequacy of the regulatory governance systems to the management of the new risks.

Regulatory governance systems need to intervene in every step of the risk management *process*, from risk identification and assessment, to prioritising and mitigation (Figure 17). In practice, this means that (different) actors intervene through governance mechanisms at each step of the risk management process.

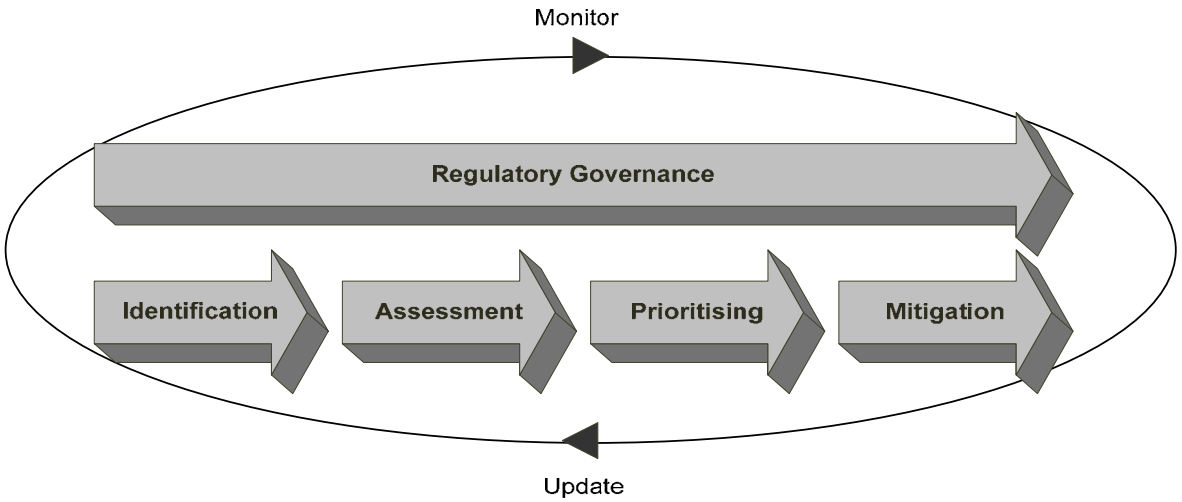


Figure 17 *Regulatory governance and the risk management process*

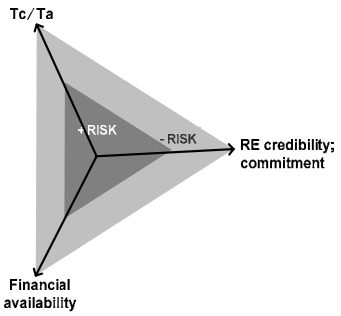
The **identification** of risks is a continuous process. In a context of reform, the sustainability of capital investment and the universal provision of the service of general interest were identified in Chapter 3 as being the main elements at risk and, as such, are the focus of this analysis.

In order to **assess** the risks and **prioritise** the actions, there is the need to assess the vulnerability factors affecting the elements at risk (see Chapter 4 for more details).

Starting with the *decision to invest*, it depends upon the operator's perceptions of risk, which are strongly correlated to the vulnerability factors. In Table 17, we summarise these factors and establish some relations between them.

Firstly, risk increases when the responsibility for investing in the infrastructure is delegated to an operator, and the lifetime of the investment is longer (i.e., *long-term asset durability*) than the contract duration. Secondly, the investment is at a higher risk if the operator feels that there is a threat of hold-up or other type of *opportunistic behaviour* by the regulatory authorities, and if there is *uncertainty* over asset valuation. Finally, the low availability of *funding sources* may also put investment decisions at risk.

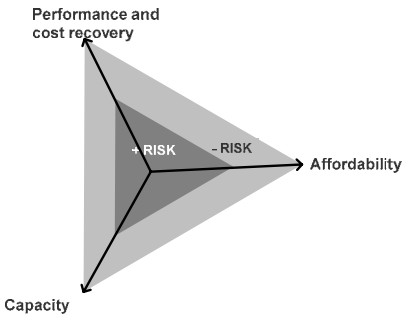
Table 17 *Factors affecting investment decisions*

Factors affecting investment decisions	***Investment at risk***	
Relation between contract duration (Tc), and asset durability (Ta)	*Tc/Ta>1=>lower risk* *Tc/Ta<1=>higher risk*	
Credibility and commitment of the regulatory entity and certainty over asset valuation	*Low => higher risk* *High => lower risk*	
Availability of sources of finance to the operator	*Low => higher risk* *High => lower risk*	

As for the *universal provision of the service of general interest*, there are mainly three factors affecting its vulnerability. In Table 18, we summarise the factors affecting service provision and establish some relations between them.

Firstly, there is the *operational performance* of the management entity, which is directly related to service coverage and its quality, as well as the degree of operational *cost-recovery* via tariffs, cross-subsidies, or other social subsidies. Thus, the provision of the service is at a higher risk for low performing operators and low degrees of operational cost-recovery. Operational costs depend among others on urban density, the state of the network, coverage rate, raw water quality and availability, and the size of the water system. Secondly, there is the *affordability* factor, which is a function of the percentage of poor customers and the weight of the water bill on their total budget. Thirdly, there is the *network capacity* to provide the service. This factor is especially important in developing countries where an important percentage of the population is not connected to the network.

Table 18 *Factors affecting universal service provision*

Factors affecting universal service provision	***Universal service provision at risk***	
Operational performance and cost recovery	*Low => higher risk* *High => lower risk*	
Affordability of the water bill	*Low => higher risk* *High => lower risk*	
Capacity of the network	*Low => higher risk* *High => lower risk*	

There are several possible **approaches** for dealing with the identified and assessed risks (SNWSC, 2002). These approaches are:

- avoidance (elimination of the risk issue),
- assumption (no action is taken regarding the risk issue),
- mitigation (some action is taken in order to moderate the risk exposure), and
- contingency planning (preparations are made to define the actions that will be taken should the risk situation occur).

The important message in this regard is that it is essential to clarify, for each regulatory governance form, which actors are responsible for **mitigating** the key risks in the system. *Key risks* are those that have high exposures in terms of impact and probability of occurrence. So, for each key risk, the responsible actor(s) determines what actions or decisions can be made that reduce its probability and/or severity of impact.

Finally, regular **monitoring** of the risk management process tracks and evaluates the effectiveness of risk-handling actions. It may provide the basis for defining additional actions or identifying new risks and, consequently, **updating** the risk management process.

We use a game framework as a methodology for analysing the interactions between the actors in the system (yet we do not develop a theoretical game model). It is considered that the regulatory strategy is the result of a game played by public authorities, regulatory entity, management entity, and users. The outcome depends on the strategies chosen by all actors. The following section identifies the strategies of each actor in the regulatory system.

8.2. The strategies of the actors

The main *actors* in the regulatory system are the public authority, the regulatory entity, operators, and consumers/customers (Figure 18).

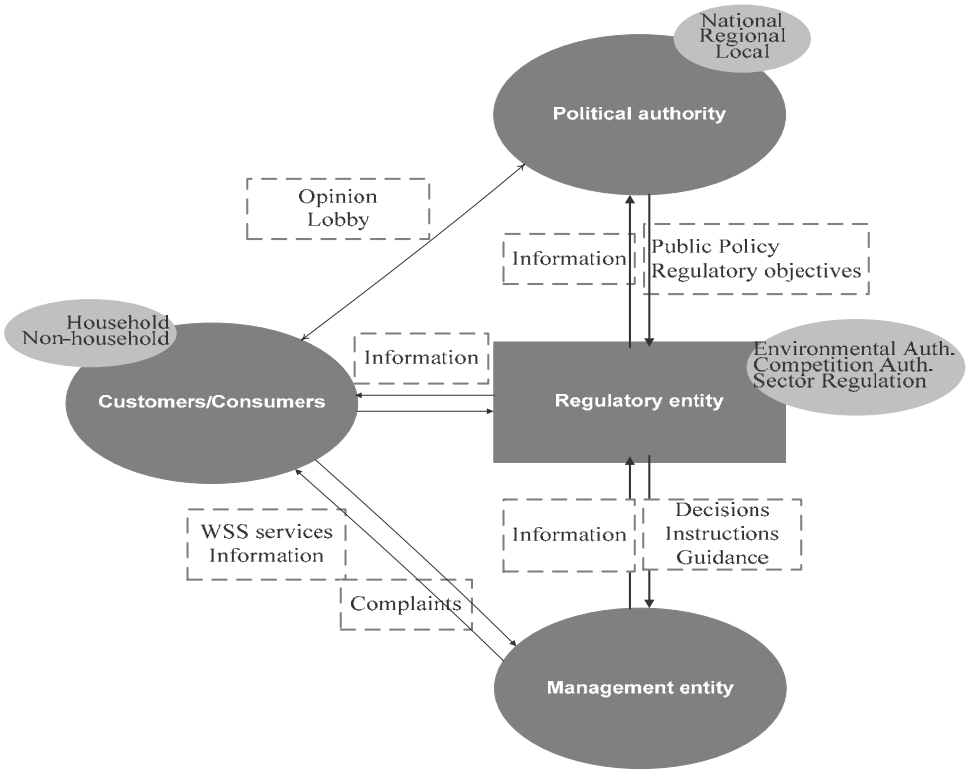


Figure 18 *Main actors in the regulatory system*

8.2.1 Customers/consumers

The type and degree of *public participation* in the UWS has changed in the past, and it differs significantly from case to case. Public participation can take two forms, namely:

- passive (e.g., information about the sector, and awareness campaigns), and
- active (e.g., consultation at policy-making and implementation levels, lobbying if there is a feeling of gain/lost from restructuring, and community management).

In the UWS, *consumers* have evolved from tax-payers to customers and, more recently, to partners. In the most common regulatory systems, consumers can intervene at two levels:

- policy-making: directly or by influencing the political authority's decision (e.g., in the definition of regulatory objectives), and
- operational: influencing the strategy of operators[61], and exerting political control of operators (mainly through institutionalised forms for informing political authorities that are activated when consumers are not satisfied with the service).

Thus, even though we acknowledge the very important role of consumers and, more generally, civil society in the sector, they are not organised and, therefore, are not considered as direct players in the regulatory game. They directly influence the decisions of public authorities, regulatory entities, and the strategies of operators, though.

Using a game framework, it is reasonable to assume that the public authority moves first by defining the regulatory regime. Moreover, it is a repeated game that ends when regulatory priorities or the rules of the game change. Because it is a repeated game, reputation matters. Therefore, there are opportunities for cooperative behaviour. And so, even though there is

[61] We consider community management to be residual, so direct participation in the management is excluded.

information asymmetry, the risk for opportunistic behaviour in a repeated game is lower than in a one-shot game. We start out by describing the strategies of the public authority.

8.2.2 Public authority

The *public authority* (PA) assumes the responsibility for service provision, the safeguard of the public interest, and the definition of regulatory objectives. The responsibility for service provision in the UWS normally lies at the local level, even though there are important competences at the national and/or regional levels, depending on the cases.

The public authority defines the *institutional framework* (i.e., it sets up the legal and operational limits within which the management entity operates), and the type of relationship between the responsible (RE) and the management (ME) entities.

Figure 19 illustrates alternative institutional arrangements, representing different *trade-offs* between the autonomy and transparency of management decisions *vis-à-vis* the public authority, as well as the degree of formal regulation. Both autonomy and formal regulation increase from Direct Public to Direct Private Management.

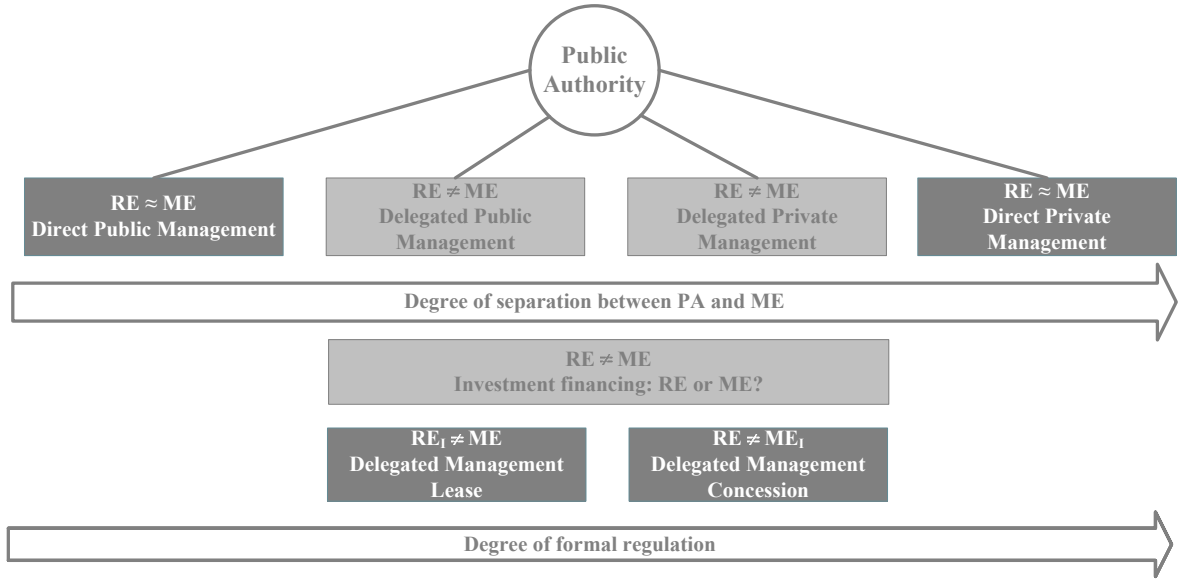


Figure 19 *Alternative institutional arrangements*

Regarding the systems' management, the public authority has two alternative strategies:

A. *Centralisation* of management (RE = ME) corresponding to direct management arrangements. There are two sub-strategies regarding the ownership of the operator, namely public and private management.

B. *Decentralisation* of management (RE ≠ ME) corresponding to delegated management arrangements. The operator's ownership may be defined by the public authority (e.g., law against private participation) or it may result from a competitive tender. There are two extra sub-strategies regarding investments, namely delegated management by:

    1. *concession* (the operator keeps the responsibility for investing in the systems) or

    2. *lease* (the responsibility for investment remains with the lessor).

The strategy of the public authority (PA) in terms of the sector's *regulation* depends on the degree of management centralisation, as well as on the operator's ownership (Figure 20).

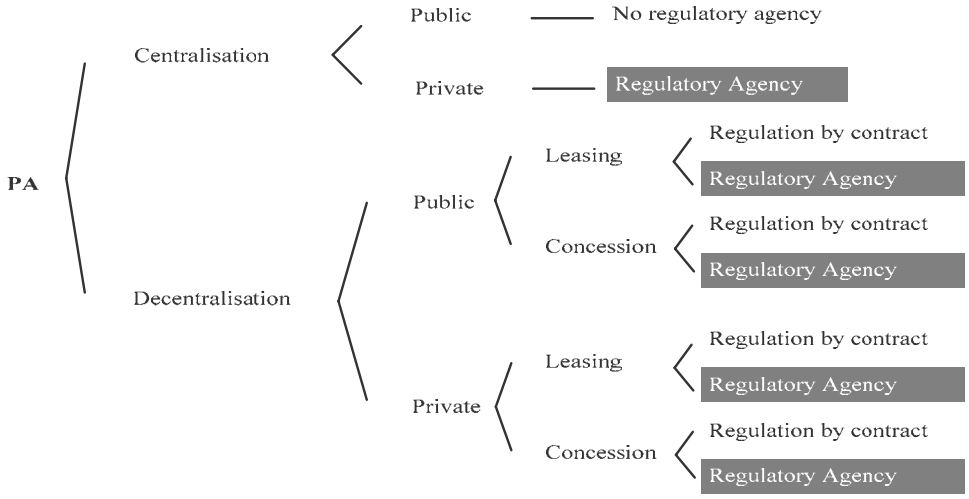


Figure 20 *Public authority's possible strategies*

Empirical evidence in the sector suggests that under centralised arrangements, a sector regulator is created if the operator is privately-owned. Under decentralised arrangements, the public authority has two alternative strategies in terms of mechanisms of regulation: regulation by contract, and the creation of a sector-specific regulatory agency.

Under *regulation by contract*, the majority of the rules and regulations are stated in the contract between the parties (i.e., the public authority and the firm). The success of this form highly depends on the specification of performance parameters, procedures for renegotiation, and remedies for non-performance.

The creation of *sector-specific agencies* as opposed to regulation by contract aims at creating stability and continuity in regulatory decision-making (Haarmeyer and Mody, 1998a). The separation between regulation and policy-making, and a clear definition of the regulator's role and responsibilities, are critical for a good regulatory design (Eberhard, 2006). Moreover, regulators need to be made accountable for their decisions in order to reduce the information rents created by asymmetry of information, which arises when the public cannot perfectly observe the regulator's actions (Bergman et al., 1998).

The public authority's strategies are related to the sector's reform, in the sense that they correspond to institutional arrangements combining different types and degrees of:

1. unbundling of functions,
2. private sector participation, and
3. autonomy of operators.

The public authority bases its decisions on information about the efficiency and efficacy of the current management entity, the level of consumers' satisfaction and their opinions, the need to upgrade infrastructure and its funding requirements, the availability of funding sources such as full-cost recovery, regional funds, and other subsidies, and the degree of private sector participation.

8.2.3 Regulatory entity

The *regulatory entity* operates under a predetermined regulatory regime (Gilbert and Newbery, 1994). Depending on the mechanisms of governance, the entity responsible for regulation can be a sector-specific regulatory agency or the public authority.

The definition of the regulatory entity's *strategies* highly depends on the level of regulatory discretion, on the priorities set by the public authority for the sector, as well as on the regulatory instruments at the entity's disposal.

The most important regulatory *instruments* in the sector are licences, price, and quality standards (see Chapter 2.1.3 for more details).

Some regulatory entities attribute *licences* (L) to management entities, based on their capacity to fulfil consumer protection requirements. In this case, only licence holders are authorised to operate in the sector. Licences can be revoked in the event of inadequate performance of the operator.

In some cases, the regulatory entity has discretion for defining and setting *tariffs* (either in contract design or through a regulatory agency), according to the public objectives set for the sector. The regulatory entity's strategy regarding pricing is essential both for capital investment and universal service provision. There are several pricing mechanisms, but we consider two of the most common ones in the UWS:

- *rate-of-return* (ROR) regulation, where the established price covers the firm's expenditures (including operating cost and depreciation) plus a reasonable profit on capital investment (i.e., a "fair" rate of return); and

- *price-cap* (CAP) regulation, where the price is fixed and, therefore, the profit margin is variable as a function of the costs.

For each of these strategies, there are sub-strategies related to output control (i.e., service quality monitoring, actual investment), cost control (especially for rate-of-return

regulation), reinforcement of funding sources (subsidies, higher tariffs, cross-subsidies), as well as warnings and sanctions.

The decisions of the regulatory entity should be based on the system's investment needs, the attractiveness of the institutional environment for investment, consumer satisfaction levels, and performance indicators.

8.2.4 Management entity

We present separately the strategies of the management entity regarding capital investments and the universal provision of the service of general interest.

When it comes to ***capital investments***, we consider the cases where the management entity is responsible for capital investments, i.e., direct management and delegated management by concession arrangements. The management entity may have a short-sighted perspective, where it has no incentive to invest, or a long-run perspective, where it wants to gain a reputation and keep the monopoly or gain the next tender. This can be related to the pressure the operator faces in its market as well as on its typology (see Chapter 7).

The *payoffs* for the management entity depend on the actual costs of investment and the revenues that it is allowed to earn.

Under *ROR regulation*, the operator's payoff corresponds to the total costs of investment. However, regulatory entities may apply the "use-and-useful" principle for determining the assets to be included in the rate base (Gilbert and Newbery, 1994). This means that part of the capital costs may be disallowed and, therefore, the operator is only reimbursed of part of its costs (decreasing its rate of return on total investments). In this case, the payoff depends on the percentage of the capital cost that is allowed. Thus, the decision to invest highly depends on the operator's expectations regarding the regulatory entities' cost allowances.

Under *price-cap regulation*, the operator's payoff is a function of the total costs and the fixed-price. The decision to invest depends on the price-cap, the duration of the transaction (the contract, when applicable), and the decision whether to bid for a new contract or not.

The sequence of moves between the regulatory entity (RE) and the management entity (ME) in terms of capital investments is presented in Figure 21.

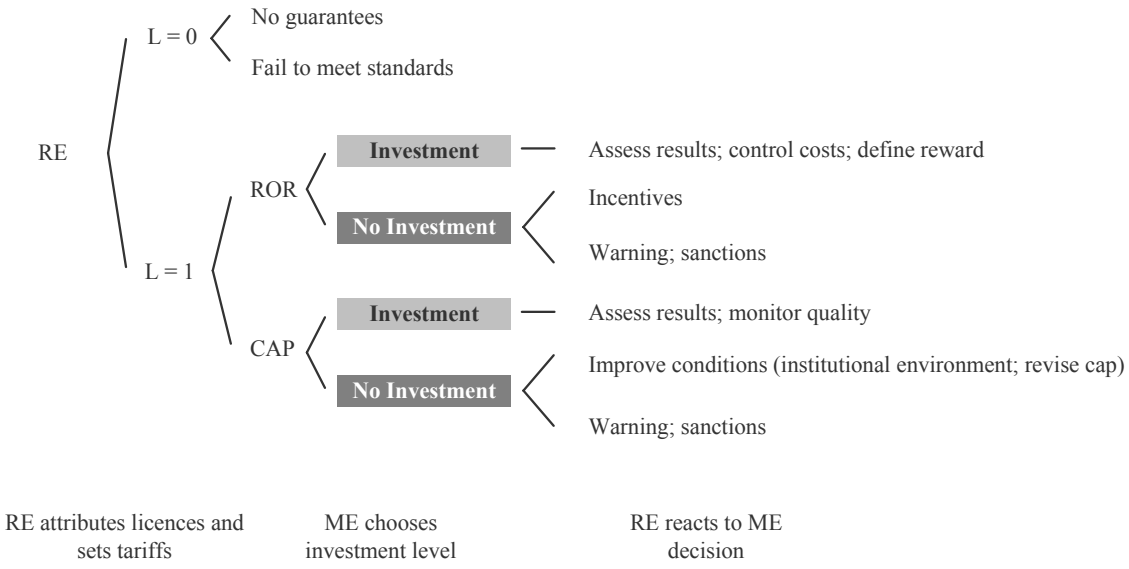


Figure 21 *Sequence of moves for capital investment*

When it comes to the ***universal provision of the SGI***, the management entity may have the organisational goal of providing a public service, or providing the service with a profit (see Chapter 7). The *payoffs* for the management entity depend on:

- the operational costs (which are directly related to the operator's performance);
- the degree of cost-recovery through tariffs, cross-subsidies or other social subsidies; and
- the capacity of the network to provide the service to the entire population.

The sequence of moves between the regulatory entity (RE) and the management entity (ME) in terms of universal provision of the SGI is presented in Figure 22.

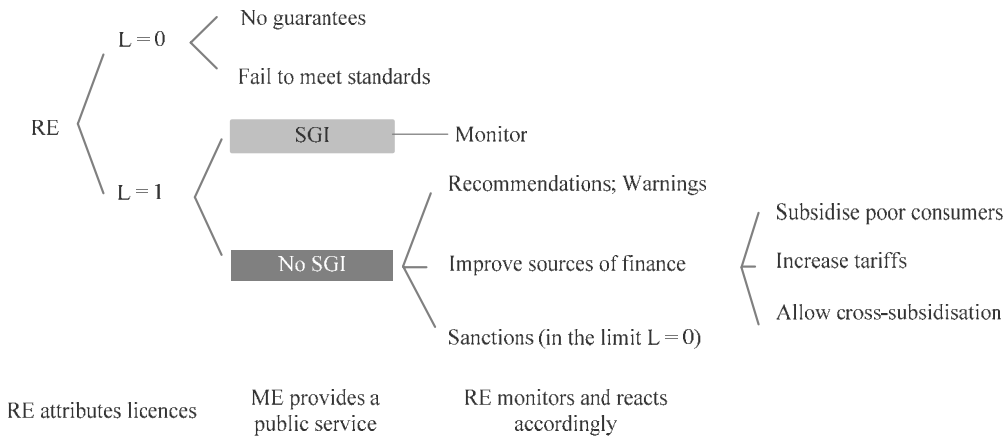


Figure 22 *Sequence of moves for universal provision of the SGI*

Based on the main actors' strategies identified in this section, we now propose regulatory governance mechanisms that tackle the problems created by the sector's reform.

8.3. Regulatory governance mechanisms

In this section, we present regulatory governance mechanisms corresponding to different phases of the risk management process. The starting point is the results presented so far in terms of vulnerability of the elements at risk and actors' strategies. Again, we present the results for capital investment and universal provision of the SGI separately. For each element at risk, we first present the rationale for intervening before identifying the appropriate mechanisms.

8.3.1 Capital investments

Capital investment is at a higher risk, the lower the ratio between contract duration and asset durability, the lower the trustworthiness of the regulator (and, consequently, the higher the threat of hold-up), and the lower the availability of financial sources are. The objective is to propose mechanisms that reduce the vulnerability of these factors, i.e. that make us move from the centre to the exterior of the figure presented in Table 17.

A rationale for intervention

From the empirical results in Part III, we notice that, in practice, *regulatory risk* and *asset specificity* (aggravated by the long duration of the assets' life) are of paramount importance. These factors were considered, on average, as more important than the lack of funding sources. However, we cannot ignore two things. Firstly, both regulatory risk and specificity have a large influence on the availability of funding sources. Secondly, the lack of funding sources remains very important in developing countries. As a matter of fact, the analysis in Chapter 5 suggested that the weight given to the factors of vulnerability differ from developed to developing countries (independently from the institutional arrangements).

Regulatory risks, including the threat of opportunistic behaviour by the authorities, were identified in Part III as being very important. However, other issues related to informational hazards are also affecting transactions in the UWS. For this reason, we include regulatory risks in the larger category of *informational hazards,* which refers to:

- *asymmetry of information* (e.g., when the regulator does not have access to all the operator's information on costs);
- *uncertainty of information*, which encompasses:
    - *institutional uncertainty* related to the difficulty in predicting the roles and actions of institutions (e.g., due to weak institutional capacities); and
    - *exogenous uncertainty* (e.g., natural hazards, demographic variations).

Asset specificity and informational hazards have a strong influence on the *duration of the transaction*. Very often, it is given more importance to specificity than to informational hazards. For this reason, long-term relationships – including long-term contracts – are considered almost a dogma in the UWS. This is aligned with the conservative strategies of operators, which aim at establishing long-term relationships in the management of services (Chapter 7).

According to Transaction-Cost Economics, when asset specificity is very significant, the parties are more likely to sign contracts with longer duration (Joskow, 1987). The reasons are that long-term contracts are a way of minimizing transaction costs in the event of high specificity (Chapter 4). This has been a reason justifying the long-duration of contracts in the sector. However, the evidence presented in this thesis suggests that *alternatives* to long-term contracts should be considered.

Firstly, *informational hazards* are very important in the UWS, which can counterbalance the influence of asset specificity on contract duration. As a matter of fact, the duration of contracts tends to decrease with higher levels of uncertainty because there is a higher need to adapt to the changing environment.

Secondly, the risks related to long-term contracts increase substantially when there is high asset specificity *and* high uncertainty. Some examples of contract disruption in the water sector prove it. So, in cases where uncertainty and asymmetry of information are high, even if asset specificity is equally high, *long-term contracts may be too risky*.

Thirdly, some types of operators – private operators and large firms – are more motivated to manage than to invest in the system, i.e. they have a preference for lease over concession contracts (Chapter 7).

Finally, in many cases, the *concession component in so-called concession contracts is weak*, in the sense that a significant part of the responsibility for capital investment is not taken by the operator (see examples in Chapter 6). This means that, in many cases, the reason justifying in theory the long duration of contracts – i.e., asset specificity – is not

valid in practice. The duration of the contracts remains long yet asset specificity related to the transaction is low.

Figure 23 presents the influence of asset specificity and informational hazards on contract duration. We start by *quadrant B*, representing cases with low-levels of specificity and informational hazards. High levels of contestability are expected and, therefore, contracts should have short-durations.

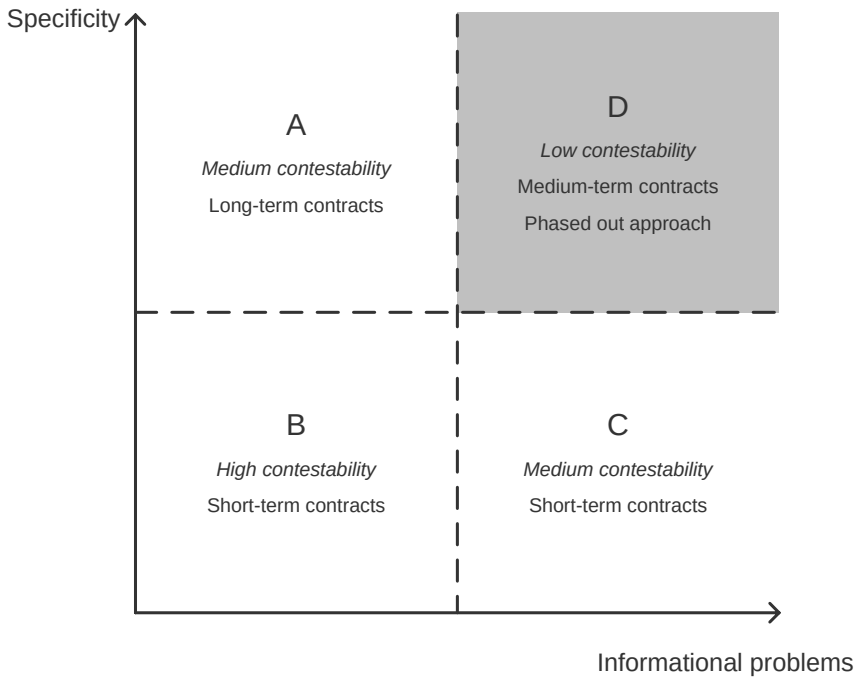


Figure 23 *Influence of asset specificity and informational problems in duration*

Quadrant A represents cases with higher levels of specificity yet maintaining informational hazards low, so it is expected a decrease in the degree of contestability. This is, in fact, the only case where long-term contracts are justified.

Quadrant C presents the inverse situation, where specificity is low and informational hazards are high, so the duration of contracts should remain short in order to enable the adaptation to changing environments. This is the case of many management and lease contracts in the UWS.

In the context of this thesis, the most interesting case to analyse is represented in *quadrant D*, where specificity is high and information problems are significant. Due to very low levels of contestability, as well as the disturbing influence of significant informational hazards, we recommend medium-term contracts or a phased-out approach to long-term contracts.

The motivation for taking a phased-out approach is the gathering of information and the mutual knowledge between the partners (which, as seen in Chapter 5, are in many cases new partners) in an effort to decrease the level of uncertainty and other informational problems.

We are therefore particularly interested in mechanisms that reduce informational hazards and align transaction characteristics (including specificity) with partners' expectations and resources. We now turn to identifying these mechanisms.

Regulatory governance mechanisms

Regulatory governance mechanisms aim at tackling the problems highlighted in terms of capital investments in each institutional arrangement (please refer to Chapter 4.3.1), and for the various stages of the risk management process (Figure 24).

There are two main propositions in terms of ***identification, assessment*** and ***prioritisation*** of risks. One is the establishment of institutional *platforms involving all actors* in order to guarantee a regular exchange of information and an adequate awareness in terms of factors of vulnerability. The agreement on regulatory goals established for the sector is particularly important. Such a platform has the potential to improve the knowledge about the sector, decreasing in this way the level of uncertainty that affects specifically concession arrangements.

The other mechanism is the definition of *investment plans* that clearly describe the flow of required investments in the system for the entire duration of the transaction. The responsible actors for defining such plans are the public authority in direct public and

leasing, the partners of the contract in concessions, and the private operator (with the approval of the regulatory entity) in direct private arrangements. Again, investment plans are particularly important in concession arrangements because they contribute to decrease the level of uncertainty and to verify the alignment of assets' life and contract duration.

In terms of risk ***mitigation***, we differentiate between propositions that are specific to the institutional arrangement and general ones. *Specific* propositions are:

- the reinforcement of funding sources in direct public arrangements. This can either be done by the allocation of subsidies, the increase in tariffs so that the operator is closer to cost recovery, or the possibility to use cross-subsidies;

- the establishment of dispute-resolution mechanisms, especially in concessions. The definition of a protocol on common vocabularies for contracts is also important in the sense that it clarifies the rights and responsibilities of partners, and avoids future misunderstandings; and

- the allocation of adequate resources to the regulatory agency in direct private arrangements. Accountability and transparency of actions are also crucial to increase the regulator's credibility and trustworthiness.

As for the proposed mitigation strategies that are *general* to all arrangements, these are:

- verification of the balance between required investment costs and available funding sources;

- public accountability and transparency of the decisions relating to the sector;

- definition of adequate penalties for non-compliance;

- definition of contingency plans; and

- creation of institutions that identify, codify and promulgate voluntary standards and best professional design practice.

Figure 24 *Regulatory governance mechanisms for capital investments*

IA / *RISK MNG*	**Direct Public Management Delegated Management by Lease**	**Delegated Management by Concession**	**Direct Private Management with Regulatory Agency**
Identification Assessment Prioritising	Institutional platforms involving all stakeholders; Agreement on goals *Initiative and follow-up by PA* Definition of investment plans *by PA*	Institutional platforms involving all stakeholders; Agree on goals *Initiative and follow-up by PA* Definition of investment plans *by partners of the contract*	Institutional platforms involving all stakeholders; Agree on goals *Initiative and follow-up by RA* Definition of investment plans *by operator and approved by RA*
Mitigation	Reinforcement of funding sources *by PA*	Protocol on common vocabularies for contracts Modes for resolution of disputes *by partners of the contract*	Appropriate capacity and resources; Transparency and accountability *of RA*
	Adequate penalties Check the balance between investment costs and available financial sources Public accountability for decisions relating to the sector; transparency in decision-making Contingency plans Insurance mechanisms		
Monitoring	Specification of performance parameters Monitoring of service quality *by PA*	Specification of performance parameters Monitoring of service quality Cost control (especially for ROR) *by PA*	Specification of performance parameters Monitoring of service quality Cost control (especially for ROR) *by RA*

Legend
IA Institutional Arrangements
PA Public Authority
RA Regulatory Agency

Finally, in terms of ***monitoring*** two aspects are particularly important:

- specification of performance parameters and independent monitoring of service quality, which is essential across all arrangements;
- control of costs, which is especially important under rate-of-return forms of regulation.

In the following section, we focus on mechanisms that decrease the vulnerability of the universal provision of the SGI.

8.3.2 Universal provision of the SGI

The provision of the *service of general interest* is at a higher risk, the higher the costs of service provision, the lower the degree of cost recovery, the higher the percentage of poor customers in society and the weight of their water bills, and the lower the availability of financial sources for covering operational costs are. Again, the objective is to propose mechanisms that reduce the vulnerability of these factors, i.e. that make us move from the centre to the exterior of the figure presented in Table 18.

A rationale for intervention

As we have seen in Part III, the universal provision of the SGI depends on the availability of infrastructure capacity and customers' affordability of price. Figure 25 presents the relationship between affordability and capacity, and their influence in terms of possible solutions to guarantee the universal provision of the service.

Quadrant A represents cases where affordability levels are high yet the network has no capacity. The provision of SGI is at risk but considering that affordability levels are high this should be a temporary situation. The focus is to increase network capacity while controlling for affordability levels (which could be endangered by higher capital costs).

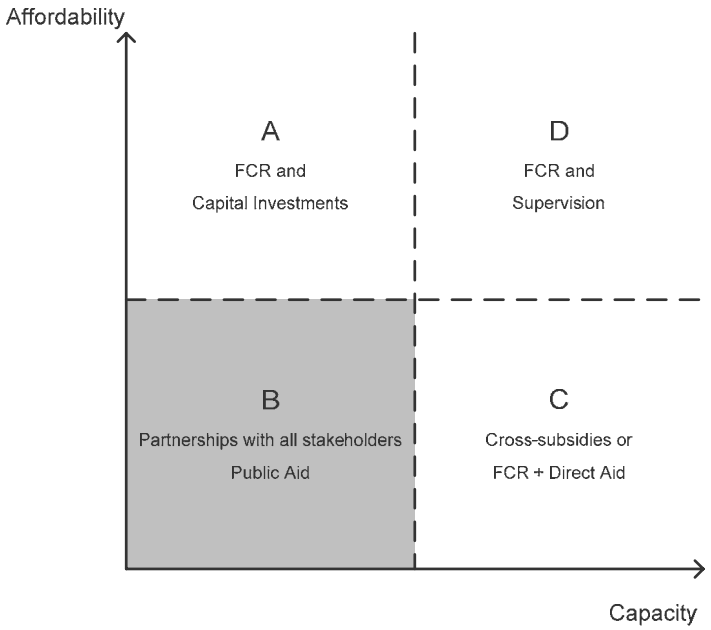


Figure 25 *Influence of affordability and capacity on the provision of SGI*

Quadrant D also represents cases with high levels of affordability but this time with high levels of network capacity. It does not pose major problems either. As long as the quality of the service is independently supervised, full-cost recovery (FCR) policies can be applied. It is important to stress that a cost-recovery pricing approach is against equity principles since low-consumption and low-income households are characterised by a more price inelastic water demand[62].

Quadrant C corresponds to cases with an adequate level of network capacity but low customers' affordability. It calls for the use of cross-subsidies or full-cost recovery policies if complemented with direct (*ex-post*) aid to customers in need.

Finally, *quadrant B* represents the most troublesome cases, where there is a lack of network capacity as well as significant affordability problems. This situation is common in

[62] Similarly, a small fixed charge reflects a more socially oriented tariff policy.

developing regions. The solution needs to pass through the establishment of partnerships between all the stakeholders, including informal suppliers. Public aid (from national governments and international donors) is needed to tackle the more critical situations, where public health is in danger.

In sum, we are particularly interested in mechanisms that are able **to guarantee affordable tariffs for customers, as well as to balance network capacity and demand** in order to guarantee the universal provision of the service. Operational efficiency (especially its consequences on costs and final prices) is particularly important for this endeavor.

Regulatory governance mechanisms

We propose regulatory governance mechanisms aimed at tackling the problems highlighted in terms of universal provision of the SGI per institutional arrangement (please refer to Chapter 4.3.2) and across the risk management process (Figure 26). Some of these mechanisms coincide with those presented in the previous section.

In terms of risk ***identification, assessment*** and ***prioritization*****,** we propose the implementation of an institutional platform involving all stakeholders to:

- exchange information in a regular way, namely in terms of the vulnerability of the universal provision of the SGI. This is important in order to decrease informational hazards, in particular uncertainty of information;

- discuss and agree on the characteristics of the SGI, namely in terms of service coverage and quality. This is particularly important in delegated management and private arrangements in general, in order to avoid the discrimination of non-profitable segments of the systems (i.e., to avoid "cherry-picking").

- prioritise areas of action. This is important for all types of institutional arrangements, and particularly in areas of great distress in terms of water supply.

Figure 26 *Regulatory governance mechanisms for universal provision of the SGI*

IA / ***RISK MNG***	**Direct Public Management**	**Delegated Private Management**	**Direct Private Management with Regulatory Agency**
Identification Assessment Prioritising	Institutional platforms involving all stakeholders; Definition of goals *Initiative and follow-up by PA* Definition of priority areas for action *by PA*	Institutional platforms involving all stakeholders; Agree on goals *Initiative and follow-up by PA* Definition of priority areas for action *by partners to the contract*	Institutional platforms involving all stakeholders; Agree on goals *Initiative and follow-up by RA* Definition of priority areas for action *by operator and approved by RA*
Mitigation		Definition of the required service levels and quality *by PA* Protocol on common vocabularies for contracts Modes for resolution of disputes *by partners to contract*	Appropriate capacity and resources; Transparency and accountability *of RA*
	Social subsidies or special mechanisms for most vulnerable groups Check the balance between operational (and capital, if needed) costs and available funding sources Definition of adequate sanctions Public accountability for decisions relating to the sector; transparency in decision-making Contingency plans		
Monitoring	Monitoring of service quality and operator performance Price control (check affordability) *by PA*	Monitoring of service quality and operator performance Price control (check affordability) *by PA*	Monitoring of service quality and operator performance Price control (check affordability) *by RA*

Legend

IA	Institutional Arrangements
PA	Public Authority
RA	Regulatory Agency

In terms of ***mitigation***, we differentiate between mechanisms that are specific to the institutional arrangement, and general ones. *Specific* mechanisms are:

- the definition of required service and quality levels in the contract in delegated management arrangements;

- the allocation of adequate capacity and resources to the regulatory agency in direct private arrangements, more generally in governance forms with regulatory agencies. Accountability and transparency of actions are also crucial to increase the regulator's credibility and trustworthiness.

As for the proposed mitigation strategies that are *general* to all arrangements, these are:

- definition of criteria for the allocation of social subsidies or other mechanisms for the most vulnerable groups;

- check the balance between operational costs (as well as capital costs, in situations where network capacity is constraining the provision of the service) and available funding sources;

- definition of adequate sanctions for non-compliance;

- public accountability and transparency of decisions relating to the sector;

- definition of contingency plans.

Finally, in terms of ***monitoring*** two aspects are important, particularly in delegated and private arrangements:

- independent monitoring of service quality, including coverage, as well as operators' performance. The standardisation of performance indicators and the use of benchmarks to compare operators are mechanisms that are important for monitoring and, at the same time, create some competitive pressures; and

- price controls, namely in terms of impact on the customers' affordability.

8.4. Conclusion

Certain features of reform, such as unbundling of functions, delegation, and private sector participation, affect incentives to invest and to provide the service of general interest in the UWS. For this reason, the protection of capital investments and consumers become very important regulatory objectives in the sector.

The reform of the sector also diffuses responsibilities through different actors in the system that have multiple, and potentially conflicting, interests. Therefore, reaching a balance between the various actors' strategies – that is, governance – is essential so that regulatory objectives are met.

The approach taken in this thesis aims at contributing to this goal in two ways. Firstly, it focuses on a new role for regulation that goes beyond the direct intervention of a public authority in the market. In the new context, regulation is the product of the interaction between State and non-State actors. There is a move away from command-and-control to incentive-based type of interventions. Secondly, it identifies mechanisms that reduce the vulnerability factors of the elements at risks because of reform.

The choice of the institutional arrangement and corresponding regulatory governance system is part of the public-authority's strategies. It depends on whether the management is centralised/direct or decentralised/delegated, as well as on the ownership of the operator. The strategies of the other actors largely depend on the regulatory governance system under which they operate.

The importance of each vulnerability factor varies according to the institutional arrangement. In terms of capital investment, in delegation by concession, contract incompleteness and the misalignment of contract duration with asset durability have the highest impact in terms of vulnerability. In direct private management with a sector-specific regulator, the most important factor is the agency's credibility and trustworthiness. In terms of the universal provision of the service, the threat of

opportunistic behaviour by the operator becomes particularly important, especially in institutional arrangements with a private operator.

We have presented regulatory mechanisms that, in our opinion, have the potential to reduce the vulnerability factors of the elements at risk. Some of these forms of regulatory intervention are general to all the systems independently of their organisation. However, it is important to acknowledge that there are also specific forms of intervention that depend on the institutional arrangements.

In terms of capital investment, the main concern is to reduce informational hazards and to align transaction characteristics with the actors' expectations and resources. One of the main characteristics of the transaction is asset specificity. Even though the level of asset specificity is high in the UWS, it is essential to assess whether this specificity is at the core of the transaction. The responsibility for investments is the object of the transaction only in delegated management by concession and direct private arrangements. In the remainder of the cases, such as management and lease contracts, the levels of asset-specificity in the transaction are relatively low, which do not sustain *per se* the need for long-term contracts.

Finally, in terms of universal provision of the SGI, the main concerns are to guarantee affordable tariffs (or alternative forms of access) for customers and an adequate level of network capacity (that does not constraint the universal provision of the SGI). It is essential to assess the impact of full-cost recovery policies on the affordability levels of the most vulnerable customers. However, this should not be an obstructing force against the implementation of such policies, which are important to increase efficiency levels in the system.

Chapter 9. General Conclusions and Future Research

The reform of the water sector is an undeniable evolution. Although it cannot be called liberalisation because there are considerable limits to introduce competition in the market, significant features that normally characterise liberalisation processes in the network industries are also present in the urban water sector (UWS).

While many authors argue that the introduction of private sector participation and competitive pressures are beneficial in terms of efficiency and attraction of capital into the sector, the reform also leads to criticisms from ideological (such as the loss of public control over an essential good) as well as from economic and managerial perspectives (such as the capacity of private operators to manage the systems more efficiently than public ones).

This thesis has covered a number of important conceptual and empirical questions referring to the costs of reforming the sector. Several theories are used to analyse the issues presented here. We can divide them into two main groups. Firstly, in Chapter 2, we present an extensive literature review of the theories of economic regulation, with the aim of understanding the interactions between regulation and reform better. Secondly, in Chapter 4, we use contract theories as a framework for presenting the vulnerability analysis of the main elements at risk because of reform.

In the following section, we present the main conclusions of this thesis, by answering the research questions posed in Part I General Introduction. Suggestions for future research are then outlined.

9.1. General conclusions

This thesis shows that regulation has an important role to play in the management of the risks created by the reform of the sector. In this regard, regulatory governance is presented as the key concept that encompasses the wide range of challenges posed to regulation in the new context of reform.

There are three main threads that run throughout this thesis. The first one is the close relationship between *reform and regulation*. The literature on regulation has followed, and sometimes triggered, the sector's reform. Even after reform, operators remain local monopolists, and therefore face no direct competition. For this reason, some type of regulatory intervention is needed to ensure a number of functions that still need to be guaranteed after reform, such as the sustainability of the network and the enforcement of public policy objectives.

A second common thread is to consider *transactions* of (property, management, or investment) rights and responsibilities as the unit of analysis. Different types of transactions correspond to different institutional arrangements. For example, the full transfer of property rights to a private operator corresponds to privatisation and, thus, to direct private management arrangements.

A third commonality is to consider *risk* as a very important component of the analysis of reform. As a matter of fact, the reform of the sector is creating new sources of uncertainty and vulnerability for the management and regulation of water utilities. We take a risk management approach to tackle the problems created by the reform of the sector.

Based on the results presented throughout this thesis, we now conclude by answering the research questions presented in Part I General Introduction.

Question 1: Whether and how is the reform of the sector affecting the nature and intensity of risks?

In order to address this question, we started by identifying the main features of reform and how they relate to the various institutional arrangements (in Chapter 1). Then we have made an exhaustive list of the different types of risks in the sector, and analysed their causes (in Chapter 3). From these results we could attest that ***three categories of risks***, namely technical, regulatory and social risks, ***are indeed created or strongly accentuated by the features of reform.***

Firstly, *technical risks* are created by the unbundling and fragmentation of the technical systems, which are normally required when introducing competition. In the situations of structural unbundling, it must be ensured that the physical material of the system does not fail when exposed to external and internal stresses.

Secondly, *regulatory risks* result from the unbundling of the managerial and regulatory functions. The separation between the management and the regulatory entities creates a new source of asymmetry of information, which is at the base of the potential opportunistic behaviour by the regulator.

Thirdly, *social risks* are accentuated by the participation of private sector operators, whose objectives may differ from public goals. In a context of reform, the provision and funding of the services of general interest are no longer guaranteed by public ownership and management. Moreover, with the end of cross-subsidies, price equity is not guaranteed either.

From the analysis of the risks created by the sector's reform, one can identify four main elements at risk, namely system's integrity, security of supply, equity of access, and affordability of prices. All these four elements are interrelated. Non-affordability of prices makes capital cost-recovery very difficult which, as a consequence, jeopardises capital investments. Hence, the system's integrity and security of supply are at risk. The same

applies for equity of access – it is at risk if there is no security of supply or if the system's integrity is not guaranteed.

We have decided to focus on the sustainability of capital investments and the universal provision of the service of general interest, which are crucial components of the elements at risk, and are themselves at risk in the new environment. This assessment that reform was creating new risks in the sector led to the development of the second research question:

Question 2: Whether and how do reform risks vary according to different institutional arrangements?

The first step taken in answering this question was to analyse how risks are shared between the parties in the various institutional arrangements. We started by grounding the analysis on the *definition of each institutional arrangement* (Chapter 3). We noticed that ***risk-sharing patterns do vary across arrangements***. Under direct management arrangements, all the risks are taken by the operator (being it public or private). Under delegated management arrangements, all depends on the type (and degree) of rights and responsibilities that are transferred. Focusing specifically on reform risks, we could notice that both the allocation of technical and social risks differ significantly across institutional arrangements.

The *empirical evidence* on risk-sharing presented in Chapters 5 and 6 confirms that risk-sharing patterns differ across institutional arrangements. However, patterns are not as clear as those resulting from the analysis based on the conceptual definitions. Firstly, the weight of regulatory risks in direct private arrangements is more evident in the empirical analysis than it was in Chapter 3. Secondly, when the management is delegated through a contract, it is quite clear that partners share the majority of the risks. However, problems arise when unpredictable or uncontrollable events jeopardize the established balance between the partners and put capital investments and universal service provision at risk.

The second step was to build a framework based on Contract Theories to develop a vulnerability analysis of the main elements at risk because of reform (Chapter 4).These

theories also suggest that the allocation of reform risks between the parties depends on the characteristics of the transaction, the costs of writing, monitoring, and enforcing the contract, and the threat of opportunistic behaviour from the parties of the contractual relationship. The results of the vulnerability analysis reiterate that the ***vulnerability factors affect the elements at risk in different ways and degrees***, ***depending on the institutional arrangement and development context***.

In terms of *capital investments*, several factors are considered. Firstly, asset specificity and durability, as well as opportunistic behaviour by the operator are particularly relevant in delegation by concession. Secondly, operators are exposed to opportunistic behaviour by the regulator in delegation by concession and direct private arrangements. Thirdly, uncertainty over the state of the network may render asset valuation difficult, which is significant mainly in delegation by concession and direct private arrangements. Finally, the lack of funding sources is also important.

Theoretical and empirical analyses show that, in a context of reform, asset specificity and informational hazards (for example, the threat of opportunistic behaviours and uncertainty over the state of the network) are the most important factors increasing the vulnerability of capital investments. The lack of funding sources is also highlighted, specifically in developing countries.

As for the *universal provision* of the SGI, the main factors affecting its vulnerability are the nature of the service, the threat of opportunistic behaviour, and financial constraints. Firstly, the nature of the service is particularly important when the operator is private because a private operator does not enter non-profitable segments nor provide a public service without a profit, unless it is compensated for its loss. Secondly, for the same reason, a private operator may incur in opportunistic behaviours, either by only choosing profitable segments or by increasing tariffs to socially unacceptable levels. Finally, the pressure to end cross-subsidies increases the vulnerability of universal provision by constraining the financial options of operators. This is very relevant in the direct public arrangement.

It became clear from the empirical evidence that non-provision of the service may result from non-capacity of the system (calling for a need to expand the system) or to non-affordability of the service. Of course, the situation is more acute when there are both affordability and capacity problems, such as is the case in many developing countries.

The identification of the vulnerability factors of the main elements at risk because of reform led to the third question related to possible solutions.

Question 3: Can regulation be a tool for reform risk management? If yes, how?

After acknowledging that regulation has a very important role to play in the UWS (Chapter 2), namely in terms of investment and consumer protection, it became clear that it can be seen as a tool in reform risk management. In this way, we proposed a new role for regulation taking into account its functions in reducing the vulnerability factors of the main elements at risk because of the reform.

In terms of capital investment, the main concerns are to reduce informational hazards and to align transaction characteristics - namely specificity – with the actors' expectations and resources. Even though the level of sector-specific investment is high in the UWS, it is essential to assess whether this asset-specificity is at the core of the transaction.

In terms of universal provision of the SGI, the main concerns are to guarantee affordable tariffs for customers (or alternative mechanisms for the poorest consumers) and an adequate level of network capacity (that does not constraint the universal provision of the SGI).

Along these lines, we propose regulatory mechanisms adapted to each institutional arrangement, involving different actors, for every step of the reform risk management process. In our opinion, this integrated ***approach of risk and regulatory governance*** is the only one adapted to the new context in the UWS.

9.2. Future research

The areas recommended for future research are extensions of the current work. These developments relate to additional empirical analyses with *de facto concessions*, where the risks related to investing into the infrastructure are indeed transferred to the operator. The cases of the concessions analysed in this thesis are at best lease contracts with some concession clauses. Completing the analysis with *de facto* concessions would allow more robust conclusions regarding the comparison across institutional arrangements, as well as the actual importance of contract duration on the incentives to invest in specific capital in the sector.

It would also be extremely interesting to organise *workshops* gathering all the relevant actors in each system in order to confront their views in terms of risk-sharing patterns and vulnerability factors of the main elements at risk because of reform. This could actually be included in the institutional platform involving all stakeholders, which is proposed as a mechanism for identifying and assessing the new risks.

Follow-up studies on the *impact of the regulatory mechanisms* presented in Chapter 8 would allows us to verify the efficacy of those mechanisms in managing the reform risks and could be understood as a complementary approach to the results presented in this thesis. In the empirical analyses presented herein we focused on risk-sharing partners and the identification of the vulnerability factors, and not on the regulatory mechanisms. Such an extension would analyse the regulatory mechanisms that are already implemented. Clearly, the analysis would be greatly enriched if it included the implementation of new mechanisms as well as their evaluation. This new study would allow making adjustments on the mechanisms and, eventually, propose new ones adapted to specific circumstances.

However, extending the empirical work may be particularly *difficult* since risk-sharing issues and capital investments are extremely sensitive issues and the stakeholders are not willing to share their views and information with researchers. This is exacerbated by the

fact that we are referring to the urban water sector, where the debates are easily highly-politicised.

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ANNEX 1

QUESTIONNAIRE ON RISK-SHARING AND ELEMENTS AT RISK

1. Please identify the institutional arrangement that best matches the conditions under which your company provides urban water services ***(only one possible option)***.

Direct public management	☐
Delegated public management (autonomous entity)	☐
Management contract	☐
Lease / affermage contract	☐
Concession contract	☐
Build-Operate-Transfer (BOT)	☐
Full privatization	☐

2. In case there is a **contract** governing the relationship between your organization and the responsible entity for water services provision:

2A. The attribution process was ***(only one possible option)***:

Competitive / Public tender	☐
Direct negotiation	☐
Negotiation after competitive selection of a shortlist of operators	☐

2B. Contract duration: _____years.

Please identify the beginning and ending years of the contract ☐ ☐

YES NO

2C. Was there any <u>unanticipated</u> renegotiation of the contract? ☐ ☐

If yes, please state the year(s) of renegotiation _____

YES NO

2D. Is it the first contract signed with this partner? ☐ ☐

YES NO

3. Does your organization **own the infrastructure**? ☐ ☐

YES NO

4. Does your company benefit from any **subsidy**? ☐ ☐

If yes, please specify the reason(s) ***(several possible options)***:

Cover part of capital costs ☐

Investments for environmental improvements ☐

Investments for service quality improvements ☐

Provision of water services to low-income customers ☐

Other reasons, such as _____ ☐

5A. Has your organisation made any important **capital investment** (i.e., investment on a fixed asset such as in the infrastructure) in the past 5 years?

Yes ☐

No, yet we are responsible for investing in capital equipment ☐

No, it is not our responsibility to invest in capital equipments ☐

YES NO In part

5B. Were these investments made to meet contract requirements? ☐ ☐ ☐

5C. What are the reasons justifying capital investments? ***(Several possible options)***

- Capacity expansion ☐
- Modernisation ☐
- Environmental standards ☐
- Quality of the service standards (other than environment) ☐
- Reduction of operating costs ☐
- Others. Please specify: _____ ☐

5D. What are the sources of financing for capital investment? ***(Several possible options)***

- Revenue ☐
- Equity finance ☐
- Bond finance ☐
- Loan ☐
- Subsidise loan ☐
- Public subsidy ☐
- European Funds ☐
- Project Finance ☐
- Others. Please specify _____ ☐

5F. Decisions to invest in capital (equipment, infrastructure) involve risk. Please mark in order of importance, what you consider the most important factors increasing risk to be ***(1=very important, 2=important, 3=of some relevance, 4=irrelevant)***

- Long amortization periods ☐
- Short duration of the contract ☐
- Risk that authorities change rules, prices, or cost allowances ☐
- Difficulty in assessing real conditions of underground assets ☐
- Lack of financial resources ☐
- Other. Please specify _____ ☐

6. How does your company cover **operational costs** (e.g., employment, energy, materials)? ***(Several possible options)***

- Revenue (tariffs) covers all operational costs ☐
- Revenue (tariffs) partially covers operational costs ☐
- Cross-subsidies
  - Block tariffs (depending on consumption) ☐
  - Type of consumers (domestic, industrial) ☐
  - Regional (urban subsidise rural consumers) ☐
  - Other business segments subsidise water business ☐
- Public subsidies ☐
- Other. Please specify _____ ☐

7. Which of the following factors are, in your opinion, important to guaranteeing the provision of water services to **low-income customers**?

(1=very important, 2=important, 3=of some relevance, 4=irrelevant)

Existence of subsidies to cover service provision to the poorer ☐

Possibility to use cross-subsidies ☐

Prohibition to cut off service provision due to non-payment ☐

Flexibility in terms of service quality (e.g., in terms of hours) ☐

Other. Please specify _____ ☐

8. Every business activities have associated **risks**. Please identify with a cross which entity bears the following risks (i.e., the entity responsible for covering additional costs resulting from the following hazards):

RISKS \ ENTITIES	Operator	Municipality	Regulator	Consumers	Other. Which?
Construction projects (e.g., equipment, infrastructure) are not finished on time, within budget and according to specifications					
Customers are not able/willing to pay for the amount projected during tariff setting					
Facilities fail to meet performance parameters					
Cash flow cannot cover operating expenses					
Authorities reinterpret regulations or create new rules that increase costs or reduce revenues					
Non-availability of financial resources to provide water services to the poorest consumers					
Currency exchange fluctuations and limits to convertibility					
Political interference, expropriation, nationalization, war, civil disturbances					
Events beyond partners' control interrupt operations (e.g., natural disasters, floods)					
Other(s). Please specify _____ _____					

ANNEX 2

PROJECT FINANCE

"Project Finance" generally refers to non-recourse finance based on the merits of a project rather than on the credit of the project's sponsor, which significantly reduces their financial exposure. Project sponsors (i.e., owners) usually create an independent juridical and economic entity called a special purpose company. This company's main goal is to create an organisational structure and obtain the necessary financial resources from lenders in order to develop and manage a specific project.

In a project finance transaction, lenders devote particular attention to the revenue-producing contracts and the underlying cash-flow from the project. A detailed review (Riviere, 2003) is made of:

1. the development and construction risks (in what refers to development and project conception, implementation and licensing, and construction);
2. the operation and maintenance risks (with a special focus on the sponsors experience and track record, as well as the qualification of the personnel, and the maintenance quality);
3. the political risks; and
4. the environmental and force-majeure risks.

However, water projects tend to be less attractive for project finance than in other network industries. The reason is that they are often relatively small and, therefore, they do not compensate for the high threshold costs that are typically required in this type of finance (OECD, 2004b).

ANNEX 3

TYPOLOGY AND MAP OF OPERATORS ACROSS EUROPE[63]

In order to come up with a possible generalisation of the strategies of WSS operators, the first step is to establish a general typology of operators rather than doing an individual case-to-case analysis. The typology of operators is defined according to four major characteristics, namely:

(1) Ownership: operators can be public, private or mix;

(2) Size: it is used the variable "served population by operator" to classify operators as small (serving a population below 100,000 inhabitants), medium (serving between 100,000 and 10,000,000 inhabitants), and large[64] operators (serving more than 10,000,000 inhabitants);

(3) Scope of the market: it defines whether the operator works on a regional, national, or international level; and

(4) Segments of the market: it relates to the types of services provided by the operator, namely water supply, sanitation or multi-utility (e.g., water, waste, energy) services.

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[63] The material presented in this Annex was published in Luís-Manso et al. (2007). Europe in the scope of this report comprises EU-15 and Switzerland. We acknowledge the contribution of the partners in the Euromarket project.

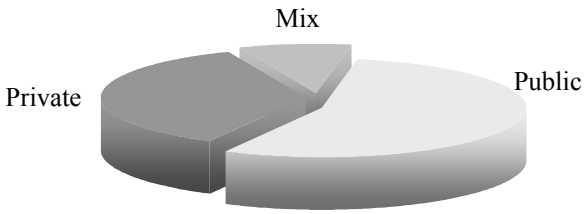
[64] Large operators participate in the ownership structure of other operators. Nonetheless, we consider local operators as the reference in calculating these figures, which means, for example, that even if a medium sized operator is owned up to 50% by a large operator, the operator is aggregated in the medium-sized category.

This typology is based on the assumption that the strategy of operators is mainly influenced by physical and business characteristics. It therefore does not consider geographical, cultural or historical factors that may shape the formulation of business strategies.

The next step aims at providing a general picture on the distribution of the different types of water operators across Europe. Considering the fact that different sources were used, as well as the lack of detailed data for some countries and typologies, the data presented in this section is just an estimation of the European map of water operators.

Traditionally water services were directly provided by local public entities. This type of operator is still dominant across Europe however other typologies have emerged in the past twenty years. Today there are more than 30'000 water operators in Europe. At a first glance on the data (Figure 27 and Figure 28), some first conclusions can be drawn. Firstly, in terms of water services provision, the majority of European population (about 55 per cent) is supplied by public operators, followed by private (about 35 per cent) and mixed owned (almost 10 per cent) ones.

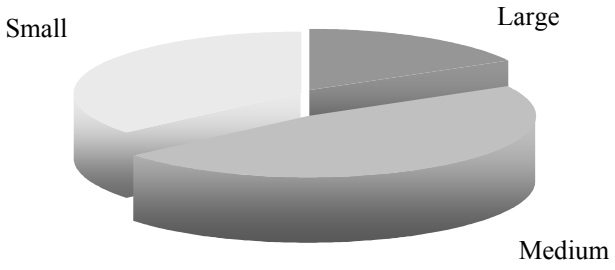
Figure 27 *Type of ownership of operators per population supplied, 2003*



Secondly, regarding the size of operators providing water services, medium-sized operators supply almost 50 per cent of the population. This result is not very significant because, according to the defined typology, medium operators are those supplying between 100'000 and 10'000'000 inhabitants, which is a very large interval. Small ones that are the majority

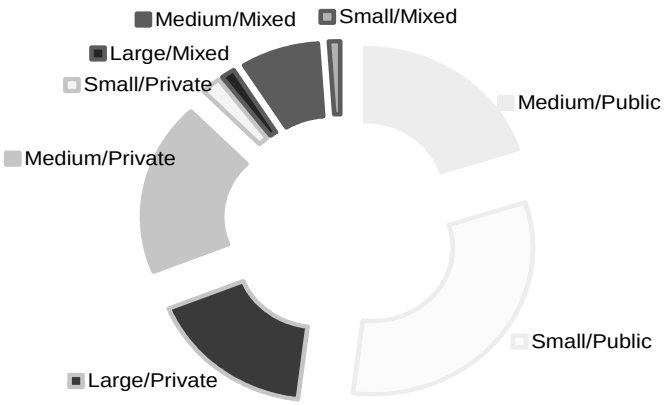
in nominal terms supply about 35 per cent of the population and, finally, large operators account for approximately 15 per cent of the inhabitants.

Figure 28 *Size of operators per population supplied, 2003*



Another interesting conclusion that can be drawn from the data (Figure 29) is that there are no "public-large" water operators. All public operators are small and medium. Another conclusion is that small public operators account individually for the biggest share in terms of population supplied (about one third), followed by medium public and medium private operators (about 20% each). Yet probably the most interesting conclusion is that the participation of the private sector through medium sized operators is very significant (approximately the same as through large sized ones), which is especially due to England & Wales. This is especially true for water supply operators. It is nonetheless important to state that large private operators participate in the ownership of several small and medium private and mixed operators, and thus their influence needs to be analysed accordingly.

Figure 29 *Partition of types of water operators in Europe, 2003*



Clustering of the 16 countries

The analysis presented so far relates to a general picture of Europe in terms of operators' typology. It is important at this moment to present a more detailed illustration, namely with the aim of clustering some countries based on common characteristics (i.e., with respect to ownership and size). The first cluster that has been made is based on ownership, the second is based on size, and the third and final cluster is a combination of these two.

In terms of population served per type of ownership, public operators are providing water services to the majority of the population in 14 out of 16 countries. Only in France and in England and Wales is the majority of the population served by private operators (although under very different institutional arrangements). Private ownership is also considerably important in Spain, Denmark (due to private cooperatives supplying water especially in rural areas) and Italy. In contrast, private participation is almost non-existent in Switzerland, and it is even zero in Luxembourg and the Netherlands (although not for wastewater). Finally, in every country except for Spain, Italy and Greece, one form of ownership (almost always public) is dominant.

In terms of size, small and medium sized operators provide water services to the majority of the population. Only in France large operators are dominant in terms of population served, which can be seen as a result of the local model of delegated management to (private) companies. Apart from France, large operators are also present in the England and Wales, and Germany (although not in a dominant position).

Clustering based on ownership

Four clusters can be identified on the basis of operators' distribution in terms of ownership:

1. France and England & Wales form the first cluster, because they are the only countries where private ownership is the dominant type (even though under different modes of management);

2. The second cluster is the mix cluster. This cluster is not based on mixed ownership, but based on the fact that these countries do not have a (real) dominant ownership structure. This cluster is formed by Italy, Spain and Greece;

3. The third cluster is formed by Denmark and Germany. These two countries have a dominant public ownership (i.e., public operators provide water services to about two thirds of the population), but less dominant than the countries in cluster 4;

4. The last cluster is the cluster where public ownership is dominant (i.e., it provides water services to more than 90% of the population), and it contains the following countries: Sweden, Finland, Ireland, the Netherlands, Belgium[65], Luxembourg, Switzerland, Austria, and Portugal.

[65] Belgium is considered in this cluster even if in terms of sanitation about 30% of population is served by mixed owned operators.

Clustering based on size

Four clusters can be identified on the basis of operators' distribution in terms of size:

1. France forms a cluster by itself, because it is the only country in Europe, where large operators are providing water services to the large majority of the population;

2. The second cluster is formed by Spain, England & Wales, Italy, Greece and the Netherlands where medium-sized operators are dominant;

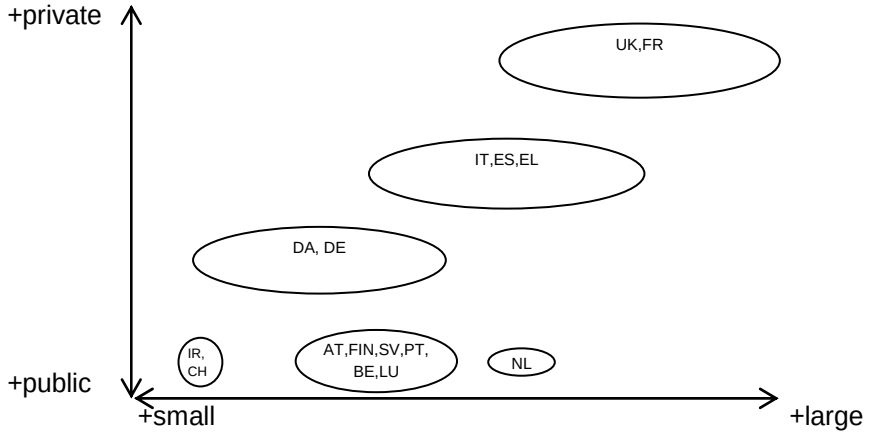
3. The third cluster is formed by countries where medium-sized operators provide water services to (more or less) the same share of population as small-sized operators. This cluster is formed by Austria, Finland, Sweden, Portugal, Belgium and Luxembourg;

4. The last cluster is the cluster where the small sized operators are dominant. Ireland, Germany, Denmark and Switzerland form this cluster.

Clustering based on ownership and size

Finally, it is possible to group the 16 countries into six different clusters combining these two typologies, i.e. ownership and size (Figure 30). The ordering of the clusters corresponds to their importance in terms of population, with the first cluster representing more population than the sixth.

Figure 30 *Clustering of countries according to operators' typology, 2003*



First cluster: France and England & Wales, the only countries with the majority of the population being served by privately-owned operators, form the first cluster. Furthermore, the major water-related TNCs (Suez, Veolia, Thames Water) have in England and France their main domestic markets.

Second cluster: The second (largest) cluster is formed by Italy, Greece and Spain. Their water operators have many different forms, structures and sizes, but in general the majority of the population is served by publicly-owned medium sized operators.

Third cluster: Germany and Denmark form the third cluster with dominant public ownership, but less dominant than the countries in the remaining clusters. Small and medium are the dominant size of operators.

Fourth cluster: The fourth cluster is formed by countries where the majority of the population is served by operators publicly owned, but equally divided into small and medium sized. Austria, Belgium, Luxembourg, Portugal, Sweden, and Finland form this cluster.

Fifth cluster: The fifth cluster corresponds to the Netherlands, which is the only country where medium-sized publicly owned operators provide water services to the majority of the population.

Sixth cluster: Finally, Ireland and Switzerland form the sixth cluster, where small publicly owned operators dominate.

CURRICULUM VITÆ

Patrícia LUÍS-MANSO
Born on March, 15 1975 in Luanda, Angola
Portuguese

QUALIFICATIONS

Ph.D. Candidate, EPFL, Switzerland, Feb. 2004 - presentation Oct. 2007
Dissertation: "Reform and Risk Management in the Urban Water Sector: the role of Regulation"

Masters in Economic and Social Development in Africa, ISCTE, Lisbon, Portugal, 1999-2001
Dissertation: "Cooperation and Investment: the impact of development aid on investment conditions in Cape Verde"

Post graduation diploma in European Studies, *Universidade de Lisboa*, Portugal, 1998-1999

Licenciatura in Economics, *Universidade Nova de Lisboa*, Portugal, 1993-1998
Socrates/Erasmus visiting student at North London University, UK, 1997-1998 (1st semester)

CAREER

Research Associate at **EPFL**, Lausanne, Switzerland, Jan. 2003-Aug.2007

Coordination and Research work within a 3-year European project on the Liberalisation of the Water Sector (reports and articles co-authoring; book co-editor; newsletter co-editor; validation of final reports' coherence; management of relationships with stakeholders; management of deliverables; planning and organisation of 10 workshops; organisation of the final conference)

Organisation of a doctoral workshop on "Water Sector: Economics and Regulation"; teaching the module on the transformation of the water sector in the PhD course on Regulation and De-regulation of Network Industries; follow-up of undergraduate students

Consultant, Switzerland and Mozambique, Nov. 2003-Jan. 2004, and Jul. 2005

Consultancy project on institutional and organisational support to the Mozambican Water Regulatory Agency (analysis of institutional dynamics of the relevant stakeholders; diagnosis of the agency's institutional and organisational problems; proposition of recommendations; definition of procedures regarding institutional and organisational issues; definition of a capacity building strategy)

Course on Regulation with 15 participants from the regulatory agency and the major stakeholders in Mozambique (organisation of the course; teaching the modules on "Introduction to Regulation"; "Regulation in the Water Sector"; "Regulation for the Poor")

Junior Consultant at the **European Investment Bank** (EIB), Luxembourg, Feb.-Oct. 2001

Evaluation of projects in the tourism sector and in Africa; market analysis of the steel sector in accession countries; comprehensive analysis of the EIB lending activities to SMEs (1990s)

Trainee at **ICEP/Ministry of Economics** (*Contacto* Programme), Portugal, Oct. 2000-Jan. 2001

Analysis of ICEP organisational structure and its suitability in promoting Portuguese Investment and Exports abroad; report on the competitiveness of Portuguese companies in pursuing contracts financed by International Financial Institutions

Junior Economist at **Rodrigues & Guerra, Lda** , Lisbon, Portugal, Jan. 1999-Sep. 2000

Management of budgets; relationship with banks and other institutional partners; development and implementation of a strategy for the adaptation to the new currency

PUBLICATIONS

Refereed Journal Articles

"The Challenges of Regulating the Drinking Water Sector under Delegated Management: Lessons from Mozambique" (with Matthias Finger) (accepted for publication, 2007). Water International.

"Water Sector Evolution Scenarios: the case of Europe" (with Jeremy Allouche & Matthias Finger) (accepted for publication, 2007). Water Policy.

"Water Resources Management in a globalised economy: towards a multi-level regulatory approach", with Jeremy Allouche & Matthias Finger (2002). Economia e Politica Industriale, n.116

Books

Water and Liberalisation: European Water Scenarios (co-edited with Matthias Finger & Jeremy Allouche) (2007), London: IWA Publishing.

Book chapters

"WSS's dynamics and trade-offs: different institutional and organisational approaches" (with Jeremy Allouche & Matthias Finger). *In* Finger, M., Allouche, J. & Luís-Manso, P. (Ed.) (2007), Water and Liberalisation: European Water Scenarios, Londres: IWA Publishing.

"Analysis of the Strategies of the Water Supply and Sanitation operators in Europe" (with Jeremy Allouche & Matthias Finger). *In* Finger, M., Allouche, J. & Luís-Manso, P. (Ed.) (2007), Water and Liberalisation: European Water Scenarios, Londres: IWA Publishing.

"Introduction: Liberalisation, Privatisation, and Network Industries: a similar path for water?" (with Jeremy Allouche & Matthias Finger). *In* Finger, M., Allouche, J. & Luís-Manso, P. (Ed.) (2007), Water and Liberalisation: European Water Scenarios, Londres: IWA Publishing.

Thesis

Cooperation and Investment: the impact of development aid on investment conditions in Cape Verde [in Portuguese] (2002). Master Thesis, Lisboa: ISCTE.

Electronic Publications

"Categories of risk and the reform of the water sector", *MIR E-Letter* (Summer 2006)

"Consumers and the liberalisation of the water sector", *MIR E-letter* (Spring 2006)

"Operators' strategies in the water sector in Europe", *MIR E-letter* (12/05)

"The water sector in Switzerland: an innovative approach to restructuring", *MIR E-letter* (09/05)

"Water liberalisation in Europe: are we converging towards a single model?", *MIR E-letter* (04/05)

"Water sector regulation: challenges for the European Union", *MIR E-letter* (01/05)

Conference Proceedings

"Reform, Risk Management, and Regulatory Governance: the case of Specific Investment in the UWS" (with Matthias Finger & Claude Ménard), 6th Conference on Applied Infrastructure Research, Berlin, Germany, Sep. 2007

"Risk sharing and capacity investment in the urban water sector in Europe" (with Matthias Finger). *In* ARAVOSSIS, K. et al. (Ed.) (2006), Environmental Economics and Investment Assessment, Southampton: WIT Press.

"The evolution of the water sector in Europe: institutional analysis of possible scenarios" (with Matthias Finger & Jeremy Allouche), EWRA 6th International Conference: Sharing a common vision of our water resources, Menton, France, Sep. 2005 (CD-Rom).

"Economic Risks in the Drinking Water Sector". In: K. P. Tsagarakis (ed.) (2005), International Conference on Water Economics, Statistics and Finance, Rethymno: International Water Association.

"Challenges for the Regulation of the Water Sector in Europe" [in Portuguese]. IV Congresso Ibérico da Água, Tortosa, Spain, Dec. 2004 (CD-Rom).

"Evidence for a new framework to analyse operators' strategy in the Water Supply and Sanitation sectors" (with Jeremy Allouche & Matthias Finger). IWA World Water Congress, Marrakech, Morocco, Sep. 2004 (CD-Rom).

"The liberalisation of the Water Sector in Europe – developments and some national cases" [in Italian]. INSTITUTO REGIONALE STUDI EUROPEI FRIULI VENEZIA GIULIA (2004), Governare l'acqua, Pordenone: Edizioni Concordia Sette.

Working Papers/ Internal Papers

Economic Regulation in the Network Industries: where does it stand? (with Cátia Felisberto) (2006). *CDM Working Papers MIR-Report-2006-010,* Lausanne: EPFL.

The evolution of the water sector in Europe: an institutional analysis of possible scenarios (with Matthias Finger & Jeremy Allouche) (2005). *CDM Working Papers MIR-Report-2005-003*, Lausanne: EPFL.

Water Institutions and Management in Switzerland (2005). *CDM Working Papers MIR-Report-2005-001*, Lausanne: EPFL.

Background Paper on the Steel Sector: Emphasis on the European Market (2001). *Industrial Economics Unit Internal Publication*, Luxembourg: EIB.

EIB lending to SMEs within the European Union (with Harald Jahn & Philippe Guinet) (2001). *Industrial Economics Unit Internal Publication*, Luxembourg: EIB.

Articles in Magazines

"Le secteur de l'eau en Europe : six scénarios possibles pour 2020" (Jan. 07). (with Jeremy Allouche & Matthias Finger). *GWA,* n. 01/2007.

"Cooperation and Investment: the impact of development aid on investment conditions in Cape Verde" [in Portuguese] (Nov. 2002). *Revista Forum Desenvolvimento e Cooperação.* 2002 Award for the best student article.

RESEARCH SEMINARS, WORKSHOP AND COURSES

European School on New Institutional Economics, Corsica, May 2nd – 7th, 2005

PhD Course on De-regulation and Re-regulation of Network Industries, EPFL, Jun., 2003

Risk and Regulation: Research Student Conference, London School of Economics, UK, Sep. 2003 and 2004

LANGUAGES

Portuguese: Mother tongue

English: Fluency (spoken and written)
French: Good knowledge (spoken and written)
Spanish: Good understanding (spoken)

IT SKILLS

Daily user of MsOffice (Word, Excel, Powerpoint, Visio, Access, Outlook) and VOIP applications
Acquainted with feeding tools for websites (e.g. Jahia, Frontpage), including basic HTML

INTERESTS/HOBBIES

Portuguese-speaking Africa (news, literature, music, gastronomy, development); organisation of events with friends (mix of outdoor activities, historical/cultural visits and other recreational activities); writing.