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November 2013

## Working Papers in Applied Economics

*WPAE-2013-22*

## THE 'SOCIAL CHOICE' OF PRIVATISING URBAN WATER SERVICES: A CASE STUDY OF MADRID IN SPAIN

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**Abstract.** – In countries where privatisation is permitted by law, policymakers usually give different reasons of general interest to allow private companies to manage water services. However, these kinds of decisions often provoke intense political debate and are at times opposed by citizens. In this paper, we illustrate how Analytic Hierarchy Process (AHP) techniques can be used to analyse the rationality of complex decisions regarding the management of water services. As a case study, we analyse the recent decision taken by the Regional Government of Madrid (Spain) to part-privatise the management of water services by introducing a private partner. In doing so, we use information from a questionnaire completed by a panel of five experts in water management, including both scholars and professionals. The results raise doubts about the rationality of the decision to privatise water services in Madrid. Rather than social interest, other reasons may be behind the decision, such as satisfying private interests whilst continuing to take advantage of maintaining public institution status.

**JEL Classification:** C61 - H83 - L33.

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## 1. INTRODUCTION

In spite of countries being extremely diverse where choosing between the public and private management of urban water services is concerned, private sector participation remains low in comparison to other industries (Perard, 2009). Currently, private companies provide water services to more than half the population in only five countries, namely, Chile, the Czech Republic, France, Malaysia and the United Kingdom. In countries such as Italy, Spain and Germany, private companies provide water services to 30-50% of the population, while in Austria, Belgium and Canada, among others, there is little or no private participation.

The water industry has particular characteristics that explain the low level of participation of private companies. On the one hand, water services are considered a *merit good* and universal access to water must be guaranteed, mainly due to the positive externalities this creates. On the other hand, it is difficult to incorporate competition into the water industry. Both circumstances result in the water industry being sensitive to public regulation and political control. In fact, while some countries don't contemplate the legal possibility of private companies becoming involved in management processes, in countries where privatisation is permitted, local policymakers are concerned about the effect of privatisation on strategic aspects of water management, such as access, efficiency and service quality. In this sense, some authors have warned of privatisation cases being linked to problems with contract performance, accessibility and service under-provision, increases in prices and decreases in quality (Lobina and Hall, 2000; Hall and Lobina 2004; Lobina, 2005; Pierce, 2012).

Since the 1970's, empirical research has attempted to explain why some local governments chose to privatise urban water service management. Most studies have based their analysis on multivariate regression techniques, particularly *probit* and *logit* models (Bel and Fageda, 2009; Picazo-Tadeo et al., 2012). The variables commonly employed to explain privatisation could be grouped into three main categories, namely, fiscal constraints, economic efficiency and political processes and ideological attitudes. In recent reviews of the literature, Bel and Fageda (2007; 2009) found that policymakers base their decisions mostly on pragmatic reasons rather than ideological or political ones. However, Bel and Fageda (2007) also highlighted that researchers need to be cautious in generalising the factors that explain the privatisation of water services due to the methodological difficulties that exist in capturing the natural dynamics of decisions made by local policymakers.

Furthermore, several empirical papers have focused on providing more in-depth knowledge and understanding for decision-making processes in particular case studies using different methodological approaches. In this framework, our paper shows how the *Analytic Hierarchy Process* (AHP) technique can be used to support decision-making regarding the management of water services in scenarios where rather different criteria need to be accounted for at the time of making a decision. In addition, AHP is also a useful tool to perform *ex-post* evaluations of decisions already made by policymakers. As a case study, we perform an *ex-post* analysis of the decision made by the Regional Government of Madrid (Spain) to partially privatise the public company *Canal de Isabel II* (CYII hereafter), which is responsible for integrated urban water management in the region. Other studies have used similar techniques to study decision-making regarding the management of urban water services (see Hajkowicz and Collins, 2007 for a survey).

The interest in this *case study* is supported by the importance of the announcement made in 2008 on behalf of the president of the Regional Government of Madrid about the purpose of partially privatising the CYII and the social reaction generated by this decision. Based on the information gathered from a series of questionnaires completed by several experts in water management (both researchers and experienced professionals), the AHP technique raises doubts about the rationality of the decision made by the Regional Government of Madrid to privatise the management of CYII.

The rest of the paper is organised as follows. Following this Introduction, Section 2 reviews some of the theoretical arguments for and against the privatisation of water services. Section 3 describes the case study. Section 4 develops the methodology and discusses the results and the final Section summarises and concludes.

## **2. THEORETICAL FRAMEWORK**

### **2.1. Considerations regarding competition, efficiency and funding**

#### *Market failure and Public Choice*

The *Public Interest Theory*, based on market failures, argues that when the market is unable to yield the most efficient (and equitable) results, public sector intervention in economic affairs is justified. This is the case of the water industry, a paradigmatic example of a natural monopoly, with high sunk costs due to investment and maintenance, high asset specificity and significant health externalities associated to service provision. Despite this, there has been a significant privatisation trend in the

management of water services in many industrialised countries since the last quarter of the 20th century.

According to the *Public Choice Theory* there are two possible explanations for this trend. First, privatisation incorporates competition into public monopolies (Savas, 1987). Outsourcing public service management through competitive bidding processes can lead to a reduction in costs if politicians and bureaucrats are no longer permitted to monopolise public services (Niskanen, 1971). Second, private participation could promote a better use of economies of scale when public services are delivered at suboptimal level (Donahue, 1989). However, there is no consensus in regards to the abovementioned effects of privatisation. On the one hand, it is not clear that bidding processes incorporate real competition into the water sector. At best, quasi-markets are achieved with a limited number of bidders (Sclar, 2000; Bel and Warner, 2008). On the other hand, privatisation is not the only way to aggregate demand and exploit economies of scale, because the same result can be achieved through other forms of inter-municipal cooperation (Bel and Fageda, 2007; González-Gómez et al., 2009).

Additionally, empirical evidence regarding the relative efficiency of different management formulas is not conclusive either (González-Gómez and García-Rubio, 2008; Bel and Warner, 2008; Abbott and Cohen, 2009; Bel et al., 2010). Although several researchers have suggested that private water companies are more efficient than public ones (see Picazo-Tadeo et al., 2009a; 2009b), they may just be reflecting the preference of private companies to take control of water service provision in scenarios where expected returns are higher (González-Gómez et al., 2011) or the tendency of public companies to operate in more complex scenarios with greater diseconomies of scale and scope (Carvalho et al., 2012).

#### *Financial aspects related to water management*

The advocates of private participation in the management of water services have also backed their stance wielding financial reasons. During the second half of the 20th century, policymakers in most industrialised countries justified tax increases to expand the welfare state, including the cost of urban water services. However, since the crisis and the first tax revolts in the United States at the beginning of the 1970's, this financial resource has been disputed. Many policymakers were forced to govern with minimal margin to raise local taxes. As a result, the existence of fiscal restrictions has been considered one of the most important explanatory factors in the privatisation of urban water management (Bel and Fageda, 2009; 2010).

Many policymakers have contemplated privatisation as a very attractive and efficient financial resource (Ruiz-Villaverde et al., 2010). Nonetheless, authors such as Massarutto et al. (2008) highlight the importance that the cost of funding is directly proportional to the economic risk that investors must bear. The water industry is capital-intensive and assets have a long economic life. Therefore, it is particularly sensitive to capital expenditures. This circumstance raises doubts over the idea that private companies have more incentives to reduce costs and ease of access to financial markets. Consequently, private management can be more efficient in many cases, but not necessarily when capital-intensive service infrastructure is involved.

### **3.2. Other relevant aspects: monitoring and citizen involvement**

#### *Agency theory*

In the case of public services, *the principal-agent problem or agency dilemma* focuses on how to ensure citizens' interests (the principal) prevail over managers' interests (the agent), taking into account the difficulty of designing a contract (in the case of contracting out service management) to promote competitive dynamics and reduce the likelihood of monopolistic behaviour (Bolton and Dewatripont, 2005). It is necessary to implement processes of effective supervision and control that could help reconcile managers' objectives with the objectives of the public administration and citizens.

Academic discussion focuses on studying when the monitoring and supervising processes are most effective in terms of an agent's performance, taking into account two criteria, namely, ownership and company size. In small companies, the supervision and control exerted by the owners is stricter in the case of private ownership (Bel, 2006). Conversely, in larger companies there is no evidence that one type of management outperforms the other in terms of supervision and control processes. Monitoring processes in both cases – public and private ownership – can become highly inefficient.

#### *Incomplete contracts and property rights theory*

Partial privatisation warrants special attention. Public-Private Partnerships (PPP) have played an increasingly important role in the field of local public service management since the late 1990s, particularly in the water industry. This is the case in Spain (Ruiz-Villaverde et al., 2010) and other European countries. A PPP is an alternative form of management that differs to the existing dichotomy between purely public or private management. Under this form of mixed public-private

management, the government maintains a degree of control over the private partner, which is responsible for the everyday operations of the company.

Some studies have proposed several arguments in favour of mixed public-private management (Bel and Fageda, 2010). This formula incurs less monitoring costs by reducing transaction costs. The key issue is that policymakers can exercise direct control over the company through their ownership rights, as well as the parallel regulatory framework. Even in cases when companies manage services independently from the government, policymakers will always be able to have their say regarding general objectives, particularly in the case of municipalities that hold 51% of the operating company. Moreover, government involvement in the board of directors helps to reduce expected problems related to long-term and incomplete contracts. Finally, it is worth mentioning that private utility managers have strong incentives to reduce costs without considering the potential deterioration of service quality (Hart et al., 1997). However, partial privatisation may lead to lower costs compared to purely public management, while also promoting improvements in the quality of service compared to purely private management (Schmitz, 2000).

Once again, there is no academic consensus on this issue either. Eckel and Vining (1985) argue in their theoretical investigations that mixed public-private companies can result in the worst aspects of both public and also private management, in which case neither profitable nor social goals can be effectively achieved.<sup>1</sup> For effective internal supervision in a mixed company it is necessary for public representatives to possess a high level of expertise and high ethical standards (Marra, 2007). Moreover, mixed companies often lack clarity and stability when setting goals (Boardman and Vining, 1989), while also facing internal conflicting pressures resulting from the coexistence of private and public interests within the same company. It should also be noted that defining social objectives or measuring results is difficult in this type of management model. This aspect complicates assessment and the degree of success of mixed companies.

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<sup>1</sup> Cruz & Marques (2012) conducted four case studies in Portugal and according to their findings, partial privatisation is not observed to have any theoretical advantage in local public services in practice, particularly in regards to the defence of general interests. For these authors, empirical evidence shows that it is very difficult under public-private management to satisfy two interests that are opposite in nature. The interests of the private entity (profit maximisation) usually prevail over citizens' interests.

### *Greater citizen involvement: new public service, communicative planning and social choice theory*

New trends in the field of planning and public administration indicate that besides interacting with markets, policymakers must interact with communities by promoting deliberative democratic processes (Nalbandian, 2005; Denhardt and Denhardt, 2000). These new trends have been coined the *new public service* in public administration (Denhardt and Denhardt, 2003) and *communicative planning* in the area of planning (Healey, 1996). The result of combining these two approaches leads us to understand policymaker decisions as dynamics that integrate market mechanisms and deliberative processes that take into account citizens' opinions (Allmendinger et al., 2003; McGuirk, 2001).

On grouping these theoretical trends in the field of planning and public administration, one could speak of an ideological shift in the theoretical approach. Hefetz and Warner (2007) empirically demonstrate that this ideological shift might already be occurring in some cities in the United States.

The *social choice theory* could be the ideological shift referred to by the foregoing authors. This theory goes one step further and proposes repetitive processes of dialogue, which combine elements of markets and planning as a way of achieving optimal social solutions. The main assumption of this theory is the importance of deliberation, especially under situations where there are significant conflicts of interests. According to this theory, policymakers recognise the potential market solutions, but they need debate and dialogue in order to respond to the diversity of interests and possible conflicts. The main challenge of this theory is to create the right context in order to take into account citizens' opinion while developing political capacity to detect possible differences of interest and identify solutions that do not divide the community (Nalbandian, 2005).

## **3. CASE STUDY: CANAL DE ISABEL II (CYII)**

### **3.1. Diversification and expansion of CYII**

CYII is a public company with legal personality subject to private law, which is responsible for integrated urban water management in the Spanish Region of Madrid. On the 1st of July 2012, the Council of the Government of the Region of Madrid approved the creation of a public limited company – *Canal de Isabel II Gestión SA* –, which is currently responsible for managing the water supply, sanitation and reutilisation services, including customer service, advertising and sales activities for almost the entire Region of Madrid (110 out of 178

municipalities). While the regional government of Madrid owns 82.4% of the shares of *Canal de Isabel II Gestión SA*, 17.6% are spread across the municipalities assigned to this new management model.

Until 2012, CYII supplied water to 175 out of the 179 municipalities comprising the Region of Madrid and 6.48 million inhabitants, almost the entire population (Canal de Isabel II, 2012). At present, this figure is somewhat lower. CYII activity has surpassed the objectives set out in its founding statutes; since the early 1990's, it has implemented a strategy of business diversification and expansion in order to leverage its expertise in public service management, the liquidity of its assets and its high level of technological development (Ortega de Miguel and Sanz Mulas, 2007). Besides managing integrated urban water services, CYII participates in other sectors such as hydropower or telecommunications.

According to data from 2012, CYII has shares in companies that operate in the hydropower sector, such as *Hidráulica Santillana* (100% direct participation). In addition, a holding company has been created – *Canal Energía SL* – (80% direct and 20% indirect participation) to participate in a group of companies that perform activities related to the production, processing, marketing and distribution of electricity. In the telecommunications sector, CYII has created a subsidiary company – *Canal de Comunicaciones Unidas SAU* – (100% direct participation), which executes projects and provides services in the fields of telecommunications and industrial and information systems. Through its participation in the company – *Canal Extensia* – (100% direct participation), CYII has developed an expansion plan in Latin America. It holds operating licenses in Colombia, the Dominican Republic, Venezuela and Ecuador. CYII has also conducted technical assistance programs through contracts with the World Bank in countries including Cuba, Brazil and Venezuela.

In summary, today the activity of CYII transcends its original purpose stipulated in its founding statutes. It is a public company at the head of a multinational holding operating in different sectors, different Spanish cities and several different countries around the world, mostly in Latin America. In this regard, it is important to note that CYII is a public company that reports a net annual profit of more the 100 million € (135 million € in 2011).

### **3.2. The bill for the privatisation of CYII**

In the plenary sessions of the *Madrid Regional Government Assembly* on the 16<sup>th</sup> and 17<sup>th</sup> of September 2008, the parliamentary group of the *Partido Popular* (PP) – the

right-wing political party governing in majority – proposed the partial privatisation of CYII. The minutes of such meetings highlight the arguments used to defend the privatisation process (Gobierno de la Comunidad de Madrid, 2008).

During these meetings, the PP parliamentary speaker indicated that the Region of Madrid would face growing water needs in the near future due to population increases and had to fulfil the environmental and management requirements set out in the *EU Water Framework Directive*. As a result, the government realised there was a necessity for major investment in new infrastructure and technological processes in coming years, amounting to an estimated figure of 4bn €. Required investments included the construction of two new reservoirs, one in the North of Madrid and the other in the South. Moreover, some works that were part of the old *National Plan for Sanitation and Water Purification 1995-2005* were still pending execution and were thus included in the new *National Plan for Water Quality 2007-2015*, amounting to an extra investment of 2.79bn €.

In view of the highly unfavourable economic and financial situation, the use of new forms of management and financing in order to maintain the quality management of CYII was proposed, while attracting new financial resources and increasing citizen involvement in decision-making processes. More specifically, a new law was proposed to allow the creation of a public limited company to manage urban water services for the Region of Madrid. Initially, the Regional Government would hold 100% of the social capital and a maximum of 49% of shares could later be sold on financial markets or the stock market. According to the Regional Government, this would provide funding and allow the citizens of Madrid to improve their participation in water management decisions as minority shareholders.

Due to the majority rule of the political party in the government, the proposal was approved in the plenary sessions with 66 votes for and 52 votes against. In December 2008, the privatisation agreement was embodied and in June 2012 the new company *Canal de Isabel II Gestión SA* was created. However, the process of partial privatisation has not yet taken place due to difficulties in finding investors, mainly because of the unfavourable economic climate in Spain.

### **3.3. Strong citizen opposition**

The announcement of the partial privatisation of urban water services was met by a citizen movement in Madrid in opposition to that political decision. The *Plataforma contra la privatización del Canal de Isabel II* consists of several social organisations:

neighbourhood associations, sections of major Spanish national Unions, political parties and individual citizens.

The movement has held some notable events including several mobilisations and demonstrations against privatisation as well as a claim being submitted to the *Constitutional Court* in March 2012 alleging that the decision was not constitutional. The movement's greatest impact came when a referendum was proposed on the 4th of March 2012. This (informal) consultation asked citizens about their preferences regarding the ownership of water service management. The result was that 99% of participants voted against any changes in ownership, preferring to continue with public management.<sup>2</sup>

The citizen movement against privatisation is a warning that the case of Madrid is very similar to that which took place in Berlin. In 1999, a consortium of two large multinational companies (Veolia and RWE) with experience in water service management and other industries, acquired 49.9% of the shares of Berliner Wasserbetriebe (BWB), the municipal company responsible for urban water service management in Berlin. According to Lanz and Eitner (2005), there have been problems associated with the privatisation process, including a significant increase in water rates, a substantial reduction in the workforce, which was a breach of the agreements with the Unions prior to the privatisation process, problems related to water quality and a lack of investment in maintenance. In addition, a disproportionate rate of profit in favour of the private partner (minority shareholder) has been recorded, causing serious detriment to the City of Berlin and its citizens.

#### **4. METHODOLOGY, RESULTS AND DISCUSSION**

The choice of management for urban water services is not an easy decision. On the one hand, this choice must take into account different decision criteria. On the other hand, as outlined in Section 2, all these criteria have pros and cons, which lead to discussion regarding the appropriateness of different forms of management of public services. Leaving aside political issues, as noted in the Introduction, AHP

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<sup>2</sup> This result is worth highlighting, as a similar social movement – *Forum Italiano dei movimenti per l'acqua* – began in Italy in 2009. For similar reasons, this movement was opposed to a water privatisation project initiated by the government at the time. Their first achievement was a *Constitutional Court* ruling in favour of conducting a national referendum in relation to the privatisation of water services (Corte Costituzionale, sentenza n. 29/2011). Subsequently, the referendum was held in conjunction with two other topics of interest to the Italian citizens. In that case, 95% of Italians voted against the privatisation of water services. On the 7th of June 2011, the Italian *Constitutional Court* upheld the claim and the privatisation project undertaken by the government was defeated (Corte Costituzionale, sentenza n. 174/2011).

constitutes a useful instrument to introduce rationality into decisions made in complex environments, such as the choice of urban water service management.

#### 4.1. A brief note on the *Analytic Hierarchy Process* method

The *Analytic Hierarchy Process* (AHP) is a mathematical technique first introduced by Saaty (1980) and commonly employed to support decision-making processes in complex scenarios and major long-term repercussions (Bhushan and Kanwal, 2004). In essence, AHP determines the weightings of a number of decision alternatives with respect to achieving a final goal. During the process, decision-makers – or experts – perform assessments considering the different criteria and sub-criteria contained in a hierarchy. The assessments are made by pairwise comparisons of the elements in each of the hierarchical levels compared to the higher level. A 9-point scale is commonly used to do so.

Accordingly,  $A=(a_{ij})$  can be defined as the reciprocal matrix obtained from the pairwise assessments of the elements  $i$  and  $j$ . The values obtained for pairwise comparisons actually represent the ratios between the priorities, represented by  $w$ , given to the corresponding functions; in other words,  $a_{ij}$  is defined by the quotient between  $w_i$  and  $w_j$  for all  $i$  and  $j$ . The reciprocal matrix obtains the so-called *priority vector*, namely  $w$ , which shows the priorities derived from the assessments (i.e., numbers associated with the nodes of an AHP hierarchy indicating the order of preferences) and can be obtained in different ways, including the *principal right eigenvector* (EM) (Saaty, 1980) and the *geometric mean vector* (GMM) (Crawford and Williams, 1985).

Formally, the priority vector using the *principal right eigenvector* is computed as:

$$Aw = \lambda_{\max} w, \text{ and } \sum_{i=1}^n w_i = 1 \text{ (normalisation criteria)} \quad (1)$$

where  $\lambda_{\max}$  is the *largest or principal eigenvalue* of the matrix  $A$ , which is obtained by solving:

$$\text{Det} (\lambda I - A) = | \lambda I - A | = 0 \quad (2)$$

Furthermore, the priority vector computed through the *geometric mean vector* is:

$$w_i = \left( \prod_{j=1, \dots, n} a_{ij} \right)^{1/n} \text{ for } i = 1, \dots, n \quad \sum_{i=1}^n w_i = 1 \text{ (normalisation criteria)} \quad (3)$$

In our case study, we use the EM approach given the scarce difference in the results obtained from the two methods.

The process can be summarised as depicted in Figure 1.

PLEASE, INSERT FIGURE 1 AROUND HERE

Finally, in order to verify whether the vector of priorities has been estimated consistently, a *consistency ratio* (CR) is computed as:

$$\text{Consistency ratio (CR)} = \frac{\text{Consistency index (CI)}}{\text{Randomly generated consistency index (RI)}} \quad (3)$$

where the consistency index (CI) is estimated as:

$$\text{Consistency index (CI)} = \frac{\lambda_{\max} - n}{n - 1} \quad (4)$$

and randomly generated consistency index (RCI) values are given in *Table 1*.

PLEASE, INSERT TABLE 1 AROUND HERE

According to the consistency criteria described above, consistency is rejected if the consistency ratio is greater than 0.1. Alternatively, Alonso and Lamata (2006) propose a simpler and less restrictive criterion to measure inconsistency in pairwise reciprocal comparison matrices, which is based on the computation of maximum right eigenvalues. One particular matrix of dimension  $n$  will be either consistent or inconsistent depending on the values taken by a consistency index, on the one hand, and on *the level of consistency needed*, named  $\alpha$  (with  $0 < \alpha \leq 1$ ), on the other. The level of consistency needed provides adaptability to different scopes and relates the *consistency error* of the matrix studied to the *average error* of matrices with the same dimension.

Formally, the consistency error of a matrix  $A$  of dimension  $n$  is defined as:

$$\text{Error (A)} = \lambda_{\max}(A) - n \quad (5)$$

while the average error for matrices of that dimension is computed as:

$$\text{Average Error} = \lambda_{\max}(n) - n \quad (6)$$

Accordingly, the matrix A will be consistent only if:

$$\frac{\text{Error}(A)}{\text{AverageError}} \leq \alpha \quad (7)$$

and the matrix will be sufficiently consistent if:

$$\lambda_{\max}(A) \leq n + \alpha(\bar{\lambda}_{\max}(n) - n) \quad (8)$$

Table 2 displays several consistency benchmarks for different consistency levels and dimensions according to the estimations by Alonso and Lamata (2006).

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#### *Applying AHP to the case study: privatisation of CYII*

As noted in Section 3, the government of the Region of Madrid announced in 2008 their decision to partially privatise the management of the urban water service. *Was this decision rational?* In the absence of a theoretical framework that allows us to confirm the superiority of one management model over another, and bearing in mind the social reaction to the decision, our objective here is to obtain the valuation of a group of experts in water service management – researchers and independent managers – using the AHP technique. In other words, we aim to ascertain which choice of management these experts would have made, taking into account the criteria the Regional Government of Madrid used to support its stance in favour of partial privatisation at the plenary session of the Regional Government Assembly. The results from this research could thus provide regional policymakers with an *ex-post* assessment of how rational their decision was.

For analytical purposes, the management alternatives recognised by the current legislation for urban water services in the Region of Madrid are included among the possible formats for indirect management (we have omitted the alternative of pure public ownership on behalf of the local government due to not being a realistic option). As a result, we have the following alternatives:

*Alternative 1 (A1): Public company.* Continue as a public company that reports to the Regional Government of Madrid.

*Alternative 2 (A2): Private company.* Establish a fully private Public Limited Company (100% of capital belonging to the Regional Government).

*Alternative 3 (A3): Mixed company.* Establish a Public Private Partnership (Public Limited Company 51% owned by the Regional Government, and 49% by private partners). This was the alternative proposed and approved in the Parliament of the Regional Government of Madrid.

The criteria used to evaluate these options stem from the arguments used in the plenary sessions of the Regional Government of Madrid and are as follows:

*Criterion 1 (C1): Financial capacity.* In view of the imminent need for investment that CYII was facing, according to the information provided by the policymakers, this criterion refers to the company's ability to obtain the necessary financial resources.

*Criterion 2 (C2): Effectiveness and efficiency in water service management.* This criterion refers to the technical and economic organisation capacity of the company that manages the water service e.g., exploitation of economies of scale and network density, incentives to innovate and reduce costs or capacity to apply new technologies, among others.

*Criterion 3 (C3): Transparency in the control and supervision of water service management.* This criterion refers to the company's capacity to create a transparent information system that makes it possible to control and supervise company managers so as to ensure the prevalence of the interests of society that are typical of a preferential service. Supervision and control should also encompass criteria of economic rationality in terms of the associated costs.

*Criterion 4 (C4): Citizen involvement.* This criterion has been considered because the *EU Water Framework Directive* makes a special call to citizens to stay informed and participate in decision processes related to water management.

#### *The panel of experts*

In order to assess the different management alternatives for CYII based on the above criteria, we relied on a panel of five experts in water management, namely, professionals with experience in managing urban water services in Madrid and

experts from the academia. More specifically, we have considered the opinion of a senior technical manager and an auditor to perform audit reports of the integrated urban water management of the Region of Madrid, along with three Spanish researchers with extensive experience in the field of governance and management of urban water services.

Initially, there is no optimum number for the composition of panels of experts. In case studies that apply the AHP technique, a large number of experts are not usually included for pragmatic reasons (Lai et al., 2002; Ruiz-Villaverde et al., 2012). In other cases, such as when incorporating voting procedures, the number of experts is usually higher.

Information has been gathered by means of a questionnaire concerning the abovementioned alternatives and criteria that the five experts completed. There are different possibilities when adding the information in the case of a group decision-making process. One can either aggregate the individual judgments for each set of pairwise comparisons into an *aggregate hierarchy*, synthesise each of the individual's hierarchies and aggregate the resulting priorities or, finally, aggregate the individual's derived priorities in each node in the hierarchy. In all cases, the relative importance of the decision-makers may either be assumed to be equal, or else incorporated into the aggregation process. In our case study, the information has been gathered individually and experts in the panel are independent with different value systems. Accordingly, we decided to synthesise each of the individual's hierarchies and aggregate the resulting priorities. This method can be computed using either a geometric or arithmetic mean, both complying with the *Pareto* principle (Forman and Peniwati, 1998).

## **4.2. Results and discussion**

The results are shown in Table 3 – individual results – and Table 4 – aggregate results. First, it is noteworthy that the levels of inconsistency for experts 1, 2 and 3 are high in the Saaty sense, as they are above 0.1. However, they can be considered consistent according to the less restrictive criterion of Alonso and Lamata (2006). The main result highlights that the experts consulted considered the public company the most appropriate alternative, based on the different criteria taken into account for managing urban water services in the region of Madrid (Table 4). Only in the case of expert 5 was a mixed public-private company considered the most appropriate, albeit by a narrow margin (see again Table 3). It is worth recalling that the different criteria used in the application of AHP have been established considering the arguments advanced by policymakers when they decided upon the

partial privatisation of water services (Gobierno de la Comunidad de Madrid, 2008). Consequently, this result might call into question the decision by the Regional Government to seek a private partner to manage urban water services.

One possible explanation for the discrepancy between the decision made by the policymakers and the option resulting from the application of AHP with our panel of experts could be that they value the decision-making criteria differently. In this sense, while the experts under no circumstances consider *financial capacity* to be the most important criterion, it was the main argument wielded by the politicians in favour of the decision to privatise. In contrast, the experts assign the largest weightings to *citizen involvement*<sup>3</sup> and *effectiveness and efficiency in water service management* (Table 4). The fact that these criteria are considered is particularly relevant in our case study, as CYII has become a multinational enterprise and has a significant national and international expansion and diversification plan. Therefore, these criteria are important in that greater citizen involvement would permit greater management transparency, which should in turn promote greater effectiveness and efficiency.

Concerning the reasons to partially privatise CYII, one possible initial explanation is the claim to provide short-term funding to local governments and the Regional Government of Madrid itself. This possibility can be understood in the context of the current budget deficit of the Spanish public administration and the lack of financial autonomy of local and regional governments to manage their responsibilities (Rubio, 2008; Zafra, 2008; de la Fuente, 2012). In the case of the water industry, some studies point to the financial failure of the public administration as a major cause of the privatisation of urban water services in Spain (González-Gómez et al., 2011; Picazo-Tadeo et al., 2012, Ruiz-Villaverde et al., 2010). Nevertheless, this explanation might well be insufficient in the case of this research, as the Regional Government is delaying the implementation of the decision, which was approved in 2008 and in 2013 is still to materialise.

Another possible explanation for the partial privatisation, as noted by Miguel Ortega and Sanz Mulas (2007), taking into account the expansion and diversification

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<sup>3</sup> While public authorities have also labelled greater citizen involvement as one of the most important reasons for privatising the water service, they probably have a different understanding of this criterion. Politicians defend that the acquisition of minority shares will allow citizens to become involved in the decision-making of the new mixed company in charge of managing the urban water service post privatisation. However, not all citizens will be able to purchase shares in the new company, in fact, not even a minimally representative proportion of the population of Madrid. Furthermore, the shares that citizens do acquire will under no circumstances be sufficient to gain a relevant presence in regard to the control and supervision of CYII management.

plan of CYII, is that the main objective was to maximise private profits. This would indicate serious principal-agent problems (see Section 2) arising from the complexity of managing CYII as a consequence of unnecessarily risky operations performed outside and within the management of integrated water cycle services. Therefore, the creation of a mixed public-private company would essentially be a way to satisfy private interests whilst continuing to take advantage of maintaining public institution status. This option could seriously harm citizens' interests.

## 5. SUMMARY AND CONCLUSIONS

The legal framework in some countries allows policymakers to opt for the privatisation of urban water services. While the management of water services is perhaps one of the most controversial decision-making processes in public administration, in the academia there is also an open debate regarding the convenience of private management in the water industry. While some studies argue that private management is more efficient, others defend that public management is the greatest guarantee for social interests, without impeding efficiency. In addition, some authors point to the mixed company as an option to combine the advantages of public ownership and private management, although others have also pointed out that mixed companies could cause significant internal conflicts of interest between public and private managers (Cruz and Marques, 2012).

This paper illustrates the use of mathematical tools such as the *Analytical Hierarchy Process* (AHP) in order to introduce more rationality into the decision-making process regarding the management of urban water services. Additionally, this technique gives a better understanding of the complexity of certain decisions as it allows the introduction of an analytical process of evaluation. In particular, the AHP expressly clarifies the criteria the decision is based on. These criteria are weighted on the basis of the preferences expressed by the decision-makers. The technique also ranks individual decisions based on the preferences observed for each criterion. In order to conduct an *ex-post* analysis, we apply the AHP technique to the decision to partially privatise CYII in the Spanish region of Madrid, a decision that has generated much controversy. For this purpose, information has been gathered from a survey completed by five experts from professional and academic areas of knowledge in water management.

The main result highlights the discrepancy between our group of experts and the Government of the region of Madrid after performing an *ex-post* analysis using the AHP technique in relation to the decision of (partially) privatising urban water service management. The panel of experts assesses the public company as the most

appropriate option for the management of water services, which raises doubts over the rationality of the decision actually made by policymakers. The different relative importance that policymakers and the experts consulted in this study assigned to decision criteria could explain this discrepancy. Additionally, politicians and the experts may also have different perceptions of the management options based on different criteria considered. Therefore, a second remarkable result indicates that experts assign the largest weightings to *citizen involvement* criterion. This result suggests that policymakers should reconsider the importance of citizen participation in the management of water services. In this context and considering the new trend in the field of public administration and *the social choice theory* the unaccepted challenge by the politicians is to enable appropriate policy mechanisms for citizens' voices to be considered. Ultimately, other unrevealed interests during the discussion process following which the decision was made may also justify the discrepancy.

Finally, we would like to conclude by addressing the following question: *What could the AHP technique contribute in situations similar to that addressed in this research?* In our opinion, it could introduce clarity to the debate and transparency in the final decision-making process. Choosing the decision-making criteria and weighting the importance of each allows us to restrict the issues to be discussed and also how in-depth that discussion is. At the same time, systemising the information provided by each decision-maker is transparent. The use of techniques such as the AHP, particularly in our case study, could have avoided doubt regarding the decision-making process and the formulation of questions such as: *Were other types of criteria than those expressed by the politicians of the Regional Government of Madrid considered that can explain the decision? What criterion was actually the most important in the decision to privatise CYII? And, above all, how important was social interest in the decision-making process?*

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## TABLES

**Table 1** Random values for the randomly generated consistency index (RCI)

| <i>Dimension n</i>                         | 3    | 4    | 5    | 6    | 7    | 8    | 9    |
|--------------------------------------------|------|------|------|------|------|------|------|
| Randomly generated consistency index (RCI) | 0.52 | 0.89 | 1.25 | 1.35 | 1.40 | 1.45 | 1.49 |

**Table 2** Acceptance criterion for  $\lambda_{\max}$  considering the consistency level

| <i>Consistency level <math>\alpha</math></i> | <i>Dimension n</i> |        |        |         |
|----------------------------------------------|--------------------|--------|--------|---------|
|                                              | 3                  | 4      | 5      | 10      |
| 0.01                                         | 3.0095             | 4.0272 | 5.0449 | 10.1334 |
| 0.05                                         | 3.0479             | 4.1364 | 5.2249 | 10.6673 |
| 0.1                                          | 3.0958             | 4.2728 | 5.4498 | 11.3347 |
| 0.2                                          | 3.1916             | 4.5456 | 5.8996 | 12.6695 |
| 0.5                                          | 3.4792             | 5.3641 | 7.2491 | 16.6738 |

**Table 3** Summary of results for the AHP analysis <sup>1</sup>

|                                                        | Expert 1<br><i>Professional</i> | Expert 2<br><i>Professional</i> | Expert 3<br><i>Scholar</i> | Expert 4<br><i>Scholar</i> | Expert 5<br><i>Scholar</i> |
|--------------------------------------------------------|---------------------------------|---------------------------------|----------------------------|----------------------------|----------------------------|
| CRITERIA RELATIVE IMPORTANCE                           |                                 |                                 |                            |                            |                            |
| Financial capacity                                     | 3.7% (4)                        | 10.6% (4)                       | 10.5% (3)                  | 11.8% (3)                  | 27.4% (2)                  |
| Effectiveness and efficiency in management             | 8.1% (3)                        | 16.4% (3)                       | 59.4% (1)                  | 5.5% (4)                   | 55.1% (1)                  |
| Transparency in control and supervision                | 23.7% (2)                       | 40.6% (1)                       | 26.1% (2)                  | 26.2% (2)                  | 13.1% (3)                  |
| Citizen involvement                                    | 64.5% (1)                       | 32.3% (2)                       | 4.0% (4)                   | 56.5% (1)                  | 4.4% (4)                   |
| RANKING OF ALTERNATIVES                                |                                 |                                 |                            |                            |                            |
| Public company                                         | 77.8% (1)                       | 77.7% (1)                       | 68.5% (1)                  | 39.4% (1)                  | 32.2% (2)                  |
| Private company                                        | 11.1% (2)                       | 10.7% (3)                       | 8.1% (3)                   | 28.7% (3)                  | 32.1% (3)                  |
| Mixed company                                          | 11.1% (2)                       | 11.6% (2)                       | 23.4% (2)                  | 31.9% (2)                  | 34.7% (1)                  |
| CONSISTENCY                                            |                                 |                                 |                            |                            |                            |
| Saaty (1980)                                           | (Reject CR>0.1)                 | (Reject CR>0.1)                 | (Reject CR>0.1)            | (Accept CR<0.1)            | (Accept CR<0.1)            |
| Consistency ratio (CR) <sup>2</sup>                    | 0.20                            | 0.27                            | 0.28                       | 0.04                       | 0.06                       |
| Alonso and Lamata (2006)                               | (Accept $\alpha=0.5$ )          | (Accept $\alpha=0.5$ )          | (Accept $\alpha=0.5$ )     | (Accept $\alpha=0.05$ )    | (Accept $\alpha=0.1$ )     |
| Principal eigenvalue ( $\lambda_{\max}$ ) <sup>3</sup> | 3.208                           | 3.280                           | 3.291                      | 3.041                      | 3.062                      |

<sup>1</sup> Ranks are in brackets.<sup>2</sup> The consistency ratio is measured using expression (4).<sup>3</sup> The principal eigenvalue is measured using expression (2).

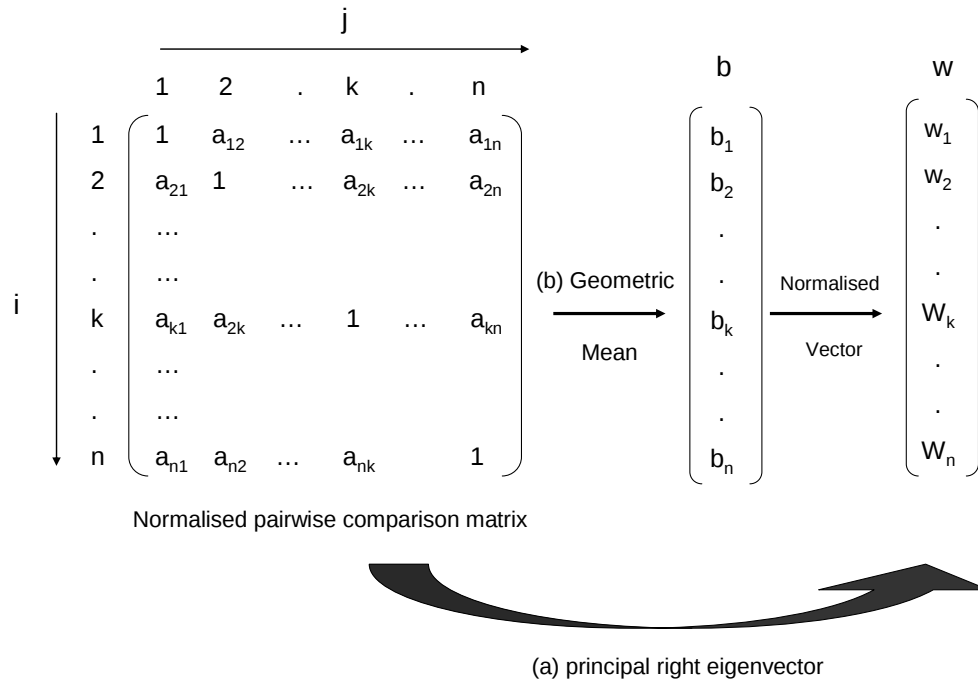
**Table 4** Aggregation of experts' priorities: criteria and alternatives<sup>1</sup>

|                                            | Arithmetic mean |
|--------------------------------------------|-----------------|
| CRITERIA RELATIVE IMPORTANCE               |                 |
| Financial capacity                         | 12.8% (4)       |
| Effectiveness and efficiency in management | 28.9% (2)       |
| Transparency in control and supervision    | 25.9% (3)       |
| Citizen involvement                        | 32.4% (1)       |
| ALTERNATIVE RANKING                        |                 |
| Public company                             | 59.3% (1)       |
| Private company                            | 18.2% (3)       |
| Mixed company                              | 22.5% (2)       |

<sup>1</sup> Ranks are in brackets.

## FIGURES

**Figure 1.** The AHP process



**Figure 2** Hierarchical design of the case study

