

# Risks, Contracts and Private Sector Participation in Water Utilities

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## Abstract

This article examines how risk is reflected in water utilities regulatory contracts. Partnerships between public and private sectors in infrastructure services require that risks to be assigned to the contractual party that is better able to mitigate them or to bear them. After identifying risks that must be addressed in water utilities contracts, their classification, allocation, and impact are presented along with the measures to minimize them. We analyze two empirical contracts in the water sector in Portugal. One of them corresponds to a public private partnership (PPP) of purely contractual type (concession) and the other to an institutionalized PPP (mixed company). We conclude that risk is a key issue in contracts with the private sector: an appropriate allocation of risks is a necessary condition for a contract to be successful.

**Keywords:** Contracts; Private Sector Participation; Public-Private Partnerships; Risks, Water Utilities

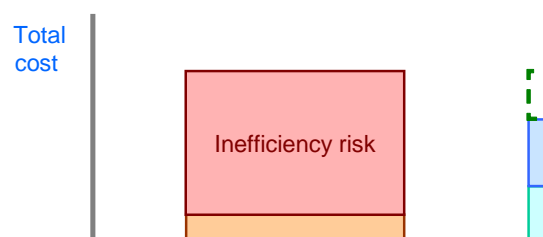
## 1. INTRODUCTION

For several reasons, private sector participation occurs with some frequent in the water sector worldwide (OECD, 2009). Sometimes private water utilities are responsible for the operation of the whole water system (e.g. France or Spain) and in other situations they only operate part of the system (e.g. wastewater treatment plant, as in Delft in Holland). Water and wastewater systems ownership, in a few situations, as in England and Wales, may be private but usually the ultimate responsibility for the provision of water services belongs to the public sector. Regardless of the kind of private sector participation, relations between public and private sector (duties and rights) are almost always established in a written contract. These ‘regulatory contracts’ can be a license (to the operator), a concession (or a lease contract), or even the statutes of the firm and the shareholder agreement document. Contract design has a number of difficulties, with the assignment of risks being one of the most noteworthy (Crampes and Estache, 1998). In addition, the imperfect allocation of risks constitutes one of the primary causes for the failures of private sector participation (Marques and Berg, 2009a).

In addition to contracting for managerial expertise and acquiring external funds, a key benefit associate with public private partnerships (PPPs) is the creation of mechanisms for assigning to the contractual party that is better able to mitigate or to bear the risk. This allocation minimizes economic costs associated with such risks. Thus, there can be substantial benefits with public authorities contracting with the private sector. Figure

1 illustrates the benefits from efficiency improvements. If there is some controversy about the relative efficiency of private water utilities when compared with the public ones (Marques, 2008a), the literature supports the economic savings from a better risk allocation (Haarmeyer and Mody, 1998). Moreover, in regulatory contracts the flawed assignment of risks has another serious consequence, the renegotiation of the contract. Such a situation involves bargaining between the operator and the government in a non-competitive environment. Since there are substantial differences in information, legal skills, and technical support, the private sector tends to be the winner in renegotiations. In Latin America (with a sample of 1,000 contracts), 75% of the water concession contracts were renegotiated after an average of 1.6 years after initially agreed upon (Guasch, 2004). If the private sector bears more risk (such as those related to demand forecasts), the associated higher returns suggest that most of these contracts will not be renegotiated. However, when the assignment of risk and responsibility is poorly done, renegotiation becomes part of the strategy of “winning” bidders.

This paper focuses on the contractual risks in the water utilities. It discusses this issue not only methodologically but also analyses two contracts established with the private sector in Portugal. After this introduction, we identify the major risks in water utilities contracts, classify them, and estimate the probability of their occurrence and associated impacts. We also describe measures to minimize impacts. Then, we examine cases of two different PPPs in Portugal: a concession contract and a contract with a mixed company.



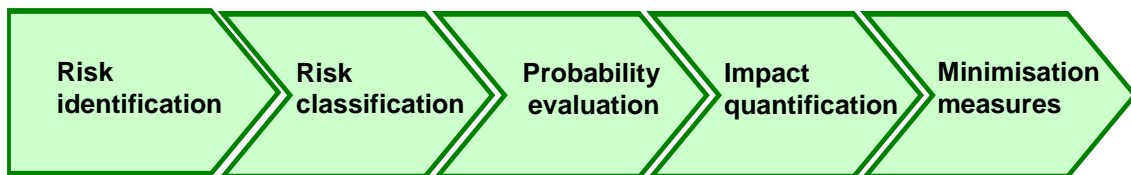
**Figure 1.** Validation of PPP model

## 2. MANAGING AND SHARING THE RISK

### 2. 1 Risk analysis

The efficiency rule for allocating risk is quite simple. The public sector (e.g. municipality) should not transfer the risks that are under its control to the private partner, nor should it assume the risks that are out of its control. The transfer of risks to

the private partner brings, in general, increases in the price of the project, so it is essential to ensure that the public benefit of such transfers overcome that increase in financial costs. The risks should be assigned to the right parties and carefully defined *ex ante*. The Eurostat in the European Union considers that in a PPP, for the purpose of public accounts, the private sector has to support at least two of the following three risks: construction risk, demand (consumption) risk and/or availability risk. In the water sector, most contracts have clauses protecting the private sector from bearing such risks while ensuring economic and financial equilibrium during the contract. When, for example, it is established that a decrease of 20% in the volume of water delivered leads to the contract renegotiation, the public sector retains this risk. In addition, while the private sector does not bear this risk, it will renegotiate without competition, recovering the lost revenues from the lower volume sold, but re-opening other issues to its benefit. This circumstance, by itself, promotes opportunistic and optimistic bidders at the public tender stage—so the winner’s curse becomes a winner’s blessing. Figure 2 indicates steps of a PPP risk evaluation: 1) Identification of risks; 2) Classification of risks; 3) Evaluation of their probability; 4) Quantification of their impact; and 5) identification of measures for risk minimization (Marques and Berg, 2009b).



**Figure 2.** Steps in risk evaluation

There is evidence that the issue of risk allocation is critical in PPP contracts for three major reasons. First, improved risk allocation reduces economic costs. Second, it provides incentives for sound management of the PPP. Third, it reduces the need to enter a renegotiation processes.

## 2.2 Identification of risks

Risk is defined as the probability of a particular event occurring; therefore all the steps should be considered before a PPP is launched. It is crucial that those preparing the contract identify and allocate risks before the public tender stage. A risk matrix with contractual clauses addressing each risk should be and provided to the bidders at the start of the process (Marques and Berg, 2009b). The bidding documents should limit *ex ante* situations that may lead to *ex post* opportunism. Inappropriate bidding strategies include optimistic population evolution or unrealistic consumption per customer. Such behavior harms the public sector and leads to renegotiation. The public sector is harmed because the “wrong” bid might have been initially selected. Renegotiation should be restricted to the aspects that the private sector does not control and is not able to predict (e.g. unilateral changes). Concerning consumption evolution, for example, the private sector is normally in a better position to estimate trends. Also, such renegotiation could be avoided if the duration of PPP was variable or if the PPP was awarded based on revenues obtained by the private operator (Engel *et al.*, 2001). A municipality, irrespective of some opportunistic position to maximize the up-front rents or tariffs,

would find it politically difficult to forecast that its resident population is likely to decrease in the future. So, the predictions are likely to be biased.

### 2.3 Classification of risks

Marques and Berg (2009b) have divided risks into production, commercial and contextual risks (Some of these risks are associated with the bidding process stage and others with the project implementation stage. While risks related to the production process are almost always best borne by the private sector, the commercial and contextual ones are mixed. Unfortunately, they are often borne by the public sector. Figure 3 presents a classification of the most typical risks. The importance of each risk depends on the project under consideration. However, consumption and unilateral change risks are in general the most problematic ones and are on the list of the top reasons for contract renegotiation.

|                   |                               |                      |                   |                    |      |
|-------------------|-------------------------------|----------------------|-------------------|--------------------|------|
| <b>Production</b> | Planning                      | ***                  | <b>Commercial</b> | Demand             | **   |
|                   | Design                        | ****                 |                   | Collection         | *    |
|                   | Expropriation                 | *                    |                   | Capacity           | ***  |
|                   | Construction                  | *****                |                   | Competition        | *    |
|                   | Environmental                 | *                    | <b>Context</b>    | Financing          | **** |
|                   | Maintenance and major repairs | ***                  |                   | Inflation          | **   |
|                   | Operation                     | ***                  |                   | Legal              | **   |
|                   | Technological                 | **                   |                   | Regulation         | ***  |
|                   | Performance                   | ***                  |                   | Unilateral changes | **** |
|                   |                               | Public contestation  |                   | **                 |      |
|                   |                               | <i>Force majeure</i> |                   | **                 |      |

\* **Low risk**    \*\*\*\*\* **High risk**

**Figure 3.** Identification of major risks

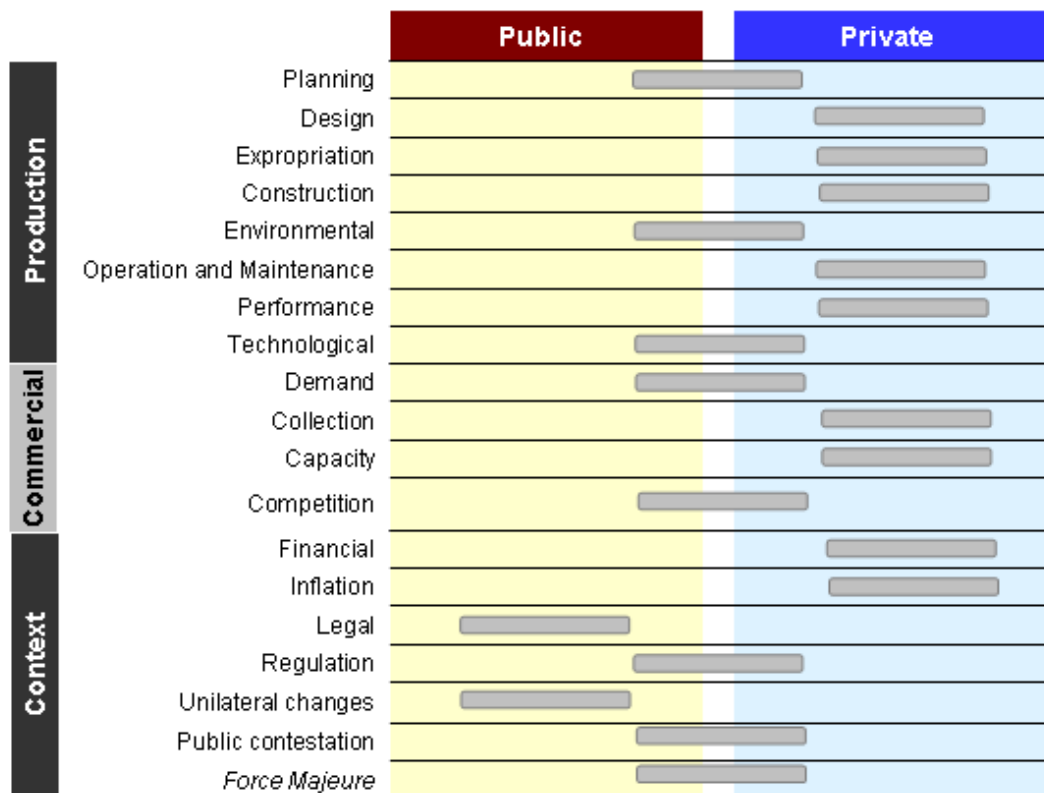
### 2.4 Allocation of risks

The allocation of each type of risk should be assigned between private and public sector according to the minimization of economic costs. Figure 4 presents an illustrative risk allocation for a specific to a particular project. Some types of costs could even be transferred directly to the customers, such as those related to new legislation (e.g. a new tax).

### 2.5 Probability and impact quantification

During contract preparation, each type of risk should be described, establishing and enumerating the different causes that may lead to its occurrence. The probability of occurrence of each cause should be estimated and quantified as well as the associated impacts level. Cost estimation of different risks and their corresponding allocation is central for the creation of a PPP (in distinction to traditional public procurement). Table

1 displays some of the risks affecting costs, efficient risk allocation, probability of occurrence, and the impact of such risks.



**Figure 4.** Identification of major risks

## 2.6 Probability and impact quantification

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## 2.7 Identification of minimization measures

For each type of risk, contracting parties should develop strategies for mitigating that risk. Table 2 shows examples of minimization approaches for each type of cost. For instance, for inflation risk, minimization measures include indexing revenues to inflation, fixed price contracting, or forward contracts; such strategies reduce the probability of occurrence and potential impacts.

**Table 1.** Probability of occurrence and impact level of construction and design risks

| Construction and Design Risks                             | Risk allocation |         | Probability of occurrence | Impact level |
|---|-----------------|---------|---------------------------|--------------|
|   | Public          | Private |                           |              |
| Increase in prices as a result of raw material price rise |                 | X       | Low                       | Medium       |
| Delays in the design                                      |                 | X       | High                      | Medium       |
| Quality gaps  |                 | X       | Low                       | Medium       |
| Uncertainty regarding geological conditions               |                 | X       | Low                       | Low          |
| Uncertainty regarding environmental conditions            |                 | X       | Low                       | Medium       |
| Difficulty in material supply                             |                 | X       | Medium                    | Low          |
| Adequacy between infrastructure and objectives            | X               | X       | Low                       | Medium       |

**Table 2.** Minimization approaches for each type of risk

| Risks                     | Minimisation approaches  |
|---------------------------|--|
| Planning                  | Careful selection of project designers; Increase detail in studies;  |
| Design                    | Careful selection of project designers; Realism in studies planning; Auditing studies and projects; Contracts with premiums and fines; |
| Expropriation             | Experienced work teams; Project compatibility; Fixed-price contracting;  |
| Construction              | Strict management; Fixed-price contracting; Insurance contracting;   |
| Environmental             | Sensitising actions; supervision and research; Pressure near the authorities;  |
| Operation and Maintenance | Association to specialised companies; Fixed-price contracting; Insurance contracting;  |
| Performance               | Systematic control; Fixed-price contracting;   |
| Technological             | Contracts with warranties; Insurance contracting;  |
| Consumption               | Sensitivity analysis; Sensitising actions; Making payment easier;  |
| Collection                | Sensitivity analysis; service interruption; Making payment easier; Customers and collection management;                                |
| Capacity                  | Increase studies accuracy; Cost-benefit analysis;  |
| Competition               | Sensitivity analysis; Public disclosure of indicators;   |
| Financial                 | Long-term financing; Hedging policies; Backup funding (bank accounts);   |
| Inflation                 | Indexation of revenues to inflation; Fixed-price contracting; Forward contracts;   |
| Legal                     | Protected by contract;   |
| Regulation                | Keep with international trend; Systematic control of performance; Benchmarking policies;   |
| Unilateral changes        | Protected by contract;   |
| Public contestation       | Sensitivity analysis; Public disclosure of indicators;   |
| <i>Force Majeure</i>      | Mostly protected; Insurance contracting.   |

### 3. PORTUGUESE CASE-STUDY

#### 3.1 Private sector participation

In Portugal, the responsibility for water activities belongs to municipalities. There are 300 retail water utilities, with about 70% of the water provided by 14 public wholesale companies. Municipalities can select from among a number of institutional arrangements, including the establishment of private companies by means of concession contracts, municipal companies that can include a (minority) private shareholder, semi-autonomous organizations, or direct supply by the municipality. Private participation was not introduced in the sector until 1993. The enactment of legislation in that year

allowed local municipal authorities to delegate water service functions to private sector companies through concession contracts (purely contractual PPP).

With the opening of the market to private participation, it became necessary to supervise this activity (private operators) so the national government created a sector-specific regulator (Institute for the Regulation of Water and Waste - IRAR) whose responsibilities included providing a non-binding opinion about the public tender documents (and the design of the contracts), as well as playing a role in proposal renegotiation and supervising the quality of service. IRAR uses sunshine regulation for this purpose; that is, it collects data, compares relative performance of operators, and promotes a public discussion of those indicators (Marques, 2008b). In 1998 (amended in 2006) new legislation allowed for the creation of municipal companies, including the implementation of mixed companies (institutionalized PPP). Both types of PPPs (concessions and mixed companies) require the private partner to be chosen by public tender.

In Portugal, as of December 2008, 38 public tenders for PPP were launched in the water sector, corresponding to more than 2.7 million inhabitants (26% of the total population). Of the 29 contracts already signed, 24 correspond to a purely contractual PPP (concession) and 5 to institutionalized PPPs (mixed companies). The average length between the tender call notice and the contract signature was about 21 months. The average number of bidders was four; at present there are five major private players in Portugal. Although private sector participation is a relatively recent development, 50% of the PPPs have already been renegotiated. The main causes are unsurprising. They were related to the consumption below the amount predicted, non-fulfillment of investment commitments assumed by the municipality, and unilateral changes by the municipality. The Portuguese experience is similar to that of other countries, mainly those influenced by the Continental (French) administrative law such as Spain, France and Italy in Europe and African and Central and South American countries subject to its influence (e.g. Brazil). The failures of regulatory contracts are generally due to the poor bad allocation of risks. Note that Portugal has even tighter rules than many other nations since there is a sector-specific regulator (IRAR) and a Court of Auditors, institutions not present in some other countries.

### **3.2 Concession contracts**

The problem in concession regulatory contracts is that the risk is not shared adequately with the private sector. According to Portuguese law, and in line with European law, the concessionaire must bear the risk of operating the water infrastructure. If there is investment by the private sector, the construction risk should be allocated to the private operator. If we carefully analyze concession contracts, we would find that most should not be considered as concessions since the private sector does not bear the major risks. The clause concerning the restoration of economic and financial equilibrium transfers the most important risks to the public sector (municipality). This circumstance is showed in Table 3 for a typical water utility concession contract. Moreover, the contract signed between the private company and the municipality also allocates rights of way or eminent domain (expropriation) and *force majeure* (acts of god) risks to the

municipality. While the former allocation is reasonable, the latter greatly reduces the risk to the company—reducing its incentives to mitigate such risks.

**Table 3.** Risks affecting the financial and economic equilibrium of the PPP

| Changes requiring restoration of financial/economic equilibrium  | Risk                              |
|--|-----------------------------------|
| a) Change greater than 10 % (up or down) of the number of costumers and of the annual volume of water distributed predicted by the bidder  | <b>Consumption</b>                |
| b) Change greater than 20 % (up or down) of the annual volume of wastewater collected predicted by the bidder  | <b>Consumption</b>                |
| c) Expansion or reduction of the system scope concerning the works predicted by the concessionaire   | <b>Several</b>                    |
| d) Meaningful change of the rules or legislation which leads to the alteration in equipments and procedures  | <b>Legal/regulation/operation</b> |
| e) If the concessionaire has to bear charges related to the factors that could not be predicted at the date of contract signature as, for example, new taxes, tariffs or taxes determined by new legislation | <b>Legal/regulation</b>           |
| f) Change greater than 20% of the annual average value of Euribor (6 months) when compared with the previous year  | <b>Financing</b>                  |

Concerning some types of risks, this clause is highly perverse. For example, the consumption risk encourages the excessive optimism (and the winner’s curse—a blessing upon successful renegotiation). The PPP granting authority is double penalized, not only does it not select the “best” bidder, but if the optimistic winner predicts a high volume of water billed (and is wrong), the granting authority has a higher probability of needing to revise the contract to achieve the financial and economic equilibrium of the PPP. Only the risks related to unilateral changes and the legal and regulatory risks should be borne by the public sector (municipality) and the latter may be transferred to the citizen/customers (Marques and Berg, 2009b).

Most of the other risks in the Table should be borne by the private sector. For example, the private firm does not have incentives to predict other investments beyond the compulsory ones in the public tender documents as their inclusion in the bid diminishes the likelihood of the concession being awarded. The best strategy for the bidder is to negotiate directly with the municipality (in a bilateral way without competition) after winning the bid. The financing risk is one that, at least in theory, should always be passed to the private sector. Notice that the ambiguous expressions such as “meaningful change” and “expansion or reduction of the system” without detail constitute an additional risk creating conflicts between the partners (private and public).

### 3.3. Mixed companies

The problem of risk sharing is more serious in the case of institutional PPPs. In this type of PPP, the public sector and a private company create a third company to provide water infrastructure and services (water utility) or an existing public company sells part of its shares to the private sector.

Generally, the public sector holds the corporate control of the company although the technical management (and operations) is normally carried out by the private company. In this model, the PPP is regulated by the statutes of the firm and by the shareholder

agreement document which establishes the relationships between private and public partners. Since the public sector is involved in management, key elements like price levels and price structures, quality of service, and investments are periodically defined and the risk is almost always transferred to the customers or, alternatively, to the taxpayers. Although the principles underlying mixed companies are sound (Marra, 2007); the public sector is an active partner in the PPP, becoming an accomplice of the private operator. So it tends to accept tariff increases (Boardman and Vining 2008). Indeed, mixed companies in general do not bear risks: risks are transferred to customers or to taxpayers. The bidding documents identify the situations that constitute the causes for restoring the financial and economic equilibrium of the mixed company. Table 4 highlights these causes for a typical case in Portugal. Moreover the bids impose financial indicators (e.g. IRR) that should be fulfilled each year. The tariff changes according to these values every year.

**Table 4.** Risks affecting the financial and economic equilibrium of the PPP

| <b>Changes requiring restoration of financial/economic equilibrium</b>   | <b>Risk</b>               |
|--|---------------------------|
| a) Abnormal change of volumes not predicted in the economic and financial viability study of the public tender   | <b>Consumption</b>        |
| b) Significant expansion of capacity requirements not predicted in the Plan of Investments   | <b>Several</b>            |
| c) Meaningful change of the rules or legislation which leads to the alteration to the conditions reflected in the initial bid  | <b>Legal/regulation</b>   |
| d) If the mixed company has to bear charges related to the factors that could not be predicted at the date of shareholder agreement signature as, for example, new taxes, tariffs or taxes determined by new legislation | <b>Legal/regulation</b>   |
| e) Change greater than 30% of the annual average value of Euribor (6 months) relative to the date of signature of financing contract   | <b>Financing</b>          |
| f) If there is any unilateral change initiated by the municipality, implying changes in the business case of contract  | <b>Unilateral changes</b> |
| g) If some form of force majeure takes place   | <b>Force majeure</b>      |

These clauses represent almost all the risky situations. However, the shareholder agreement document clarifies these circumstances by establishing the conditions where a change in the proposed main financial indicators is recovered in the next annual tariff review. In this way, the rate of return and other indicators are always guaranteed. Note that the risks are not supported directly by the municipality and that the benefits of this arrangement belong to the municipality as well (as shareholder), although management and other fees paid directly by the mixed company accrue to the private firm and its managers. However, customers bear the risk, and costs can drift upwards, leading to conclude that the public interest is harmed by poor contract design in this instance.

As mentioned earlier, the issue of risk allocation is central to problems arising within PPP projects. Earlier studies suggest that these contracts have a high failure probability (Boardman and Vining, 1989). Since the municipality is inside the mixed company, there will be political and ethical difficulties that may generate controversies due to the duty of protecting the public interest and simultaneously remain loyal to its partner, (especially because of its co-responsibility for key decisions). Furthermore, a dispute leading to a deadlock may compel the municipality to purchase shares under the call option, which is unacceptably costly in economic terms.

#### 4. CONCLUDING REMARKS

This paper discussed the problem of risk in water infrastructures regulatory contracts. In first part of the paper, we highlighted some methodological aspects regarding the risk issue. We first identified the major risks associated with the private sector participation in the water utilities. Next, we classified the risks and allocated them to the party better able to mitigate or to bear them. The probability of occurrence and the impact different risks were then briefly described. The mitigation measures were described. In the second part of the paper, we analyzed two empirical cases of regulatory contracts in the Portuguese water sector, one corresponding to a concession contract and other to a mixed company. These examples are not different from other countries influenced by Continental administrative law, such as France, Spain and African and Central and South American countries. We conclude that the risk issue is generally taken into account in a flawed way and that this represents one of the major reasons for contract failure, both their renegotiation and/or early termination. In Portugal, the risk in the two types of PPP (concession contracts and mixed companies) is not correctly transferred to the private sector: this tendency limits the success of contracts and consequently, reduces the benefits from private sector participation in the water sector. Thus, one can argue that the major problems of water utilities are not technical or solved by developments in science. Rather, contract design, institutional incentives, inter-agency collaboration, benchmarking, and management information systems represent the high payoff areas for those seeking to improve water sector performance.

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