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THE PUBLIC CHOICE OF URBAN WATER SERVICE MANAGEMENT: A MULTI-CRITERIA APPROACH

Alberto Ruiz-Villaverde · Francisco González-Gómez[1]

Abstract.- *Local governments have to take decisions in increasingly complex contexts. Among other decisions, in countries where it is permitted by the legal framework, local policymakers have to choose the type of management of local public services. The importance of the urban water service and the variety of criteria to be considered in the management choice make it advisable that local government should consider the existing tools to rationalize the decision-making. Different Multi-Criteria Analysis (MCA) facilitates decision-making processes in situations where several criteria must be taken into account. This paper applies an Analytic Hierarchy Process (AHP) to analyze the decision on the urban water service management in Granada, city in southern Spain. An assessment through an ex-post analysis is aimed to conclude whether the choice was appropriate and, therefore, whether or not the City Council should reconsider its past decision. The main conclusion is that the decision was consistent.*

Keywords: Urban water management; public choice; Multi-criteria analysis; Analytic Hierarchy Process.

1. INTRODUCTION

Local governments are the level of public administration that is closest to citizens. Following the principles of good governance, city councils should provide public services in pursuit of greater efficiency and universal orientation (Goldsmith, 1992). The environment in which local governments must respond to citizens and take decisions is increasingly complex. There are several factors that contribute to complicating the scenario of local action, primarily in large and medium-sized cities. The first is the population growth experienced in these urban areas (Antrop, 2004). This is due to both the population growth experienced worldwide in recent decades, as the change in the productive structure towards economies that dominate industrial and service activities, which has led to a gradual exodus from rural areas to cities. Secondly, local governments are increasing their jurisdictions and taking on increasing responsibilities (Martínez-Vázquez & Timofeev, 2009). For instance, it was unthinkable a few decades ago that Councils would provide childcare for their workers, social care services to the elderly and disabled, or organised leisure activities for their citizens.

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In this context, an important decision that local governments face in many countries is to decide what type of entity should manage the services within their jurisdiction. The liberalisation and deregulation of economies since the 80s has led to greater responsibility and more autonomy in local decisions (Goldsmith, 1992). Consequently, many municipal governments must decide what is more appropriate. Should they manage local services by themselves? Should they establish public autonomous entities? Should they privatise the management of local services?

The case of urban water service management is a particularly important decision. Intuition or political and ideological debate should never be considered sufficient for the public choice of water service management. The interest of Citizens should not be subject to arbitrary decisions on behalf of policy-makers. Apart from considering citizens' opinions, local governments must rely on management tools that enable them to take rational decisions. In this context it is important to bear in mind that decision-making processes usually have to take into account several criteria. In these situations, the usefulness of Multi-Criteria Analysis (MCA) may be twofold: Ex-ante analysis can introduce analytical rationality to decision-making; Ex-post analysis makes it possible to test whether past decisions were consistent, taking into account the time when the decision was taken, or whether they would be consistent in the current situation.

This research proposes using MCA as a tool for choosing the manager of water service. As far as we are aware, this would be the first time that MCA has been applied to this decision-making process. More specifically, the technique used is the Analytic Hierarchy Process (AHP). In order to illustrate how this technique is used, an ex-post analysis is carried out to evaluate the decision taken by the Local Government in the city of Granada (southern Spain) in 1997. For this purpose, we have used information from the minutes of the plenary sessions of the Council and the information available in technical reports from a special commission of experts created to help in the voting and decision-making processes of the town councillors. Finally, we also used information obtained through a questionnaire applied to a research group involved in water studies at the University of Granada. The main conclusion to be drawn is that, based on the information available at that time, the decision was consistent.

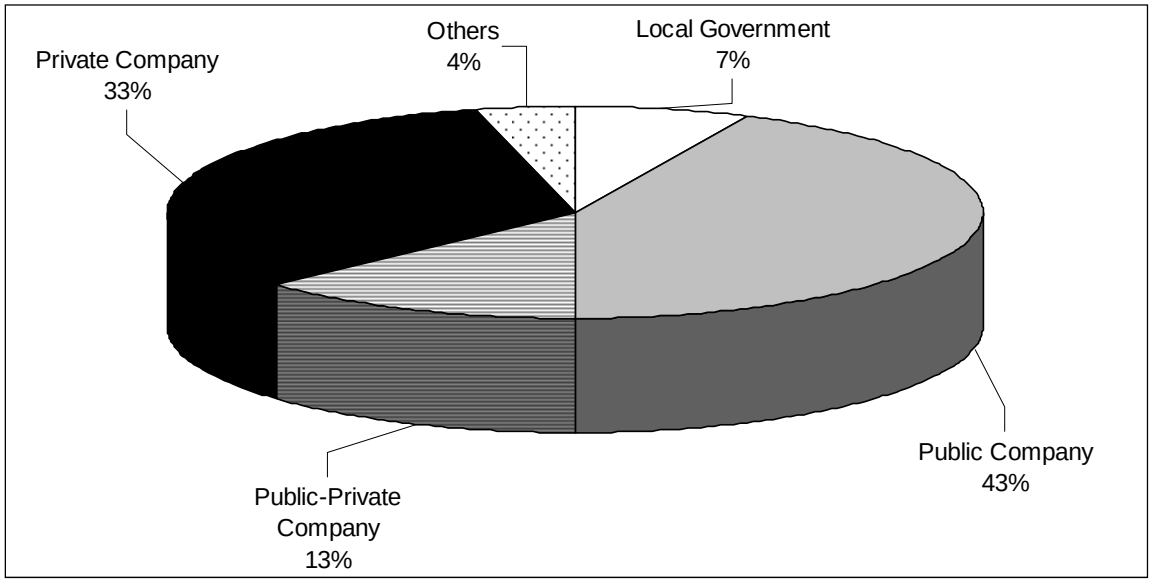
This paper is structured as follows. Section 2 provides an overview of the management of urban water services in Spain and the reasons that may influence the choice of management option. Section 3 describes the AHP method. Section 4 shows the results of applying the AHP technique to the case study. Finally, Section 5 concludes.

2. MANAGEMENT OF URBAN WATER SERVICES IN SPAIN

The legal framework that regulates the type of management for municipal services in Spain is constituted by Law 7/1985 of 2 April, regulating the Terms and Conditions of Local Government and Law 57/2003 of 16 December, on Local Government Modernisation Measures. Article 25 of the first of these laws stipulates that local government is responsible for urban water services.

The local government has the authority to decide the legal format for the provision of water services. Firstly, local policymakers may choose to manage the service from the council itself or outsource it. In the second case, service management may be transferred to an entirely public company, an entirely private company or to a mixed public-private partnership. However, municipalities can only privatise the management of the water service, because infrastructures still belong to the public administration. The company that holds the concession is responsible for the running of the service and the maintenance of the supply networks during the time arranged in the contract. At the end of the contract, the local government must decide again how the service is to be managed. Figure 1 shows the distribution of the type of management of water services according to population served in Spain.

Figure 1 Percentage of population served in Spain subject to different types of urban water service management



Source: AEAS (2010). Own elaboration with data from 2008.

As regards duration, we can say that the option of the service being managed by the City Council itself or a public company is subject to revision at any time. Otherwise, the water service is either completely or partially outsourced to a private company for a given time after signing a concession contract. There is a limit of fifty years in contracts involving the execution of infrastructure works and operating the service and twenty-five years in those contracts solely referring to operations. At the end of the contract, the local government may again choose the alternative they consider the most suitable for the management of the urban water service.

Several papers have attempted to identify the factors behind the decisions taken by municipal governments in relation to the type of management for local public services. Recent literature reviews (Bel & Fageda, 2007; 2009) summarise four reasons that influence the decision of local governments when choosing how to manage municipal services: 1) search for efficiency, 2) financial constraints of the municipalities, 3) ideology, and 4) political motivation. Specific research on urban water management confirms what generally happens in the rest of local public services: essentially pragmatic reasons explain local government decisions. There is evidence on this aspect for the management of urban water services in France (Mènard & Saussier, 2000), in the USA (Pérard, 2009) and in Spain (Miralles, 2009; González-Gómez & Guardiola, 2009; Guardiola et al, 2010; González-Gómez et al, 2010; Bel & Fageda, 2010).

As mentioned above, these studies aim to analyse the factors behind the decisions taken by local governments. These studies involve ex-post analyses, largely applying different discrete choice techniques. The information contained in these studies may be of interest to local political leaders, giving them a notion of what factors explain the decisions taken in other municipalities. However, local political leaders may also wish to answer other questions closely related to the management of services in the municipality. One example would be whether or not to change the type of water service management? Was the past choice of water service management a wise one? Is it worth renewing the contract held by the current concessionaire? The following section describes a methodology that can be used to answer such questions.

3. METHODOLOGICAL NOTES. GENERAL FRAMEWORK AND DESCRIPTION OF MCA AND AHP

3.1. MCA GENERAL FRAMEWORK

The advent of the multi-criteria decision paradigm in the 1970s constituted a major revolution in the field of decision theory (Romero & Rehman, 1987; Hajkowicz & Collins, 1997). Until then, the prevailing economic theory based on the neoclassical school of

thought explained the decisions of economic agents under the assumption of rational behaviour and the ability to set agent preferences based on the optimisation of the decision based on a single criterion. The abstract rationality that neoclassical theories are based on is at odds with the empirical perception of economic agents, and decision makers in particular have a 'bounded rationality' (Simon, 1947). Moreover, empirical evidence also shows that decision makers do not optimise their decisions on the basis of a single criterion; on the contrary, most decisions should be based on a variety of objectives, which are usually in conflict (Romero & Rehman, 1987).

Based on an eminently positive approach, different MCA techniques aim to solve decision-making problems by considering a set of objectives and attempting to satisfy a set of goals associated with these objectives (Holt, 1998; Hajkowicz & Collins, 2007).

There are several classifications in relation to different MCA methods. Depending on whether the set of solutions generated was infinite or finite, we can distinguish between continuous and discrete MCA methods. In accordance with the characteristics of the decision problem to be analysed in this study, the public choice of urban water service management, we apply a discrete choice model.

3.2. AHP METHOD

We chose the AHP (Saaty, 1977; 1980)[2] from a series of discrete choice techniques. . The reasons for this are as follows: 1) its ability to handle uncertain, imprecise and subjective data; 2) its robustness in solving practical ranking problems; 3) its methodological clearness and mathematical simplicity (Tong & Bonissone 1984, Zimmermann 1987, Chen & Hwang, 1992; Deng 1999).

The AHP method consists of determining the relative importance of a given set of alternatives in relation to a predetermined goal, taking into account a number of pre-established appropriate criteria and sub-criteria. In practice, in order to introduce analytical thinking into a decision-making process, the AHP method is based on three basic principles (Saaty, 1995, p. 17): 1) the principle of constructing hierarchies, 2) the principle of establishing priorities and, 3) the principle of logical consistency. A first phase would involve designing the decision-making process, establishing for this purpose a proper hierarchical structure of the elements involved in the process. In a

[2] The pairwise comparison method was first introduced by Fechner (1860), and developed by Thurstone (1927). However, it is correct to say that the AHP method based on pairwise comparison has been developed, refined and widely popularised by Saaty (1977, 1980). See also Stigler's law of eponymy.

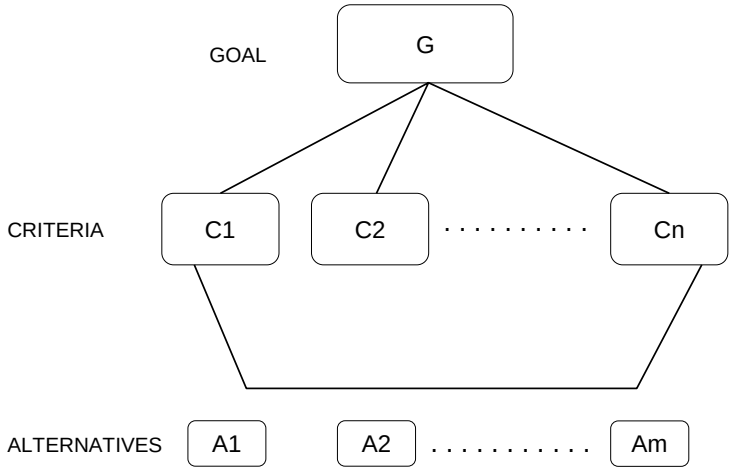
second phase, priorities would be estimated from the information and assessments obtained, taking into account the logical consistency of the process for each hierarchical level.

3.2.1 PHASE ONE: IDENTIFICATION AND DESIGN OF THE DECISION-MAKING PROBLEM

In the first phase a (flexible) hierarchical structure is designed in a multi-criteria context. The first step is to determine the overall objective, or Goal (G), to be achieved. Then, the first hierarchical level would comprise the criteria to be taken into account when assessing the alternatives. These criteria can in turn be divided into successive lower levels of sub-criteria. Finally, after defining the criteria and possible sub-criteria, the next level would consist of the decision alternatives that the decision maker can choose from.

Figure 2 shows a schematic decision problem with a two-level hierarchical structure. Taking into account a goal (G) and a set of criteria C_i (i = 1, 2, ..., N), a choice can be made from a set of alternatives A_j (j = 1, 2, ..., M).

Figure 2 Hierarchical representation of criteria and alternatives



Source: Srdjevic & Pinto-Medeiros (2008, p. 882)

3.2.2 PHASE TWO: ESTIMATION OF PRIORITIES

In a second phase we proceed to estimate priorities, once the decision-making problem has been designed (i.e., goal, criteria and alternatives have been clearly defined). The purpose of the process is to obtain a series of matrices made up of

different assessments that, in turn, allow us to obtain priorities for each hierarchical level in regard to the next highest level. In a final step, we obtain the global priorities for the alternatives allowing decision-making.

Hierarchical level 1: criteria assessment

At this point we carried out an assessment through a process of pairwise comparison of the elements of the first hierarchical level i.e. the criteria in regard to the goal. The pairwise comparison is performed by applying the 9-point scale recommended by Saaty (Table 1). This assessment process usually involves close collaboration with a group of experts.

Table 1 Scale recommended for expert pairwise comparison

Intensity of importance on an absolute scale	***Definition***	***Explanation***
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment moderately favour one activity over another
5	Essential or strong importance	Experience and judgment strongly favour one activity over another
7	Very strong importance	An activity is strongly favoured and its dominance demonstrated in practice
9	Extreme importance	The evidence favouring one activity over another is of tile highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals	If activity i has one of the above numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i.	
Rational	If consistency were to be forced by obtaining n numerical values to span the matrix	

Source: Saaty (1990, p. 15).

Thus, the first matrix is obtained from a sequence of judgments (through pairwise comparisons) of N x (N-1)/2 comparing the relative importance of criteria in regard to the goal, using Saaty's recommended scale for this purpose.

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{N} \\ a_{21} & a_{22} & \dots & a_{2N} \\ \dots & \dots & \dots & \dots \\ a_{N1} & a_{N2} & \dots & a_{NN} \end{pmatrix} \qquad (1)$$

In relation to the estimation of priorities for each hierarchical level, it is important to ensure logical consistency in the collection of assessments by experts. This involves fulfilling two requirements, transitivity and proportionality. First, order relationship between assessments must be respected. Namely, if A is preferred to B and B to C, then A must be preferred to C. Second, proportions between the orders of magnitude of assessments, with a little margin of error or inaccuracy, must be respected. Namely, if A is 3 times more preferred than B and B is 2 times more preferred than C, A should be 6 times more preferred than C. The above example would be a 100% consistent judgment, as it satisfies the requirement of transitivity and proportionality. However, we must consider that in a normal situation, decision makers do not make entirely consistent judgments.

If through collaboration with perfectly rational experts, we estimate the priorities associated with the judgments, it is verified that the values obtained for pairwise comparisons actually represent the ratios between the priorities given to the corresponding functions: $a_{ij} = w_i / w_j$ for all i and j. Thus, the priorities (w_i) of each function could easily be determined from the N x (N-1) / 2 values of a_{ij} that experts have stated. However, perfect consistency in the assessments of decision makers rarely occurs in reality. There are several methods for approximating these priorities to overcome this obstacle. The two methods most used in the literature are described below.

(a) The principal right eigenvector (EM)

This method was proposed by Saaty himself (1980). According to this author, EM should be used to estimate priorities according to the rating scale described above (Table 1). This assertion is based on the eigenvector being a continuous function of the elements of the matrix, so if the matrix is consistent, it is possible to achieve right priorities using the EM (Saaty, 2003). In the case that the elements of the matrix are slightly perturbed in the process through a subjective assessment, the eigenvector retrieves the value of the scale above (slightly different), hence producing a matrix of consistent judgments. Therefore, given a reciprocal matrix of paired comparisons, $A = (a_{ij})$ with $a_{ij} > 0$, the priority vector 'w' obtained from this method is given by the following expression:

$$A\,w = \lambda_{max}\,w, \qquad \sum_{i=1}^{n} w_i = 1 \quad \text{(normalised)} \qquad (2)$$

where: λ_{max} is maximum eigenvalue of the matrix A obtained by solving:

$$\det(\lambda I - A) = |\lambda I - A| = 0 \qquad (3)$$

Additionally, this procedure is often accompanied by measures of consistency such as the Consistency Index (CI) or sensitivity analysis. The most used is the CI, which measures the level of inconsistency in ratings. Usually tolerating up to 10% of inconsistency, this index is calculated as follows:

$$CI = \frac{\lambda_{\max} - n}{n-1} \qquad (4)$$

(b) The Geometric Mean Vector (GMM)[3]

Although Saaty believes that GMM is an approach to EV that provides good results only for situations of little inconsistency, this method is supported by other authors (Crawford & Williams, 1985; Barzilai et al., 1987; Barzilai, 1997). Crawford & Williams (1985) consider that the eigenvector is not the only vector-valued function of judgment matrices that provides the correct scale when the matrix happens to be consistent. There are many others such as the vector of row sums, the vector of the inverse of columns sum, etc. In particular, given a reciprocal matrix of paired comparisons, $A = (a_{ij})$ with $a_{ij} > 0$, the priorities obtained by geometric mean are given by:

$$w_i = \left(\prod_{j=1,\ldots,n} a_{ij} \right)^{1/n} \quad i = 1,\ldots,n \qquad \sum_{i=1}^{n} w_i = 1 \quad \text{(normalised)} \qquad (5)$$

Crawford & Williams (1985) prefer GMM because of its psychological characteristics and statistics and conclude that GMM, in comparison to EM, inter alia: 1) is statistically better, 2) easier to calculate, 3) gives rise to estimates of utility with known statistical properties, allowing tests of hypotheses, confidence interval estimation,…etc.

Furthermore, there are other methods of obtaining priorities such as those based on goal programming (Bryson, 1995) or regression (Laininen & Hämäläinen, 2003). In any case, despite statements by Saaty (1980) and Crawford & Williams (1985), there is no clear evidence of the absolute superiority of one method over another in the related literature (Fichtner, 1986).

[3] Also referred to in the literature as the Logarithmic Least Squares Method (LLSM)

Hierarchical level 2: alternatives assessment

In the absence of sub-criteria, the next step in the AHP is to set (usually by way of a group of experts) an evaluation of alternatives, through pairwise comparisons, to the hierarchical level 2 in regard to level 1, criteria. A set of N matrices of size M x M would be created accordingly. In the same way as before, the corresponding vector of priorities is obtained for each matrix through one of the methods described above.

$$X_i = \begin{pmatrix} x_{11} & x_{12} & \dots & x_{1M} \\ x_{21} & x_{22} & \dots & x_{2M} \\ \dots & \dots & \dots & \dots \\ x_{M1} & x_{M2} & \dots & x_{MM} \end{pmatrix} \quad i = 1,\dots,N \qquad (6)$$

Each matrix X_i, would associate a vector of priorities:

$$W_j^i = (w_1^1, w_2^1, \dots, w_M^1), (w_1^2, w_2^2, \dots, w_M^2), \dots, (w_1^N, w_2^N, \dots, w_M^N) \; ; \; i = 1,\dots,N; \; j = 1,\dots,M \qquad (7)$$

Finally, the global priorities ($Z_j = Z_1, Z_2, \dots, Z_M$) of the alternatives the decision is going to be based on are derived from the sum of the products of the relative priorities obtained from the assessment of the alternatives multiplied by the relative priorities obtained from the assessment of the associated criteria.

$$Z_j = \left(\sum w_i . w_j^i\right) = \begin{pmatrix} (w_1.w_1^1) + (w_2.w_2^1) + \dots + (w_N.w_M^1) \\ (w_1.w_1^2) + (w_2.w_2^2) + \dots + (w_N.w_M^2) \\ (\dots\dots) + (\dots\dots) + \dots + (\dots\dots) \\ (w_1.w_1^N) + (w_2.w_1^N) + \dots + (w_N.w_M^N) \end{pmatrix} = \begin{pmatrix} Z_1 \\ Z_2 \\ \dots \\ Z_M \end{pmatrix} \quad i = 1,..N; \; j = 1,\dots,M \qquad (8)$$

4 APPLICATION OF AHP IN MANAGEMENT CHOICE FOR URBAN WATER SERVICES: THE CASE OF GRANADA

This section shows the results of applying the technique described above in a particular case. In 1997, the local government of Granada, a city of 498,365 inhabitants (metropolitan area) located in southern Spain, decided to incorporate a private partner in the shareholding of the municipal company managing urban water services. The municipal company was no longer a public company, but a mixed company. This

research proposes an ex-post analysis to conclude whether or not that was a wise decision.

In order to carry out this application of AHP to the management choice of urban water services in the city of Granada, we have considered three main sources of information:

(1) Minutes from the Government Commission of the City of Granada related to the Record of management change of Water and Sewer Public Services, 24/96 between 1996 and 1997.
(2) Technical reports (legal and economic) and documentation taken into account by the corporate members of the Council of Granada in the voting process and decision-making in reference to management change of Water and Sewer Public Services.
(3) Results of a preliminary study based on a questionnaire completed by a group of 5 members of the Water Institute (University of Granada), see appendix.

First, we outline the design of the AHP applied to the case study and then we show and discuss the results.

4.1 Design of AHP for the case study

For the AHP design, we follow the first phase described in the previous section: 1) identification and design of decision making problem, i.e. the definition of the goal and criteria as well as developing alternatives, 2) performance of the hierarchical structure of the components involved in the process.

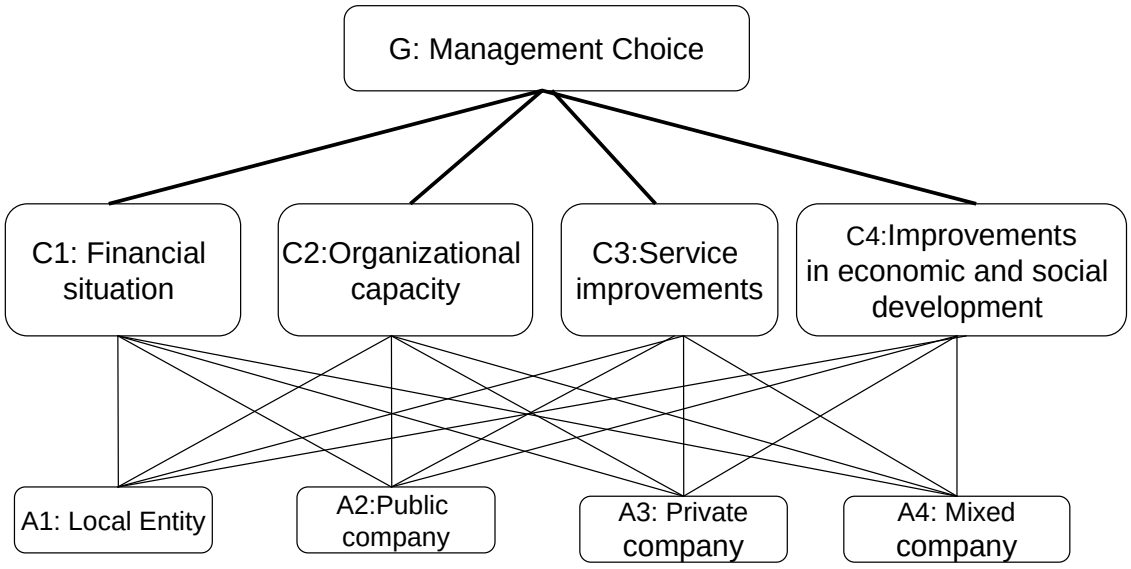
Firstly, in this case study the goal would be to choose the most appropriate form of management for urban water services in the city of Granada. Secondly, we should determine the criteria for making assessments.

For this phase, we have used the information from technical reports prepared by special committees of experts to assist corporate members of the City Council in voting processes and decision making. From this information, the following criteria can be determined. Criterion 1 (C_1): Financial situation, especially considering the lower water rates that do not involve a failure of economic and financial solvency of the management entity. Criterion 2 (C_2): Capacity of technical and economic organisation (use of economies of scale, capacity and flexibility in management, ability to undertake investments for improvement…etc.). Criterion 3 (C_3): Service improvements for citizens. Criterion 4 (C_4): Improvements in economic and social development of the municipality.

Thirdly, we must define the alternatives for the decision making process. According to the review in section 2, Spanish law establishes four options. We would present the AHP design as follows. Alternative 1 (A_1): Direct management through a Local (Public) Entity. Alternative 2 (A_2): Public company. Alternative 3 (A_3): Private company. Alternative 4 (A_4): Mixed public-private company.

After completing steps 1, 2 and 3, we would have clearly established the hierarchical structure of the decision making process (Figure 3).

Figure 3 Hierarchy for the case study of Granada



4.2 PROCESS APPLICATION AND RESULTS PRESENTATION

Based on the information obtained or the perception of those involved in the process, the judgments for each pair of elements are introduced. The AHP begins with the first hierarchical level, where the relative importance of the criteria is compared to the goal. Then the process continues with lower hierarchical levels. Similarly, judgments for each pair of elements are introduced in regard to the next highest level until the last level with the alternatives.

Hierarchical level 1: criteria assessment in regard to the goal

Following the description of the AHP considering information from the experts we obtain the first matrix (Table 2), as described in section 2.

Table 2 Matrix of criteria comparisons in regard to the goal

Respect to GOAL	*C1*	*C2*	*C3*	*C4*
C1	1	3	6	7
C2	0.33333333	1	4	5
C3	0.16666667	0.25	1	3
C4	0.14285714	0.2	0.33333333	1

Now, we proceed to estimate the weights of relative importance or priorities of each criterion in regard to the goal. In order to do so, we will use the two methods described in the previous section. To estimate the priorities using the EV method, formulas (2) and (3), we will rely on the Expert Choice 11.0 computer software, which can also be used to obtain the Consistency Index (CI), formula (4). Parallel to this, we estimate the priorities using GMM, formula (5), ascertaining the following results (Table 3). It is important to note that the results obtained by both methods are practically identical, which means that the matrix is very consistent.

Table 3 Priorities of criteria comparisons

	Priorities (EV)	***Priorities (GMM)***
C1: Financial situation	0.571	0.571
C2: Capacity of technical and economic organization	0.274	0.274
C3: Service improvements for citizens	0.102	0.101
C4: Improvements in economic and social development	0.054	0.053
Inconsistency	0.060	

Hierarchical level 2: alternative assessment in regard to the criteria

At this level, we carry out a pairwise comparison between the described alternatives in regard to each of the defined criteria. A total of N = 4 matrices are generated by pairwise comparison, coinciding with the number of criteria (Table 4).

Table 4 Comparison of alternatives in regard to criteria

Respect to C1	*A1*	*A2*	*A3*	*A4*	*Priorities (w_i^1)*
A1	1	0.33333	0.2	0.2	0.07039792
A2	3	1	0.5	0.5	0.19279266
A3	5	2	1	1	0.36840471
A4	5	2	1	1	0.36840471
Inconsistency					0.00157
Respect to C2	A1	A2	A3	A4	Priorities (w_i^2)
A1	1	0.33333	0.2	0.25	0.0715094
A2	3	1	0.33333	0.33333	0.15122397
A3	5	3	1	2	0.46578046
A4	4	3	0.5	1	0.31148617
Inconsistency					0.04
Respect to C3	A1	A2	A3	A4	Priorities (w_i^3)
A1	1	0.5	0.33333	0.2	0.084701
A2	2	1	1	0.33333	0.1791208
A3	3	1	1	0.25	0.18447357
A4	5	3	4	1	0.55170464
Inconsistency					0.02
Respect to C4	A1	A2	A3	A4	Priorities (w_i^4)
A1	1	1	3	1	0.29385743
A2	1	1	3	2	0.34945735
A3	0.33333	0.33333	1	0.25	0.09115505
A4	1	0.5	4	1	0.26553017
Inconsistency					0.04

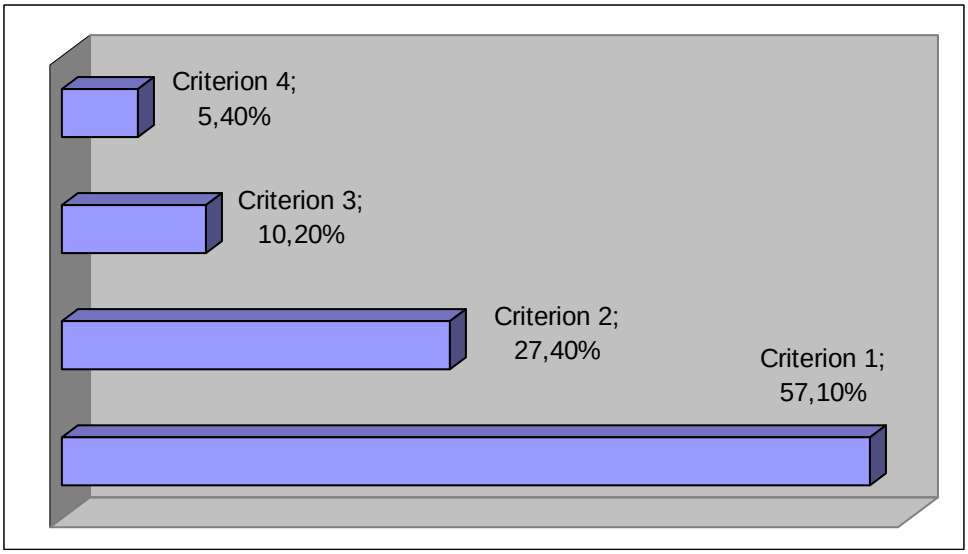
Finally, after obtaining the comparison matrices of alternatives with their associated priorities, we carry out the last step, the estimation of global priorities (Table 5), as shown in formula (8).

Table 5 Global priorities estimation

Global Priorities	*C1 (0.571)*	*C2 (0.274)*	*C3 (0.101)*	*C4 (0.053)*	Z_j
A1	0.07039792	0.0715094	0.084701	0.29385743	0.08405669
A2	0.19279266	0.15122397	0.1791208	0.34945735	0.188361865
A3	0.36840471	0.46578046	0.18447357	0.09115505	0.361667526
A4	0.36840471	0.31148617	0.55170464	0.26553017	0.36591392

The first noteworthy result has to do with the assessment of the criteria. It is interesting to see that the financial situation (criterion 1) has the most relative importance, 57.10 % (Figure 4).

Figure 4 Relative importance of criteria



Source: Own elaboration

The previous aspect is interesting because, insofar as the financial situation determines the decision making process on how to manage urban water services, local governments will prefer the alternatives of full or partial privatisation of management. This issue is extensively referred to in previous research. The main factors taken into account in local privatisation are essentially pragmatic (Bel & Fageda, 2007; 2009; González-Gómez & Guardiola, 2009; González-Gómez et al., 2010; Bel & Fageda, 2010), although even within these pragmatic reasons, financial constraints are seen as a decisive factor. The privatisation alternative, historically, has become a highly recurrent

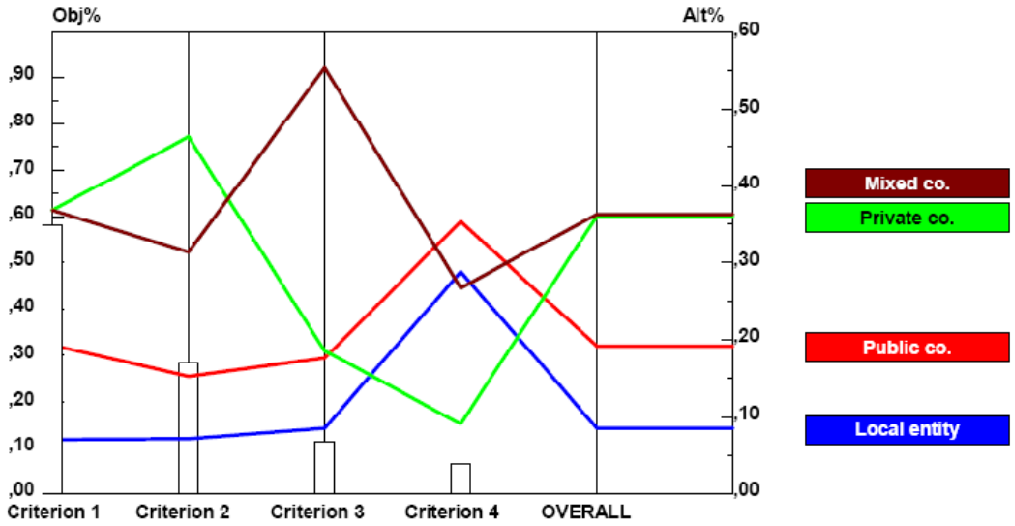
resource for city councils when their financial situation has not been favourable (González-Gómez et al., 2009; Ruiz-Villaverde et al, 2010).

According to the minutes of the City Council of Granada plenary sessions (Record 24/96), the final decision was partial privatisation through a mixed public-private partnership. A total of 49 % of the shares of the municipal company (Emasagra S.A.) were sold to Aquagest[4]. In exchange, the management of the service was transferred for a period of 25 years. The shares were sold for a total of 241,366,461.12 euro. This amount partly allowed the city council to relieve the ailing situation of its accounts at that time.

The second noteworthy result is the striking equality between alternative 3 (private company) and alternative 4 (mixed company). According to the final result, a mixed company is slightly more appropriate than a private company (36.59% > 36.17%). We observe that private companies are slightly more preferred than mixed companies according to criterion 2 (Capacity of technical and economic organisation). However, regarding criterion 3 (Service improvements for citizens) and criterion 4 (Improvements in economic and social development), mixed companies provide a better assessment. Please note that criteria 3 and 4 have less relative importance according to the assessment in comparison with criterion 2, which is why the difference between the two alternatives in the overall result is hardly significant (see figure 5). In this vein, it is worth mentioning that alternatives 1 (local entity) and 2 (public company) receive a favourable assessment with respect to criterion 4, even better than the score recorded by private and mixed companies; nevertheless, the same occurs as indicated previously, criterion 4 is less important than other criteria, affecting the overall results.

[4] Aquagest belongs to the Agbar Group, a big holding which operates in all the fields related to community services: complete water cycle, among others.

Figure 5 Performance sensitivity for nodes



Source: graph generated by Expert Choice 11.0 software

As regards overall priorities, we could establish the following order of preference, according to the results: A4 > A3 > A2 > A1. The fact that the decision made by the City Council of Granada in relation to urban water service management and the results obtained in this study coincide does not necessarily imply that a mixed company was the best alternative. Instead, we can conclude that, based on the information available at that time –legal and economic reports– the decision was consistent. That is to say, when a Local Government is experiencing serious financial problems such as the City Council of Granada in the 1990s or even at present, the alternative of complete or partial privatisation is seen as a necessary resource that provides a solution to such problems. However, it should be noted that this resource is only available every 25 years.

In any case, in regard to the comparison between the full and partial privatisation of urban water service management, it is worth highlighting that the mixed company alternative is playing a more leading role. This option allows taking advantage of the know-how of private management in day-to-day activities without the public partner having to relinquish its direct control of social interests. One advantage of this type of company has is lower transaction costs, in relation to reducing the cost of monitoring the performance of the private company. Spanish cities have opted for this type of management to a greater extent in recent years (Ruiz-Villaverde et al, 2010).

5. CONCLUDING REMARKS

The tendency of population to concentrate in urban areas and new requirements demanded by citizens have forced local governments to take more and more decisions in a more complex environment. In these scenarios, policymakers should have tools to rationalise decision making in favour of citizens.

One important decision that local governments have to address, in those nations where the law provides, refers to the form of management urban water services should have. The difficulty of deciding is usually due to local governments having to consider several criteria simultaneously. In these cases, different multi-criteria analysis techniques can be useful when it comes to facilitating decisions.

In this paper, we apply the AHP method to the case of Granada, a city in southern Spain. Through an ex-post analysis, we assess whether the decision in 1997 to sell part of the municipal water company's shares to a private company was a wise move. The study includes four criteria to consider based on information accessed from council minutes and technical reports compiled throughout the years of the decision making process.

The result is consistent with the literature that explains decisions made by municipal governments concerning how to manage local public services. A pragmatic reason, high local debt, is the determining factor in explaining the decision to incorporate a private partner into urban water service management. Partial privatisation, besides obtaining better leverage for the contribution of know-how, helps to alleviate the poor state of public finances.

Nevertheless, further research in this direction is undoubtedly required. It is advisable, therefore, to determine whether or not full or partial privatisation should be considered a source of funding for the municipality, regardless of whether the alternatives of a private or mixed company are more appropriate where the interests of the municipality are concerned. According to the results of this study, a public company is perceived as the most appropriate alternative for the social and economic interests of the municipality. However, when a city council faces serious financial difficulties, these problems take precedence over others; despite the fact that privatisation involves delegating the management of the service for a minimum of 25 years.

Finally, it should be noted that current public administration decisions are taken in increasingly complex scenarios. Therefore, having the advice of groups of experts and

mathematical tools such as multi-criteria analysis can help to increase consistency and analytic rationality in decision making processes.

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