

## Article

# Design and Application of a Citizen Participation Tool to Improve Public Management of Drought Situations

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**Abstract:** The growing scarcity of water for human consumption in southern Europe is driving today's public administrations to search for new ways of optimising its availability. Within this context, the purpose of this paper is to analyse whether citizen participation is an appropriate way of improving the management of available water, as several international organisations suggest. This study is part of a research project carried out by the University of Seville in Spain on behalf of the city of Seville's metropolitan water supply company, hereinafter EMASESA. A qualitative method is applied in this research using pre-mortem testing techniques, enabling a specific participation tool to be designed, called the EMASESA Water Observatory, which this article describes in detail. The tool produced specific measures aimed at better addressing drought situations. In view of the practical application of this newly designed tool, we conclude that citizen participation is indeed useful in identifying solutions to improve public water policies and drought management. It is also concluded that the tool's design calling for active participation is a positive factor in its application. Finally, the tool has also demonstrated that it generates knowledge that can be used to address other water-related issues and challenges, beyond those related to water availability.

**Keywords:** water; drought; climate change; environment; sustainability; citizen participation; programme assessment; evaluation



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## 1. Introduction

Water, a natural resource that is essential to life, is a human right recognised by the United Nations since 2010 [1]. This right implies sufficient, safe, acceptable, physically accessible, and affordable water for personal and domestic use [1]. Two billion people, equivalent to 25% of the world's population, still suffer from lack of access to safe drinking water in the world [2]. This circumstance underlies the recognition of this right and its fulfilment [3,4] being established in Goal 6 of the 2030 Agenda, dedicated to "Clean Water and Sanitation", the first target of which calls for universal access to safe drinking water for the entire world population by 2030 [5].

In Europe, most countries have 100% of their population connected to the public water supply [6]. However, around 20% of Europe's land cover and 30% of its population is affected by water stress [7], i.e., when water demand exceeds water availability. Situations of water scarcity are becoming increasingly frequent in southern Europe due to lower rainfall and advancing desertification [8], aggravated by climate change [9,10].

Over the last three decades, the surface area and population affected by the number and intensity of droughts in Europe has increased by 20% [11].

It is true that another influence on lower water availability is the growth in the European population over the last 50 years, which has led to an increased demand for water on the continent and a reduction in Europe's renewable water resources [7].

In cities with high average temperatures throughout the year, such as Seville in southern Spain, there have been numerous droughts, the most serious and recent being

those that occurred between 1991 and 1995 and in 2017. This reality is common to southern Europe and to cities and territories in this region. The droughts have stimulated increased efficiency in human water consumption. Consumption per inhabitant per day in Europe and in countries such as Spain has fallen in recent years to 128 [12] and 133 litres [13], respectively. These data show society's degree of awareness with regard to water, a factor that has a positive impact in situations of drought.

Apart from human consumption, there are many other factors that affect water availability, especially external ones such as the volume of inflow. Thus, rivers in general, for example the Guadalquivir in Seville, are estimated to experience reduced inflowing water volume between 8 and 20% by the year 2030 [14], due to higher average temperatures and lower rainfall.

Precisely because of its acute vulnerability in this matter [14,15], and in line with a concerted effort towards sustainable urban transformation [16], cities such as Seville, Paris, and Amsterdam declared a climate emergency in 2019, before the same declaration was made at the European level with the approval of the European Green Pact [17].

Faced with this problem, leading international organisations, such as the United Nations through UNESCO [18] and the Organisation for Economic Co-operation and Development, hereinafter OECD [19], are calling for more inclusive and democratic water governance [20], as well as a more proactive change in water consumption management. Through this, they aim to identify solutions and establish measures under a rights-based approach [21], so that different measures can be developed [22].

Within this context of searching for alternative ways to address the problem via new public actions, those international organisations have recently opted for citizen participation [18–20]. However, they do not articulate what this participation means and put it into practice to improve the management of water availability and drought situations.

The United Nations, in particular, acknowledges the importance that citizen participation can have on keener management of water resources, on the formulation of public water policies, and as a means of ensuring those policies meet their objectives [18].

Likewise, the OECD [20] establishes participation, along with effectiveness and efficiency, as essential dimensions for improving public water policies. By creating areas or circles of trust with the general public and guaranteeing citizen inclusion, government agencies can legitimize democratic actions through greater social equity, and thus, strengthening their decision-making processes [23].

Consequently, in view of this problem and the recommendations from international organisations, the purpose of this paper was to analyse whether citizen participation was an appropriate way to improve management of available water and drought situations in cities such as Seville.

Thus, our first hypothesis is that establishing a specific, properly articulated citizen participation tool that offers information and specialised knowledge would be an effective method for finding new solutions to the problem under consideration.

Our second hypothesis proposes that such a tool for citizen participation could, in turn, generate solutions for other water problems, beyond those related to water availability.

Therefore, the main objective of this research was to identify how to articulate citizen participation, develop a specific citizen participation tool for the specific case in question, and determine how to implement participation to address the challenges brought about by drought in cities such as Seville. In this study, we reviewed the literature to see if any instrument for citizen participation had already been developed or applied to other settings and, if not, design a specific tool for our purposes.

## 2. Materials and Methods

This study used three main sources for its research: information analysis, focus groups, and a questionnaire.

First, information analysis was carried out [24] to ascertain whether any tools for citizen participation in the field of water had already been applied, with the intention of

replicating them for cities in Europe that are particularly affected by drought situations, such as Seville. A literature search was run using ‘participation’, ‘water’, and ‘drought’ as keywords, and ‘Europe’ as the geographical reference area. The search was run on major international multi-disciplinary databases (WOS and Scopus) and another search was conducted using Google as the general search engine.

As a result of this exploratory phase, the Paris Water Observatory [25] was identified as a reference at the international level, whereas, within Spain, we discovered the Terrassa Water Observatory [26] and the Observatory of Water Prices in Catalonia [27].

The next stage was to study their replicability by assessing the origin, purpose, objectives, and practical articulation of the three reference models found.

The Observatory of Water Prices in Catalonia was excluded because its aim, objective, and articulation [27] solely focused on the price of water, which did not match the purpose of our research.

As for the Paris and Terrassa Water Observatories, created in 2010 and 2018, respectively, the reason they were created was from a demand by citizens to have the water service in their respective territories municipalized [25,26]. The underlying objective, in both cases, was to guarantee a public high-quality water supply service with citizen control once water has been brought back under public management. These two observatories are articulated as extra-governmental bodies [25,26] in which citizens play a proactive role.

Unlike these cases, cities such as Seville already have a public water supply service. Therefore, the demand to municipalize a service that is already public was not consistent with our objective in starting processes of citizen participation. This situation occurs in many cities in Spain and southern Europe.

Furthermore, the initiative to set up these citizen participation processes did not come from the public, but rather from the water operating company itself, to identify solutions and alternatives that better deal with drought situations and manage the entire water cycle in general at the local level, in response to suggestions from international organisations [18–20]. Given that the initiative comes from the water company itself, the organisation and articulation of the tool has a governmental character, with citizens having, at least initially, a reactive role.

Therefore, the reference models found in the exploratory phase differed from our initiative in terms of motivation, goals, and organisational and citizen roles (Table 1); thus, we chose not to replicate these tools.

**Table 1.** Comparative analysis of citizen experiences aimed at better water management and the Paris and Terrassa Water Observatories. (Source: authors).

Comparison Variable	Paris and Terrassa Water Observatories	Other Citizen Experiences
Origin and motivation	To municipalize the water utility service	To apply recommendations of international organisations on implementing citizen participation processes
Initiators of participation	Citizens	Public water utilities
Main goal	To guarantee the water service is public in character	To identify solutions for drought situations and, in general, to improve the entire water cycle
Organisation	Extra-governmental, independent of public administration	Governmental
Citizen role	Proactive	Reactive

Consequently, the difference between the two studied initiatives and our case, where cities already have a municipal public management service, meant that these experiences were not replicable. This led to the decision to specifically design a tool for citizen participation.

We chose a qualitative study design using focus groups, following Krueger [28], who proposed that meetings of a limited group of people with homogenous characteristics (in this case, people with expertise in water management) to discuss a researched topic, in a horizontal way, was an effective method. We also used pre-mortem analysis in the focus groups [29,30], a technique that imagines that a strategy has failed; in the first phase, the causes of failure are identified, and in the second phase, possible solutions to avoid failure are defined.

The pre-mortem analysis technique was employed because of its value in deciphering and anticipating possible risks when undertaking projects that are subject to significant uncertainties and areas of ignorance during implementation, such as this unprecedented participation tool. Thus, possible risks were drawn up for each focus group and, once identified, the focus groups suggested solutions to be implemented to achieve optimal adaptation of the participation tool.

These focus group meetings lasted two hours, during working hours, and involved 24 key informants, who made up the total population of managers in the company. The 24 key informants participated in all meetings freely and voluntarily, without receiving any kind of incentive.

The purpose of the tool had already been defined, providing an answer to the 'why' and 'what for' of the tool and which matched the purpose of our research. Thus, the objective was to identify new strategies for better management of available water. This purpose is applicable to water operators that also have public management and are looking for new solutions to the common challenge of drought.

The choice of our key informants is justified, first, because they are the people that are going to be using the participation tool, so their participation in designing the tool helps ensure maximum suitability. Second, they are the people with the keenest understanding of the public water management company's interests

A total of four focus groups meetings were held, with the same participants. In the first meeting, the name of the tool was discussed to facilitate its design under an already established name, and it was agreed that it should be called Water Observatory, following the example of the Paris and Terrassa Water Observatories, in order to make the tool more recognisable and identifiable within the water sector.

The main topics of interest to the participants when defining the Water Observatory were identified. Questions about the design of the participation tool included:

- What are the key points that should determine the participation tool?
- How should the tool be articulated, i.e., what architecture should it have?
- Who should participate, and why?

The second meeting designed the key ideas of the participation tool, thus answering the first of the questions posed in the previous meeting. The participants in this session agreed on the following as key ideas of the tool:

- Horizontal nature, so that all participants in the Water Observatory have equal opportunity to contribute ideas, regardless of its format and dynamics, thus ensuring a truly participatory nature.
- Balanced nature, so that there are an equal number of internal members or members belonging to the public company as external members in the established participation areas. This was important given that the central goal of the tool was to generate knowledge shared between the company and society.
- Flexible nature, with both permanent and visiting members, depending on their profile and the specific topic to be assessed.
- Advisory nature, offering solutions to problems in this subject, but without displacing the company's decision-makers, given that the public company has a Board of Direc-

tors that is responsible for decision-making, and who, legally, cannot be replaced by any other body.

- Geared towards results and impacts, given the Observatory's objective of prioritising the search for measures to cope with drought situations in Seville.

At the third meeting, in response to the question on how the Observatory should be organised, it was decided to structure the participation tool in advisory panels, as opposed to using other techniques. This opened up space for reflection, geared towards the underlying objective. It was agreed to establish as many advisory boards as there are management areas in the public company. An Observatory structure based on the company's own structure would provide the dual advantage of making its organisation more easily identifiable from the outset and, most importantly, facilitate the assignment of tasks and responsibilities when running the Observatory.

The work in the fourth and final meeting was aimed at identifying who should participate in and form the Water Observatory. It was decided to establish criteria for participation, as opposed to an assembly, to guarantee the legitimacy of each participant in the Observatory by establishing institutional legitimacy, legitimacy via expertise and knowledge, legitimacy as sufferers of the problem, and legitimacy via representativity. This way, in the nature of pre-mortem analysis, the company could establish a participation system that would prevent any key agent being deemed to lack legitimacy to participate in the advisory panels, or any lack of legitimacy in the proposals reached.

All the participants were recruited by direct invitation from the company, based on the above-mentioned participation criteria. Thus, all neighbourhood organisations, environmental associations, consumer associations, public administrations, and professional associations in the area were invited. In addition, all university experts from the nearest universities, whose areas of specialisation included water management and drought, were invited to participate. As indicated in the results, eight advisory roundtables were held with the people who were invited to participate.

Finally, we implemented a tool for citizen participation, called the Water Observatory. Setting up the Observatory made it possible to test its validity as a method for applying participatory processes in questions of water management, as it is described in the following sections.

Finally, as a third method of assessment, a questionnaire was used to evaluate the effectiveness of the Observatory once it had been implemented. This questionnaire was addressed to a total of 36 participants in the Observatory's advisory panels after they had been set up, who therefore represented the targeted sample. The questionnaire was divided into a total of 31 items, in two blocks, including: assessment of participation on the advisory panels and uses and usefulness of the results achieved through the advisory panels. The results of the questionnaire are discussed in the following sections. The questionnaire was online, using a Google form. The questionnaire included multiple choice questions, using a Likert scale.

### 3. Results

Implementation of the Water Observatory tool enabled the proposed hypotheses to be tested.

From a quantitative point of view, it should be noted that eight advisory committees of the Water Observatory had been held to seek proposals for dealing with drought situations. As shown in Table 2, the solution adopted to articulate the Water Observatory was through advisory boards. The average number of participants in these advisory boards was 36 people, 52.7% of whom were external participants, or those not belonging to the Seville public water company, and 47.3% were internal participants, or company personnel. This complied with the parity of the tool, an aspect that is also included in Table 2 as a solution to the risk of the establishment of non-feasible proposals.

**Table 2.** Summary of the Water Observatory design through pre-mortem analysis: risks to be avoided and solutions taken.

Questions Concerning the Design of the Water Observatory	Solution Taken	Risks to Be Avoided
What are the main key points that should determine participation tool?	Horizontal nature	Inequality between participants
	Balanced nature	Setting unfeasible proposals
	Flexible nature	Setting general rather than specific proposals
	Advisory nature	Exceeding the Observatory's sphere of competence.
	Geared towards results and impacts	Participation tool becoming an end in itself
How should the tool be articulated, i.e., what architecture should it have?	Advisory panels, one per division in the firm organisation.	Restrictions to air views openly
		Inability to manage the Observatory
		Difficulty to assign responsibilities for suitable implementation of the Observatory
Who should participate, and why?	Channels that legitimise participation: institutional, expertise, and knowledge, sufferers of problem, representativity.	Lack of legitimacy of people forming part of the advisory panels
		Lack of legitimacy of the proposals made

Source: authors, from focus group meetings held.

In terms of results, the advisory panels enabled the first of our hypotheses to be accepted, given that a direct result of the Water Observatory was the specialist information and knowledge on solutions and alternatives to the problems of water availability in Seville. We produced an Emergency Plan for drought situations for the city of Seville developed through the Observatory's advisory panels.

Likewise, the second of the established hypotheses was accepted, given that solutions have been generated for other water-related problems beyond those that refer to the availability of water in the area, as a result of the advisory panels held by the Water Observatory. These other problems related to the quality, accessibility, and affordability of water. In response to these other problems, the Water Observatory developed the Seville Emergency Climate Plan. The questionnaire also demonstrated the validity and usefulness of the Water Observatory as a tool for citizen participation in improving the management of water availability for the city of Seville.

In terms of its usefulness, as shown in Table 3, the Observatory was perceived by participants as a tool that favoured transparency, generated circles of trust, and ensured the proposals produced were both appropriate and legitimate. It was also seen as a tool that improved information, communication, accountability, and decision-making. Additionally, it prevented conflicts and encouraged public-private collaboration and co-operation between institutions.

**Table 3.** Evaluation of usefulness of the Water Observatory. External participant % rating and employee % rating.

Participants in the Water Observatory from outside the company	High consideration (75–100%)		Information channel (72%, 97%) Communication channel (69%, 97%)	Transparency (100%, 100%) Generates areas of trust (100%, 89%) Suitability of agreed measures (100%, 89%) Legitimacy of agreed measures (89%, 89%)
	Medium consideration (50–75%)	Prevent conflicts (42%, 61%)	Accountability (53%, 64%)	Decision-making (94%, 78%)
	Low consideration (25–50%)		Public-private co-operation (61%, 42%)	Collaboration between institutions (89%, 89%)
		Low consideration (25–50%)	Medium consideration (50–75%)	High consideration (75–100%)
Participants in the Water Observatory that are company employees				

Source: Prepared by the authors based on questionnaire to participants in the Water Observatory.

Regarding its validity as an instrument, the results of the questionnaire also showed that the Water Observatory was positively viewed in terms of its dynamics and organisation.

As shown in the table below (Table 4), more than 80% of the Observatory's participants considered that the mechanism for proposing Observatory discussion topics, participation, dynamics used, people participating, and calendar of advisory panel meetings were suitable.

**Table 4.** Evaluation of the dynamics and organisation of the Water Observatory.

Indicator	Assessment	
	Percentage of Positive Responses	Remark
1. Degree of suitability of Observatory discussion topics.	100.0%	Suitable discussion topics.
2. Mechanism for proposing Observatory discussion topics.	88.9%	Topics for discussion proposed.
3. Assessment of the length of time and participation.	81.5%	Suitable length of discussion panel meetings.
	85.2%	Availability of sufficient time to intervene at advisory panel meetings.
4. Assessment of the dynamics used.	88.9%	Availability of sufficient opportunities to voice an opinion at advisory panel meetings.
	88.9%	Assessment of the dynamics used.
5. Assessment of number and profile of the people participating.	85.2%	Assessment of the number of participants on advisory panels.
	88.9%	Assessment of the profiles of the members of the Observatory.
6. Assessment of the schedule and calendar of advisory panel meetings.	85.2%	Assessment of the regularity with which advisory panel meetings were held.
	81.3%	Assessment for morning rather than afternoon/evening sessions.

Table 4. Cont.

Indicator	Assessment	
	Percentage of Positive Responses	Remark
7. Assessment of the information and documentation received before advisory panel meetings.	96.3%	Information received in good time.
	96.3%	Ample information and documentation.
	92.6%	Documentation open to the possibility of including changes.
	91.1%	Information received is clear and precise.
	96.3%	Outcome of the panel meeting received after it was held.
8. Assessment of feedback process.	96.3%	Documentation received after panel meeting was sufficient.
	96.3%	Was able to make contributions after participating on the advisory panel.
	96.3%	Participation outcomes and results were suitably collected in reporting.
9. Assessment of how results are published.	93.0%	Internal communications suitable.
	91.1%	External communications suitable.
10. Interest in continuing participation in the Water Observatory.	92.6%	Interest in continuing to participate in the Water Observatory.
11. Overall assessment of the Water Observatory.	37.0%	Excellent
	63.0%	Positive

Source: Prepared by the authors based on the results of questionnaire to participants in the EMASESA Water Observatory.

Furthermore, over 90% considered the information and communication received, discussion topics and feedback process, together with the issues addressed, to be adequate and indicated their interest in continuing participation in the Observatory, which represents an indicator of interest in the newly designed participation tool, rated as excellent or good.

#### 4. Discussion

According to Aguilar [31], today's new public governance acquires the responsibility of solving society's problems, needs, and challenges in ways that should be shared between governments and citizens, so that public administrations are, as McBride et al. [32] indicate, articulators of a networked society and acquire a new role as collaborative agents.

In view of this approach, consistent with that of Denhardt and Denhardt [33] on public services being a co-creation between governments and citizens, this research explored the articulation of participatory processes in the specific case of public water policies and the management of drought situations in Seville, in response to recommendations from international organisations [18–20] to apply participatory strategies in this area.

Taking participation to be an instrumental activity [34] in improving public water interventions and policies, the Water Observatory was designed within the framework of this study as a space for participation and co-creation [33].

It is common for citizen participation to follow a proactive model, aimed at a specific demand. However, reactive models can also be observed, in which citizens are not particularly interested in participating, a priori. Then, when faced with an initiative from the water management company itself, the citizen participates as a reaction to it. In line with Bekkers et al. [35], instead of diminishing its role and ceding its responsibility and decision-making capacity, the government benefits from citizen participation by reducing its regulatory and managerial space for a more open and collaborative one. This boosts government institutional learning and the continuous improvement of its public policies



and programmes. This research puts such an approach to test, using the questionnaire to determine whether the people in charge of the public water management company in Seville acknowledge that the Water Observatory is a valuable instrument that effectively improves their decision-making processes.

The incorporation of citizen participation in public action is still incipient and lacks abundant empirical evidence, both generally, as pointed out by Wirtz et al. [36], and in the specific area of climate change, as indicated by Mees et al. [37].

Hence, this was a further challenge for the current study, given the lack of earlier experiments, as demonstrated in the literature review. The few research papers that existed [25,26] had very different purposes and objectives to the case of Seville.

The main contribution of this work is, therefore, an experience of citizen participation at the local level, applied to the case of public water policies. Furthermore, it did not stem from public demand within the framework of a water municipalisation process [25,26], but rather as a way of improving decision-making processes initiated by the actual public administration.

Given the way this tool was applied, the results it achieved, and its usefulness, it may be helpful to replicate this method in other territories.

The tool designed for this research led to both a specific proposal for improving drought management, the Drought Emergency Plan, and additional proposals on other issues linked to public water policy beyond water availability, e.g., the Climate Emergency Plan.

These results confirm the usefulness of the new tool, not only for issues relating to drought (first hypothesis), but also for other issues (second hypothesis).

It is important to highlight the collaboration of the people and entities taking part in the Observatory's advisory panels, in line with reports from earlier research papers [36].

The use of a basic questionnaire that provides information on the development of the participatory tool, such as the Water Observatory, is a useful qualitative tool. In other cases, other tools were used, such as interviews, etc. In this study, the questionnaire was conceived as a complementary element to assess the quality of the participation process. In other situations, the interest may be different and, consequently, another tool may be more suitable.

As for limitations to the research, the impact of the COVID-19 pandemic resulted in a large portion of Observatory's advisory panels having to be held online. Furthermore, the number of participating citizens was small. Other similar experiences prior to the pandemic had shown higher participation, with assembly meetings that brought together more than a hundred people; however, for our case, the average participation was 36 people.

Another limitation of this research is that the Water Observatory does not respond to any international, national, and/or local statutory requirement, but has been designed and implemented at the initiative of the current management team at the public water management company in Seville. In other words, it is voluntarily instituted. This circumstance may pose a risk to the continuity of this citizen participation tool when the company's management team changes, as it occurs every five years.

For future research directions, it would be beneficial to establish a system of indicators and a system for evaluating the proposals resulting from the Water Observatory. To this end, there needs to be more investigation of evaluation proposals, such as those of Agulló-Tomás et al. [38] or Pérez et al. [39], which would make it possible to measure and analyse the effects the solutions proposed by this Observatory have on the problem in question. Also, impact evaluations from both a contribution analysis and an attribution analysis should be carried out, in line with the World Bank's approach, given that this is the international reference for evaluating the impact of public policies [40]. In the real context, the results of the Observatory have already been applied through an improvement plan that the public company is developing, with the proposals reaching the advisory roundtables. It would also be important to incorporate gender perspectives and consider age and ageing variables.

## 5. Conclusions

Citizen participation, when properly articulated, provides a valuable instrument in the management of the full water cycle, with which we can identify solutions and alternatives to drought situations, as well as other problems, needs, and challenges that concern public water policy.

Cities such as Seville are particularly vulnerable to drought situations and the effects of climate change. The design and application of a tool for citizen participation, such as the Water Observatory, helps the city be more resilient and successfully mitigate these effects. Moreover, the Water Observatory provides a useful resource for governance, making public water policy more transparent, and offering spaces for reflection and shared knowledge between public administrations and society. Thus, this tool can strengthen decision-making processes by defining new and more legitimate public actions.

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