Reform, Risk management, and Regulatory Governance: the case of specific investment in the UWS

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Abstract

This paper deals with the risks created by the Urban Water Sector reform and the governance of the main regulatory issues posed by the new environment, focusing on the case of specific investment. Notwithstanding the slow pace at which they are implemented, reforms are making their way into the sector. Overall, these reforms are creating new sources of uncertainty and vulnerability for the management and regulation of water utilities. We differentiate the traditional risks that are faced by any water operator in the execution of its functions from the risks created by reforms. We also analyse how specific features of the reform put the sustainability of specific investment at risk, in order to identify its main factors of vulnerability. Evidence suggests that the new context created by reform, together with its risks, calls for a change in the objectives and regulatory presence in the sector. As a result, it is important to assess the adequacy of the regulatory governance systems in the management of the new risks. As for what specific investment is concerned, we analyse the main actors' strategic behaviour for the purpose of determining which actions or decisions can be made that reduce its vulnerability.

Keywords: Urban Water Sector, Reform, Risk Management, Regulatory Governance

JEL Classification: L33, L51, L95

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1. Introduction

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. These are specificities stemming from the nature of its technology, such as high transport costs. There are also economic specificities related to the nature of the good, namely low price elasticity since there are no substitutes for water, and strong environmental and public health externalities that make it a merit and quasi-public good. Finally, there are specificities related to the nature of the water resources, which are scarce and have limited capacity for regeneration.

These specificities determine the way the UWS has traditionally been structured as a local public monopoly. Nonetheless, the sector has undergone important *reforms*, triggered by the search for efficiencies, underinvestment, and new environmental challenges. The main features characterising the majority of the reforms are the introduction of competition, 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. They result from the emergence of new actors in the sector, as well as from "unbundling" of operational and regulatory functions, which were traditionally integrated in the publicly-owned utilities. Therefore, apart from the traditional risks that are faced by any water sector operator in the execution of its functions, there are also new risks created by reforms.

In this paper, we identify the risks created by reform (section 2.1), focusing on specific investments (section 2.2). Evidence suggests that reform, together with its risks, calls for a change in the objectives and regulatory presence in the sector (section 2.3). As a result, it is important to assess the adequacy of the regulatory governance systems in the management of the new risks. To do so, we first present the strategies of actors regarding specific investment (section 3.1). Then, we identify the main differences across governance systems (section 3.2). Finally, we propose regulatory mechanisms that tackle the

main problems highlighted in each system (section 3.3).

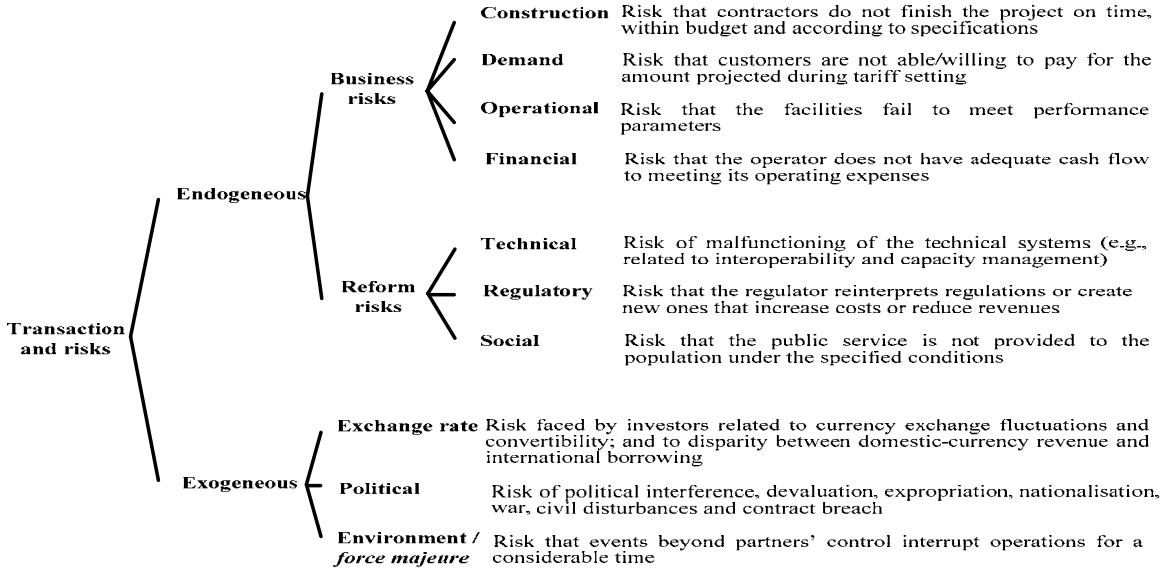
2. Risk in the Urban Water Sector: focus on specific investment

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 sector. One of the main features of reform in the UWS is the transfer of rights and responsibilities that were traditionally concentrated in publicly-owned integrated utilities to other actors in the sector.

Transactions differ according to what is being transferred, such as the right and responsibility to provide specific tasks (management contracts), to operate and maintain the system (lease), to manage and invest (concession), or to own property rights (divestiture). According to Transaction-Cost Economics, transactions are characterised in terms of frequency, uncertainty, and specificity of investment required (Williamson, 1979).

In this context, *risks* 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). We differentiate between the risks that are endogenous and exogenous to the transaction (see Figure 1).

Figure 1 *Categories of risks in the urban water sector*



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

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. Others, which are the focus of the following section, are created by the reform.

2.1. Risks created by the sector's reform

Risks created by the sector's reform 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. The most important risks created by the unbundling of operational and regulatory functions, the participation of the private sector, and the introduction of competitive pressures in the sector pertain to technical, regulatory, and social hazards. We describe them as follows.

Firstly, the unbundling and fragmentation of the technical systems, which are normally required when introducing competition, make interoperability, interconnection, and capacity management more complex and, consequently, intensify ***technical*** risks (see e.g., Newbery, 2001).

The *integrity* of the system is essential for the overall quality of the service provided. It requires a regular assessment of the state of the infrastructure and frequent decisions about maintenance, replacement, and renewal of unreliable elements of the network. The separation of ownership and management responsibilities, as well as delegation of responsibilities to a different actor during a limited period of time, may render the comprehensive assessment of the state of the network difficult and may jeopardize the necessary long-term perspective on the requirements of the system.

Secondly, 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). In the context of reform, these externalities exacerbate the need to regulate, thus augmenting the ***regulatory*** risks faced by the management entity. Moreover, municipalities with little experience often become responsible for important regulatory functions (Haarmeyer and Mody, 1998b).

Regulatory risks refer to a behaviour assumption of opportunism by the regulator related to the reinterpretation of existing regulations, or to the creation of new ones that increase costs or reduce revenues for the operator (Bakovic et al., 2003). Regulatory risks are by definition borne by the operator. This is, however, in contradiction to recommendations from risk management theories, according to which the party that has more control over a given risk factors should bear the risk. Therefore, the public sector would be expected to carry risk classified as political and regulatory (Christiansen, 2006).

Thirdly, in a context of reform, the provision and financing of public services are no longer guaranteed by public ownership and management. Thus, ***social*** risks pertain 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 financing of non-profitable segments. At last, 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/her supply, independently from equity considerations.

Social risks are ultimately borne by consumers through higher tariffs or, in an extreme situation, no-access to the service (either due to non-affordability or no-capacity of the network). According to some authors (e.g., Kessides, 2004), the government (i.e., taxpayers) should bear the social commitment of providing the public service. In practice, regulation has an important impact on social risk allocation, namely in what concerns the funding of a minimum service. Thus, social risks can be

(at least partly) transferred to the operator or even to certain categories of consumers.

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.

From the analysis of the risks created by the sector's reform, it is possible to identify four main elements at risk, namely system's integrity, security of supply, equity of access, and affordability of prices. Within the scope of this paper, we are particularly interested in analysing *specific investment* as an important component of both the system's integrity and the security of supply.

2.2. Specific investment: element at risk because of reform

Specific investment is meant to cover capital costs, which are related to service levels, new quality expenditures, services improvement, and balance of supply and demand. The execution and efficacy of specific investments is thus essential for the overall quality and integrity of the system. The output quality of specific investments can be measured by indicators such as the performance of the system, percentage of leakages, and safety conditions.

Some features of the reform put the *sustainability* of specific investment at risk. Prior to the reform, the public monopolist was the sole responsible for specific investments throughout the integrated value-chain and for the entire duration of the assets' life. De-integrating the network services may lead to a possible loss of economies of scope, i.e. the advantages of co-ordinating the operation and expansion of the network with the services provided over it (Newbery, 1999). Moreover, the delegation of management for limited periods of time, as well as private sector participation, are other features of reform influencing incentives to invest. This section focuses on the factors that affect the vulnerability of specific investments, and on how these are influenced by the features of reform.

Asset durability is one of the most important vulnerability factors of specific investment. Long-lived assets are related to large sunk investments with long payback periods, which have relatively little

value beyond their use in the context of a specific transaction (i.e., investments that are highly specific). The corresponding 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 for a limited time to a different actor (whose private goals may differ from public ones), long amortisation periods may trigger opportunistic behaviour by the operator, who may under-invest 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 where the operator begins to under-invest in maintenance and expansion of the network (Shirley et al., 2000).

Moreover, long-lived assets expose investors to the risk that regulatory settings change before costs are recovered (Guthrie, 2006). Assets' long-term durability also increases specification costs, consequently augmenting transaction costs related to contract design and enforcement.

A second vulnerability factor refers to the ***risk of hold-up***. Hold-up is clearly one of the vulnerability factors that are caused by the sector's reform, especially in the event of private sector participation. Authorities may be tempted to change the rules of the game during the execution of the contract, 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 an attitude makes future negotiations to renew the investment highly unlikely. Guthrie (2006) suggests that the possibility of opportunism (e.g., unanticipated costs disallowances) will affect investment even when this possibility is not realised.

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

A third factor of vulnerability is the ***uncertainty related to the real conditions of the network*** (i.e., information about 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. This is particularly important because uncertainty increases the writing, renegotiation, and (re-)tendering costs, and it reduces incentives to invest.

Finally, we consider the ***scarcity of local funding*** as an important factor of specific investment vulnerability, which is in fact one of the main factors triggering the sector's reforms to begin with. Financial scarcity may have different sources, such as constraints of public finance, underdevelopment of capital markets (Haarmeyer and Mody, 1998b), and the high fragmentation of the sector's structure. 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 a national incumbent).

The new context created by reform, together with its newly created risks, calls for a change in the regulatory presence and objectives in the sector. In the next section, we turn to this issue.

2.3. Protecting investment: an important regulatory objective

Notwithstanding the slow pace at which they are implemented, in comparison to what has happened in other network industries, reforms are making their way into the UWS. For reasons summarized above, most reforms in this sector have so far been oriented towards introducing competition for the market, with one prevailing form, i.e., Public-Private Partnerships. This means that forms of monopoly power continue to be dominant in this sector. In combination with concerns for universal accessibility and for safety of the product delivered, this has resulted in *powerful regulatory pressure*, whether exercised directly by public authorities at different levels, or whether monitored via agencies.

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. None of these functions could be eliminated by reforms. Among them, maintaining the sustainability and integrity of the infrastructure deserves special attention in this paper. Therefore, new ways have to be found so that after reform (and ideally parallel to it), the sector maintains its integrity and guarantees security for consumers.

With respect to the problem explored in this paper, the characteristics of investments in the UWS, 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. In this way, one of the most important regulatory *objectives* in the sector is to protect the specific investments that are required for guaranteeing and maintaining the integrity of the UWS (Table 1).

Table 1 *Protect investments: an important regulatory objective in the UWS*

Regulatory objective	
Protect Investments	- 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 are not met - attraction of financial resources - secured access to financial market

One important *challenge* of reforms has to do with matching institutional approaches that can deal efficiently with the factors of vulnerability identified in the previous section, in order to pursue the regulatory objectives that tend to persist because of the very specific nature of the product at hand. In the following section, we assess the adequacy of regulatory governance systems in the management of the new risks, in particular in weakening the vulnerability factors of specific investment.

3. Regulatory governance and risk management: focus on specific investment

The main *challenge* in terms of regulatory governance pertains to reaching a balance between the actors' 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.

In this context, *governance* stands for the involvement of (state and non-state) actors in collective problem-solving, such as managing the risks created by the sector's reform. It is a process to balance multiple (eventually conflicting) interests and reach co-operation through formal and informal institutional mechanisms.

Regulatory governance systems need to intervene in every step of the *risk management* process, from risk identification and assessment, to prioritising and mitigation (Figure 2). In practice, this means that (different) actors will intervene at each step of the risk management process.

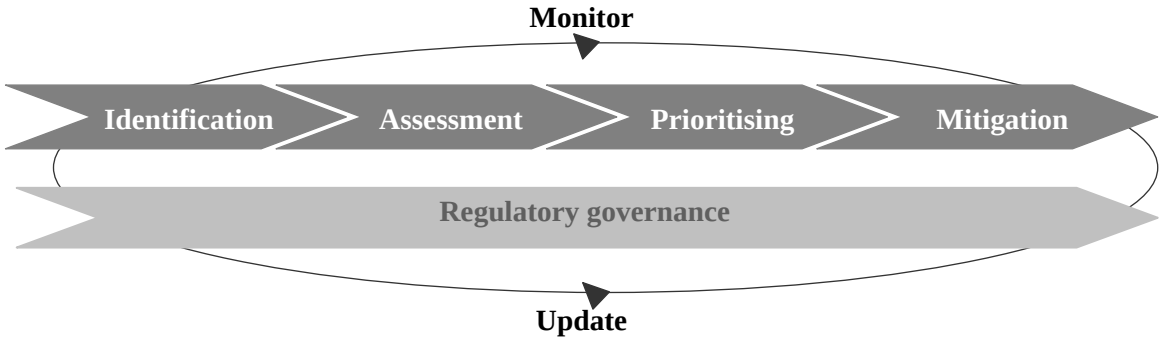


Figure 2 *Regulatory governance and the risk management process*

The identification of risks is a continuous process. In chapter 2, specific investment was identified as being one of the main elements at risk by reform and, as such, it is 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 specific investment (section 2.2). The decision to invest depends upon the operator's

perceptions of risk, which is strongly correlated to the *vulnerability factors*. 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 low availability of financial sources may also put investment decisions at risk. Finally, 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.

There are several possible approaches for dealing with the identified and assessed risks (SNWSC, 2002). These 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 system, which actors are responsible for mitigating the risks related to specific investment.

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.

Next, we analyse the different actors' strategic behaviour *vis-à-vis* the choice of the regulatory governance system and specific investment decisions.

3.1. The strategies of the actors regarding specific investment

The main actors in the regulatory system are public authorities, regulatory entity, operators, and users/consumers.

The ***public authority*** assumes the responsibility for service provision and the safeguard of the public interest. It 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) entity for service provision. The degree of autonomy of the management entity *vis-à-vis* the public authority, as well as the degree of formal regulation, increases from Direct Public Management to Direct Private Management (i.e., divestiture).

Regarding the management of water systems, 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 direct public management, and direct private management. In these cases, the operator is responsible for specific investments in the system; and

B. *Decentralisation of management* (RE ≠ ME) corresponding to delegated management arrangements. There are two sub-strategies regarding specific investments, namely delegated management by concession (the operator keeps the responsibility for investing in the systems) or lease (the responsibility for investment remains with the lessor).

Regarding the sector's regulation, the strategy of the public authority depends on the degree of management centralisation, as well as on the operator's ownership. According to empirical evidence from Europe, 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 regulatory agency.

Thus, the ***regulatory entity*** may be a sector agency or the public authority. The definition of the regulatory entity's strategies highly depends on the level of discretion, the priorities set by the public authority for the sector, as well as the regulatory instruments at the entity's disposal. The most important regulatory instruments in the sector are licences, price, and quality standards.

In some cases, the regulatory entity has discretion for defining and setting *tariffs* (either in contract design or through a sector regulator), according to the public objectives set for the sector. The regulatory entity's strategy regarding pricing is very important for specific investment decisions. 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, increase tariffs, allow cross-subsidies), and warnings and sanctions.

The responsibilities of the ***management entity*** differ according to the institutional arrangement. In the event that the management entity keeps the responsibility for investment, it chooses the level of capital to install based on its perception of the specific investment's vulnerability factors. The *payoffs* for the management entity depend on the actual costs of investment and the revenues that it is allowed to earn.

Under *rate-of-return* regulation, the operator's payoff corresponds to the total costs of investment. However, in some cases, regulatory entities apply the "use-and-useful" principle for determining the assets that should 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 for part of its costs. In

this case, the payoff depends on the percentage of the capital cost that is allowed.

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 length of the contract, the decision whether to bid for a new contract or not, and on uncertainty over asset valuation (at the end of the contract).

The type and degree of ***users' participation*** has changed in the past decades, and it differs significantly from case to case. The users of the water systems have evolved from tax-payers to clients and, more recently, to partners. 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 terms of regulatory governance mechanisms. They directly influence the decisions of public authorities, regulatory entities, and the strategies of operators, though.

In the following section, we analyse in more detail the differences across different systems of regulatory governance in terms of the vulnerability factors of specific investment.

3.2. Differences across regulatory governance systems

The importance of each factor of vulnerability varies for different regulatory governance systems. Table 2 summarises the findings for the most common systems in the UWS, namely direct public management, regulation by contract, and the creation of a sector-specific regulator. We focus on the most important factors of vulnerability in each form of governance.

Under ***direct public management***, there is no unbundling of functions and the public operator is both responsible for the regulation and the provision of the service, and is manager of the system. The availability of funding sources is the most important factor of vulnerability in this form of governance.

Table 2 *Importance of the vulnerability factors in different governance systems*

		Regulatory Governance Systems		
		Direct Public Management	Regulation by contract	Sector-specific regulator
Vulnerability Factors	Contract duration and asset durability	L	**H**	L
	Regulator's credibility	L	L	**H**
	Certainty over asset valuation	L	M	M
	Availability of sources of finance	**H**	?	?

Legend:

H	High
M	Medium
L	Low

The unbundling and delegation of functions, as well as private sector participation have called for different systems of regulatory governance. The most common one in the UWS are regulation by contracts and sector-specific regulatory agencies.

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 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. An equally important factor of vulnerability is the relation between long-asset durability and contract duration.

The creation of ***sector-specific agencies*** as opposed to contract regulation 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). In terms of specific investment, the most important factor of vulnerability is the regulator's credibility.

On the basis of the whole analysis presented so far, we turn to propose regulatory governance mechanisms that tackle the problems highlighted in each regulatory governance form.

3.3. Regulatory governance mechanisms

In this section, we present what are - under each regulatory/institutional regime - the various forms of regulatory intervention to mitigate the risks related to specific investment, at the various stages of the risk management process (Table 3). The starting point is the results presented so far in terms of actors' strategies and vulnerability of specific investment (Table 2 in particular).

We present two propositions in terms of ***identification, assessment*** and ***prioritisation*** of risks, namely:

- 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 available knowledge about the sector, decreasing in this way the level of information incompleteness that affects specifically systems under regulation by contract; and

- definition of investment plans that clearly describe the flow of required investments in the system for the entire duration of the transaction. Depending on the regulatory regime, the responsible actors for defining such plans are the public authority, the partners of the contract, or the operator (with the approval of the regulatory entity). Again, investment plans are particularly important in regulation by contract 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 regulatory regimes and general ones. *Specific* propositions are:

- reinforcement of the funding sources in direct public management. This can be done either 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.

- establishment of dispute-resolution mechanisms is essential for the sustainability of the reform and the efficacy of regulation (e.g., Biltrán and Arellano, 2005, and Ménard and Clarke, 2002), especially in systems under regulation by contract. 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

- allocation of adequate resources to the regulatory agency. It is also essential that the agency is made accountable for its decisions in order to reduce the information rents created by asymmetry of information, that is when the public cannot perfectly observe the regulator's actions (Bergman et al., 1998). Accountability and transparency of actions are crucial to increase the regulator's credibility and trustworthiness.

As for the proposed mitigation strategies that are *general* to all regulatory systems, 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.

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 systems; and
- control of costs, which is especially important under rate-of-return forms of regulation.

Table 3 *Regulatory governance mechanisms for specific investments*

RISK MNG	REGULATORY GOVERNANCE SYSTEMS		
	Direct Public Management	**Regulation by Contract**	**Sector-specific Regulator**
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 balance btw 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:

PA Public Authority
RA Regulatory Agency

4. Conclusions

Certain features of reform, such as unbundling of functions, delegation of rights and responsibilities, and private sector participation, affect incentives to invest in the UWS. This is of utmost importance because specific investments are essential for the overall quality and integrity of the system. For this reason, the protection of specific investments becomes a very important regulatory objective 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 paper aims at contributing to this goal by proposing mechanisms that weaken the vulnerability factors of specific investments.

The choice of the 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.

Similarly, the importance of each vulnerability factor of specific investment varies according to the regulatory governance systems. In direct public management, the scarcity of public funds is a major factor. In regulation by contract, contract incompleteness and the misalignment of contract duration with asset durability are major factors of vulnerability. In regulation via a sector-specific agency, the most important factor is the agency's credibility and trustworthiness.

We have presented regulatory mechanisms that, in our opinion, have the potential to weaken the vulnerability factors of specific investments and, in this way, increase the incentives to invest. There are general forms of regulatory intervention that should be implemented in all systems independently of their form of organisation, such as the definition of adequate penalties for non-compliance.

However, it is important to acknowledge that there are also specific forms of intervention depending on the chosen type of regulatory governance system, such as the transparency and accountability of the sector-specific regulator.

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