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PUBLIC-PRIVATE PARTNERSHIPS AS MECHANISMS FOR RISK MANAGEMENT IN THE WATER SECTOR

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Abstract

Some forms of Public Private Partnership (PPP) have been long since used in the procurement and operation of water infrastructure, as shown in the first part of the paper. The main object of the paper is to highlight the mechanisms of PPP in the water sector and to suggest that in times of economic and financial distress, when both the public sector and the private sector face additional risks and challenges, various models of PPP may be used to manage and mitigate the risks and to improve performance in providing the public services of Water Supply and Sanitation (WSS). The economic and financial risks of the WSS sector are commonly classified in two broad categories but within these broad categories there are many more specific risks. Therefore, we shall analyse some of these main risks and their potential interrelations, by employing several methodologies: literature review, case studies, performance indicators, risk matrix, analysis and synthesis. The mechanisms, features and experiences of PPP in this branch of the water sector are summarized and comparatively analysed, from the viewpoint of risk sharing, leading to some conclusions and recommendations on the opportunity and effectiveness of implementing such arrangements especially in Romania.

Key words**:** *economic and financial mechanism, Public Private Partnership (PPP), risk, Water Supply and Sanitation (WSS)*

INTRODUCTION

While in most industrial countries, the WSS services are very developed, due to heavy early investments in water infrastructure and institutions, thus requiring only renewing and improving for environmental sustainability, in developing and emerging countries the main challenge is investment in new infrastructure [1]. Still, all these countries share the financial need to maintain and improve infrastructure and to construct new works, seeking capital and management capacity from the private sector.

As we mentioned in a recent paper [2] some important trends have occurred in the EU water sector, mainly driven by the European Water Framework Directive 2000/60/EC. Since we have dealt first with water demand management and regionalization of water utilities, we would like to consider another trend: privatization of the water companies' management and creation of a competitive market in the water supply and sanitation (WSS) industry.

Improving the delivery and coverage of WSS utilities is a critical need for the emerging economies and the new EU member states, in order to be able to comply with the Water Directives.

However, due to the incapacity or the unwillingness to acknowledge water as a finite natural resource and an economic good – a commodity that needs a market price reflecting the cost of provision and its true value to society [3], public water systems are often operated inefficiently and services are unreliable, lacking coverage, regular maintenance and good design. Therefore, in the long run, regional and local governments

(public authorities) should consider, for developing and delivering WSS infrastructure and utilities, the potential involvement of some private sector partners who might be able to offer increased access to their: private investment funds; improved and innovation management systems, technologies and techniques.
Nevertheless, the Public-Private Partnerships in the WSS sector may also involve some obstacles and shortcomings and may not easily take all the risks featured by the sector; still, they should be encouraged as means to develop the WSS network and service quality, compliance and coverage as well as to relaunch the local economy and to reduce unemployment.

MATERIALS AND METHODS

After presenting a theoretical and historical background of the PPP concept applied in the water sector, economic and financial risks of the WSS sector are classified in two common broad categories but also with a view of the more specific risks falling within these broad categories.
To highlight the mechanisms of sharing and transferring the risks in different PPP arrangements, we exemplify and analyse some of these main arrangements, with their risks and their potential interrelations, by employing several methodologies: literature review, case studies, performance indicators, graphic diagrams, risk matrix, analysis and synthesis.

RESULTS AND DISCUSSIONS

Theoretical and historical background

The concept of Public Private Partnership (PPP) may be defined for our methodological purposes, as „any contractual arrangement between a public sector agency and a for-profit private sector concern, whereby resources and risks are shared for the purpose of delivery of a public service or development of public infrastructure" [4].
As resulting from the relevant EU documents in this field [5], there are some key features which characterise these PPP, such as: the cooperation between a public partner and a private partner involving a long-term relationship; the funding of the projects mostly done by private partners; the public entity is focused on the objectives to be achieved in the term of public interest and is responsible for monitoring the project, for the quality of the provided services and the pricing policy; the private partner is usually responsible for the stages in the project like design, completion, implementation and funding; risk management through risk sharing between partners, as some risks are being transferred from the public entity to the private partner.
For the provision of municipal water and wastewater services, the PPP basically constitutes an alliance between the public and private sectors, supplying water and/or wastewater services to the customer who will in turn pay a tariff or tax to the partnership. Hence in the public-private partnership, ownership of assets remains public and only certain functions are delegated to a private company for a specific period.
As we shall further analyse in the next section, the most common forms of PPPs, in the order of increasing responsibilities for the private partner, are:
-the management contract (for 4–7 years), under which the private operator is only responsible for running the system, in exchange for a fee that is to some extent performance-related<
-the lease contract (for 10–15 years), under which assets are leased to the private operator who receives a share of revenues;
-the mixed-ownership (joint-venture) company in which a private investor takes a minority share in a water company with full management responsibility vested in the private partner;
-the concession (for 20–30 years), under which the private operator is responsible for running the entire system. Investment is mostly or fully financed and carried out by the private operator.
The management and lease contracts are used to increase efficiency and improve service

quality, while asset sales and concessions primarily aim to reduce the fiscal burden or to expand access to WSS services. Often several of the objectives and motives are combined, resulting also in hybrid forms of the above cited models of PPP.

In the European Union and worldwide, the public-private partnerships (PPPs) are the most common form of private sector participation in water supply and sanitation today, but some forms of Public Private Partnership (PPP) have been long since used in the procurement and operation of water infrastructure. For instance, the water sector in France has always been characterized by a coexistence of public and private management, with their respective shares fluctuating over time. The two largest private companies are Veolia Environnement (formerly the Compagnie Générale des Eaux founded in 1853), and Suez Environnement, (formerly Lyonnaise des Eaux founded in 1880). The share of the private sector gradually increased from 32% in 1954, 50% in 1975 and 80% in 2000, by using a new model instead of the concession contracts: the new lease contracts (*affermages*) made the private operator only responsible for operation and maintenance, while major investments became a responsibility of the municipalities [6].

As in 2011 (according to the Pinsent Masons Water Yearbook (2010–2011), 909 million people (13% of the world population) were served by private WSS operators, in different forms of PPP arrangements. This estimation includes 309 million people in China, 61 million in the United States, 60 million in Brazil, 46 million in France, 23 million in Spain, 15 million in India and 14 million in Russia. In Chile, the Czech Republic, Armenia and four African countries – Côte d'Ivoire, Ghana, Gabon and Senegal – PPPs assure water services to the entire urban population, while in Hungary they serve almost half the population (see Table 1 for a selection of data on countries and cities with some form of PPP in the WSS sector).

As may be noticed from the presented experiences and the data in table 1, all kind of countries (with developing, middle income, advanced, even socialist national economies), from all over the world, have involved Public Private Partnerships in providing their water supply and sanitation networks and services. This is a proof that PPPs can provide solutions to communities faced with the need to improve critical infrastructure or find cost efficiencies to help fund necessary projects.

However, due to the several sectoral specificities, such as: the extremely high capital costs, mostly financed with long term debt and the relatively low rates of return on investment in the WSS business, private operators are particularly sensitive to the quality of the investment climate and the level of risk, which is an important obstacle to Public-Private Partnerships in many regions of the world.

Table 1: Countries and types of PPP contracts in the WSS sector

	Country	Start date	Population and cities served	Type and number of PPP contracts
1.	China	2001	27 cities and towns	Concessions (22), full privatizations (3) and management contracts (2)
2.	Bulgaria	2000	Sofia	Concession (1)
3.	Cuba	2000	Havana	Concession (1)
4.	Czech Republic	1993 (reform) and 2001 (Prague)	Prague and 23 other cities	Concessions (24)
5.	Côte d'Ivoire	1960 in Abidjan 1973 country-wide	All urban areas	Lease (1)
6.	France	1853	9000 localities	Concessions and leases
7.	Gabon	1997	All urban areas	Concession (1)
8.	Germany	1999	Berlin	Mixed-ownership company (1)
9.	Ghana	2000	All urban areas	Management contract (1)
10.	Hungary	1994	Budapest, Szeged, Debrecen and five other cities and towns	Concessions (8)
11.	Poland	1992	Gdansk, and other 7 cities and towns	Full privatizations (4), concession (1), leases (2) and management contract (1)
12.	Romania	2000	Bucharest, Ploieşti and Otopeni	Concessions (3)
13.	Spain	1867	Barcelona and more than 1,000 other municipalities	Mixed-ownership companies and concessions
14.	Saudi Arabia	2008	Riyadh, Jeddah, Mecca	Management contracts (3)
15.	United States	1772	73 million people	Investor-owned and 2,000 PPPs

Source: Own research and selection, from various references above cited in the text

As we shall detail further, considering the specific risks of the sector and the financial challenges brought by the crisis, an important

issue is the selection or development of the right model of PPP arrangement.

Risks of the WSS projects; allocation and management through PPP

Risk is an unavoidable factor in the provision of water supply and sanitation services. Both the public contracting authority and the private operator know that future values of certain variables, such as demand, interest rates, and foreign exchange rates, are important for the project. Future water demand, for instance, depends on growth in per capita income and population as well as changes in the weather, preferences, and technology, variables which cannot be forecast with certainty.

Aiming to analyse the mechanism for improved economic and financial risk management through PPP in the WSS sector, we should first try to identify the main risks since quite many risks affect the water sector; one risk is often a bundle of other, more specific risks and some risks are interrelated.

The economic risks faced by the water sector for the provision of WSS can be divided into two broad categories [7]:

-*Investment-related risks*—the set of risks associated with investment in new infrastructure;

-*Operation-related risks*—the set of risks associated with operating and maintaining service.

Within these broad categories there are many more specific risks; we shall analyse some of them and their potential interrelations, according to a civil engineering study [8]:

a) *Risks of design and construction (D&C)*; normally associated with the procurement of treatment or distribution assets and determined by obsolete or inappropriate technology, cost overrun, program delay, inadequate quality control. The D&C (including technological) risks are likely to have major impacts on other specific risks, such as the long term O&M risks and the risks of compliance.

b) *Risks of operation and maintenance (O&M);* O&M risks involve defects, rising energy and material prices, deterioration and depreciation of assets, structural failure, process failure or obsolescence, supply and demand balance, raw water quality and quantity, site security and cost efficiencies. If these risks are not properly managed, they could lower the service performance or raise the operating costs of the utility.

c) *Risks of compliance*; are externalities imposed by the law, environmental agencies or the regulator. For WSS suppliers in the EU, these are in the form of compliance with the WFD and other water Directives (98/83/EC on the quality of water intended for human consumption), water resource constraints such as abstraction licenses and non-revenue water (NRW) / leakage targets.

d) *Commercial risks*; in general, commercial risks cover demand risks, the price elasticity of water demand (i.e. the customers' response in water consumption when facing a tariff increase), present and projected demographics of the area, water consumption patterns, illegal connectors, billing and bad debts and the social cost of pollution in the case of wastewater. Here we included also the tariff risks, although the WSS service tariff level is either regulated through a tariff adjustment mechanism or determined politically.

e) *Financial risks* are the investment-related risks occurring when there is a change in the cost of capital to the utility. Main factors which determine these risks are the interest rate, the exchange rate, the crediting rating of the utility, and the local capital market development.

f) *Risks of transaction* are incurred whenever a transfer of assets or human resources takes place and relate to uncertainties in the quantity, quality and cost of these assets.

g) Regulation and legal risks to consider here are existing legal or regulatory framework for the provision of water and wastewater services, resolution of legal disputes as well as enforceability of the legal provisions.

h) Political risks concern the stability and socio-economical behavior of the society, the trustworthiness of the government and the general political environment.

Management of these risks is quite a difficult task, therefore the advantage and aim of private participation in a PPP, as a mechanism of risk management in the WSS sector, is to allocate risks and responsibilities between the WSS operator and the contracting authority so that:

-each responsibility is allocated to the party best able to undertake it;

-each risk is borne by the party best able to manage it.

Therefore, the standard models of the public-private partnership in the water supply and sanitation sector are defined by a particular mechanism of the responsibilities and risks allocation:

PPP type I: the management contract

Under a management contract the operator fills key management positions in the water company with appropriately skilled staff. The publicly owned water company continues to be accountable for other responsibilities, such as undertaking new investment. In this arrangement, the private sector partner will provide O&M and/or capital programme management services and receive an annual fee from the public partner. The revenue collection function is usually retained in the public sector and the scope and mechanism of risks transfer is limited, but performance generally improves. Apart from the D&C, the O&M and compliance risks, almost all other major risks are owned by the public sector.

An example of PPP through management contract is that of Armenia, in the Central Eastern Europe and Central Asia region. A management contract for the service area of the Armenia Water and Sewerage Company (AWSC), serving 37 towns and 280 villages throughout the country with about 600,000 inhabitants, was initially signed in 2004 with the French company SAUR International for 3 years and then extended. In the area served by the AWSC, within the first 2.5 years, the management contractor increased revenue collection by 24%; decreased energy costs by 15% and water losses by 20%. The number of metered connections has increased by 76% [9].

PPP type II: affermage-leases

Under an affermage-lease, responsibility for operating and maintaining existing assets, plus commercial and management responsibilities, pass to the private operator. The public contracting authority usually retains responsibility for new investment.

Here, the risk transferred from the contracting authority to the operator is usually quite significant, but the mechanism of risk transfer depends on the details of the contract and, in particular, the way the operator's remuneration is determined: under an affermage, the tariff adjustment rules that matter most are those applying to the operator's tariff (or affermage fee); under a lease, the operator gets the customer tariff minus a lease payment, so the tariff adjustment rules that matter most are those that apply to the customer tariff.

For instance, the characteristics of the Chaumont municipality contract are common to most affermage contracts in France. The operator Société Lyonnaise des Eaux, owned by SUEZ, provides water and sanitation services on the basis of two different contracts, which were signed simultaneously (as stipulated by the French law). As for the mechanism of main risks allocation, the municipality bears most of the investment risks, while the private operator carries operational and commercial risks [7].

PPP type III: joint-ventures

In this type III of PPP, the public-private partnership is more intimate and integrated, since the public and private sector form a joint venture to provide water and wastewater services to the customer. It is a good practice for the public sector to inject the water infrastructure assets and the private sector partner to contribute with the capital, to form a joint venture company. This is potentially the most complicated of the four types of PPP mentioned here but is also an increasingly modern and popular model favoured by the different stakeholders.

The joint venture model permits the sharing of risks in the form of profit-and-loss sharing. This allows the redistribution of savings and potential benefits in a project between the public and private partner, a provision which is usually conspicuously missing in PPP projects [10]. The public sector will have to retain a certain degree of risks in areas like O&M, revenue collection and financing, compliance (Figure 1).

An example of joint-venture (mixed-ownership) PPP is that of Berlinwasser of Berlin, Germany. It supplies water and provides wastewater treatment services to a population of 3.7 million in Metropolitan Berlin and surrounding areas. This type III PPP was formed between the Berlin Government (50.1%) and a private consortium (49.9%) that consists of Allianz, RWE and Veolia (then Vivendi) (10%: 45%: 45%) in 1999. The public sector retains the

majority stake, but employs the entrepreneurship of two experienced private utilities while retaining the board control of the undertaking [8].

PPP type IV: concessions

Under a concession the operator assumes full responsibility and exclusive right to operate, maintain and carry out investment in a public utility and the risk transferred from the contracting authority to the operator is usually substantial, but depends particularly on the rules for adjusting the customer tariff.

As a handy example, we are able to cite the water and sewer system of Bucharest (capital of Romania, population of 2.3 million), privatized in 2000 through a 25-year concession to the French company Veolia. The Bucharest Municipality assigned the rights and obligations to manage the public WSS services and related public assets to the company Apa Nova Bucureşti, on the company's own risk and expense, in exchange for a fee payment (royalty). To reduce the risk of low water demand, the concession contract foresaw the possibility to increase tariffs beyond the contractually foreseen increases, if total water use was more than five per cent below water use in the previous year [11].

According to a recent report [12], this PPP for municipal water services is praised being considered very successful since „under the private operator the utility: has raised service quality above Romanian standards and toward Western European levels; by 2008 efficiency gains had produced cost savings of US$349 million. The concessionaire has financed US$259 million in investment, without public subsidy, while keeping tariffs well below the Romanian average".

In figure 1, we summarize and represent in a risk matrix, the mechanisms of risk sharing for each of the main 4 types of PPP models for the WSS services; as indicated graphically by the arrow, the degree of private responsibility and risk taking increases from left to the right.

The political risk was not included in the risk matrix since it is not a project risk element, but may impact on the choice of the PPP model. If the political risk is rather high, the private sector will tend to choose one of the first types of PPP models from the left (I or II), in order to minimize its overall risk exposure.

Increased private sector responsability and risk in the PPP

Risk	I Management contract	II Affermage-lease	III Joint-venture	IV Concession
D&C	Public	Public/private	Public & private	Private
O&M	Private	Private	Public & private	Private
Compliance	Public/private	Public/private	Public & private	Private
Commercial	Public	Private	Public & private	Public/private
Financial	Public	Public	Public & private	Private
Transaction	Public/private	Private	Private	Private
Regulation and legal	Private	Private	Public & private	Private

Source: Own analysis and appraisal, mainly based on researched references

Fig.1. Risk matrix (risk sharing mechanisms) of the main PPP models in the WSS sector

A recent study on the PPP in the water sector [13] has identified, besides many other trends and features, the technological, demand and financial risks as the most important risks lately faced by the WSS sector in two EU member countries (Poland and Portugal), in the recent years of economic crisis. Using the method of a comparative analysis, the paper also highlighted some worthy common as well as different issues that appear in the mature, saturated Portuguese market and in the fresh and developing Polish market economy, for the acceptance, implementation and development of PPP models for WSS.

CONCLUSIONS

In our opinion and according to the cited literature, PPP agreements are resourceful and should be used more widely in the financing and development of WSS infrastructure and services. "The main advantage of a concession is that full responsibility for operation, maintenance and investment moves to the private sector, thus provides a commercial incentive to operate efficiently, while continuing partnership with government. The authorities should consider themselves as partners with the private sector in the provision of high quality environmental services and at responsible cost" [14].

Indeed, in times of economic and financial distress, it is normal for the public sector - to be prudent and risk averse, but this should not

prevent municipalities and governments from developing effective and strong PPP for WSS infrastructure and services.

The best approach is to develop a true partnership relationship so that each risk element is fairly allocated to the party best able to manage it or even shared between the parties (as in the type III joint-venture PPP). Actually, we would recommend the joint-venture PPP as the best suitable and opportune model of PPP in the WSS sector nowadays, since it allows for innovation, expansion and job-creation. A careful SWOT analysis should be conducted for the companies entering in the joint venture, in order to optimize the share of private participation and the mechanism of risk sharing.

In all the PPP options for the WSS utilities, although there are many opportunities for sharing and transferring the specific risks, the public authority remains responsible for overseeing the activity and for ultimately ensuring that public needs are met. Governments retain final responsibility for setting and enforcing performance standards; also, the PPP arrangement for WSS services must be very well designed, regulated and carefully implemented in order to avoid the trend of transferring too much of the risks incurred by the water sector to the end-users of the WSS services, namely to the impoverished customers [2].

Unless continued access to water services of the poorest people is ensured at a reasonable cost, and sufficient levels of transparency in decision making are ensured, social resistance to Public-Private Partnerships has still to be expected. Thus, many Public-Private Partnerships have encountered difficulties due to insufficient attention being paid to the social consequences of involving the private sector as they often implied tariff increases due to a move towards the full recovery of operation and maintenance costs through tariffs. For instance, returning to our Romanian concession Apa Nova Bucharest, the bulk of investments were financed through commercial loans and, indirectly, by customers through the company's retained earnings. However, tariff adjustments (the latest in force from 01.03.2013) were possible only after the fifth year of the concession and needed approval from the National Regulation Authority for the Public Utilities Community Services, ANRSC.

In the case of the capital city of Bucharest, the WSS PPP works with good results in the water quality and economic efficiency performance, as shown by [12] and [15]. However, for Romania, the primary objective of private sector involvement is attracting capital investment, with technological know-how and financial capacity, to help for the development of the WSS networks and services as required to comply with the EU water Directives and also to increase the access of Romanian population to public water supply and sanitation services (national average rate of connection of dwellings to WSS, of only 65% in 2011, preliminary data according to latest NIS survey). This environmental sector needs demanding investments: from the about €12 bn total estimated in 2007-2013 period (for the whole water sector), only about €5.4 bn are foreseen from the EU funds [16].

Hence, the first specific objective of the SOP ENV is the improvement of quality and access to water and wastewater infrastructure, by providing water supply and wastewater services in line with EU practices and policies, in most urban areas by 2015 and by setting efficient regionalised water and wastewater management structures. Still, the Priority Axis 1 "Extension and modernization of water and wastewater systems" faces some problems, shortcomings and challenges for a higher absorption of EU structural and cohesion funds available for the effective development of the water/wastewater infrastructure, since the co-financing and implementation capacity of the Regional Operators has proved to be too limited.

The process of regionalisation and aggregation of the Romanian water sector was a strategic move, being expected to create, besides economies of scale, also a large enough demand base for the Regional WSS

operators to become attractive for private sector participation [17].

Besides, the Sustainable Development Strategy of Water Supply and Sanitation Public Services- Romania 2025 supports the involvement of private capital in large investments, especially through PPP arrangements required to achieve to major construction and expansion of treatment plants and wastewater. Considered ways to open the market for water and wastewater strategic private operators are: the licensing process, mandatory performance indicators, public tender for the WSS services not licensed yet.

Another good outlook for the WSS PPPs is that, to induce a growth of the use of the public-private partnership, the European Union offers the possibility to finance these projects through structural funds or through innovative financial instruments.

Thus private investments may be attracted in domains where the financial risk would be too big to make attractive an investment, when the domains are included in EU priorities, such as the environmental protection or the climate change [18].

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