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The Political Economy of Water Policy Design and Implementation in the Jucar Basin, Spain

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Summary:

Water scarcity has intensified conflicts between regions and interest groups for the use of water resources. Water policies have been implemented worldwide to face with water stress; however, existence of opposite interest between water users together with differences in their political power hinder the effectiveness of the water policy reform. A better understanding of users' behavior is necessary to avoid the failure of water policies and the intensification of water scarcity problems and water conflicts. This paper empirically examines the perception of interest group about the implementation of different water policies to deal with water scarcity, and also their proactive involvement, or lobbying, with water organizations. We have conducted a survey in a water stressed basin in Southeastern Spain (Jucar River Basin) to analyze interest group opinions regarding water institutions' performance and management; and the cost and benefits from group influence or lobbying on policy makers. The results highlight the existence of notably differences between the preferred measure to face with water scarcity together with sizable divergences in the active lobbying capacity of the interest groups depending on the size of the group, the specific basin location (upstream or downstream), and group characteristics.

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INTRODUCTION

Many water policies and regulation interventions have been implemented globally in order to cope with water scarcity and deterioration of its quality, which affect about 50% of the world's population (Mekonnen and Hoekstra 2016). But, one of the main problems with water regulatory policies is the uneven outcome of their effectiveness and fairness across regions and groups of users. Well established are the inter-sectoral conflicts (e.g., irrigation vs. residential uses) as well as opposed interests of user groups residing in different places along the flow of the river (e.g., upstream and downstream users). These opposed interests may lead to derailment of the policy reform at stake. The fact that water is a shared resource, either directly, as a common pool resource (Ostrom 1990; van Oel et al. 2009), or indirectly, via return flows from upstream to downstream, complicate the relations between user groups using the same source. Illustrations to these opposed interests include local, regional and international examples, ending up in recurring water disputes (Dinar and Letey 1991; Giordano and Wolf 2003; Ward and Pulido-Velazquez 2008).

While international water conflicts are very important, some authors point out the not less relevance of water conflicts within countries. Internal confrontations over water resources are, in fact, even more severe than those involving different countries (Ohlsson 1999). Examples of internal water conflicts can be identified almost everywhere; a recent one is the acquisition of five island in the Sacramento-San Joaquin River Delta for one of the most important Southern California's water suppliers that has generated opposition and conflict among several interest groups.[1]

Usual disagreements within a river basin exist between sectors (irrigation vs. hydropower, or irrigation vs. residential use, or recreation and environment vs. irrigation), and between upstream and downstream irrigators. Users' disparities together with differences in the political power of the different groups have originated continuous conflicts between water consumers and managers that may lead to a failure of the water policy reform. Some evidences suggest that the most important drivers of domestic water conflicts are related with demand-side factors as population pressure, agricultural productivity, economic growth, and institutional restraint (Böhmelt et al. 2014). While water scarcity seems to also be an element for water disputes (Gleik and

[1]Information from Los Angeles Times (L.A. Now). 'Southern California water district completes $175 - million purchase of delta islands' by Matt Hamilton (July 18, 2016)

Heberger 2014, Wolf et al. 2003), the ability of policies and institutions to deal with water scarcity appears to be a critical determinant of water disputes (Yoffe et al. 2004, Gizelis and Wooden 2010).

Despite several existing analyses of local and regional water conflicts (Böhmelt et al. 2014, Devlin and Hendrix 2014, Gizelis and Wooden 2010, Raleigh and Urdal 2007, Hendrix and Glaser 2007), a better understanding of the factors and characteristics that drive domestic water conflicts are still necessary. Better knowledge of the main drivers of domestic basin disputes, and the behavior of interest groups, could largely help better understand the root causes of the water conflicts. Part of the explanation of a basin dispute can be attributed to the local physical, institutional-legal, and socio economic conditions that prevail in the basin—what institutional economists coin ”path dependency”. Therefore, the case study approach is of great value for each basin analysis.

In the case of Spain, which is the focus of this paper, water conflicts have been habitual in many, if not all, regions and among many sectors. Especially relevant are the conflicts for the use of water for irrigation in South and Southeast basins of Spain where water scarcity is significant. An increasing water demand in Spain together with the general mismanagement of several groundwater resources has raised political conflicts during past decades. Water conflicts in Spain are intensified at all levels (local, basin, and regional) and also between different water users or interest groups such as irrigators, energy utilities, ecologists, urban utility managers, and others (Llamas 1996).

The Jucar River Basin in Spain is a relevant example of a water stressed basin where conflicts between different stakeholders and regions have prevailed since the 1970s. The development of irrigated agriculture during this period has increased the levels of groundwater extractions in the basin. The dry climatic characteristics of the region together with excessive levels of withdrawals from both surface and sub-surface sources led to continuous disputes between users (especially between upstream and downstream irrigators). Additionally, the predicable impacts of climate change, including decrease in precipitations and increase in temperatures and evapotranspiration are likely to aggravate the basin’s water problems. While the basin water authority (Jucar River Basin Authority - JRBA) has implemented several policies to address the recurring water shortages in the Basin, water allocation disputes still prevail between interest groups. The main water policies implemented by the JRBA (water quotas,

allocation of water rights, and technology modernization[2]) have not relieved the water stress, especially, in some periods and some regions. Additionally, disparities in the users' opinion on the water authorities performance add to the conflict.

The objectives of this paper are to: (1) identify the main stakeholders, or interest groups, that share water resources in the basin and their principal conflicts over water resources, (2) analyze interest groups' perception about different policy interventions used in the past to address water scarcity, (3) study interest groups' involvement in influencing the direction of the policies, and (4) identify common threads and differences between the interest groups, which can be used to promote future policies and to a better understanding of water disputes. The paper contributes to the literature by attempting a cause and effect analysis on water disputes between interest groups, based on quantitative data that was collected in a comprehensive survey among stakeholders in the basin.

The paper is organized as follows. In section 2, we discuss the physical, institutional-legal, and socio economic features of the Jucar Basin that may affect the development of conflicts over water. We then review the main conflicts between water users in the Jucar Basin and the principal interest groups involved. Section 3 discusses the survey design and data collection procedures. We summarize the main results in Section 4, illustrating the attitudes of the main interest groups regarding the policies implemented by the regulatory agency. In section 5 policy implications from the results are highlighted. Finally, section 6 concludes.

WATER CONFLICTS IN THE JUCAR RIVER BASIN

The history of water conflicts in the Jucar River Basin dates back to the middle ages. We will not review the conflicts at this early period, but will indicate the impact of institutions set at that time on the present nature of the conflicts. In addition, we recognize the importance of the geographic setting of the basin on the nature of the conflicts. Therefore, we provide below a short description of the Jucar River Basin study area.

[2] Irrigation technology modernization is mainly managed by regional and the national governments with the support of the JRBA.

Study area: the Jucar River Basin

The Jucar Basin is located in Southeastern Spain, lying within the regions of Valencia and Castilla-La Mancha (Fig. 1) and representing the most important sub-basin within the jurisdiction of the Jucar River Basin Authority (JRBA). It extends over 22,000 km^2, collecting 5.3% of the total water demanded in Spain by 5% of the Spanish population. The basin is located in a semi-arid region with irregular Mediterranean hydrology, which is characterized by dry summers and recurrent drought spells. Mean annual precipitation is 500 mm, but it ranges from 300 mm to as much as 700 mm, and with important seasonal and spatial variability that concentrates the precipitations mainly during autumn months. Furthermore, precipitations and stream flows are extremely variable with recurrent periods of flooding as well as droughts.

While the Jucar is the principal river in the Basin, there are other additional surfaces sources (Jucar tributaries and dams) together with several aquifers. Most of these water resources are consumed by irrigated agriculture and urban and industrial centers, with the larger share (85%) going to irrigated agriculture. The Jucar Basin also includes two major water distribution channels: (1) the Acequia Real that conveys water from one the most important reservoir (the Tous dam) to traditional irrigation districts (located downstream in the Valencia region); (2) the channel Jucar-Turia that conveys water from the Tous dam to recently established irrigation districts (also located downstream and between the Turia and Jucar rivers).

Renewable water resources in the Jucar Basin are nearly 1,700 Mm^3, of which 930 are surface water and 770 are groundwater. Water extractions are 1,680 Mm^3, leaving the system very unstable in drought years. Extractions for irrigation are 1,400 Mm^3, and urban and industrial extractions are 280 Mm^3. Agricultural irrigation activities in the basin date centuries back, especially in the region of Valencia. Nearly 40 years ago new irrigation projects were developed in the basin. Currently, the basin includes three major irrigation areas (Fig. 1): (1) the Eastern La Mancha irrigation area located in the upper Jucar (from hereafter—upstream); (2) the more modern Canal Jucar-Turia irrigation district located between the Turia and the Jucar river watersheds; and (3) the traditional irrigation districts in the lower Jucar. Regions (2) and (3) are referred from hereafter as downstream.

Fig. 1. The Jucar River Basin

Note: The different colors represent all the sub-basins that are part of the Jucar River Basin District. The largest one corresponds with the Jucar River Basin and its tributaries.

The importance of water resources in the basin, together with the climate irregularity and frequent droughts, has led to serious conflicts between water interest groups. Since the nineties, irrigators located at the upstream and downstream have been engaged in disputes over the basin's water resources and water rights. Additionally, urban and industrial consumption, especially during summer, becomes important because the tourism attractiveness of the region. However, conflicts between irrigators and urban users for water allocations are not relevant because the Spanish law guarantees water provision to human consumption over all other uses. So, principal conflicts in the basin are currently over the distribution of the water assignments between the irrigation projects located at the two main Jucar Basin regions, upstream and downstream.

The Jucar River Basin Authority

The institution in charge of the legal management and regulation over inland water and groundwater in this basin is the Jucar River Basin Authority (JRBA). This institution, created in 1935, is part of the Spanish Ministry of Environment, but having an autonomous functionality to provide all types of public water services in the whole Basin. A special feature of the basin authority is the key role played by stakeholders, which are inside the water authority, taking decisions in the Basin governing bodies and in the local watershed boards. The JRBA main activities are related with the general monitoring and management of water resources, administrating the Basin hydraulics, and constructing and operating of hydraulic infrastructures (Estrela 2004). To deal with the traditional water scarcity in the Basin several measures have been implemented by the JRBA. The implementation of water quotas pursues to limit high levels of extractions to maintain water resources sustainable, especially during drought years. Other water policy has been the motivation for irrigation technology modernization to be more efficient with the use of water. And finally, another relevant policy in the basin has been the legal allocation of water rights, since the seventies water rights were assigned to users, and the process is still ongoing with several irrigators waiting for their rights (especially, in the case of groundwater rights).

Upstream water users

The Eastern la Mancha Aquifer is the largest aquifer in Spain covering 33% of the total Jucar River Basin (7,260 km^2) and extending over three regions (Albacete, Cuenca, and Valencia). The aquifer is located in the central high plain with an elevation of about 700 meters above sea level that is crosses by the Jucar River. The river and aquifer have important hydrological connections with an interchange of water between them (Sanz et al. 2009, 2011) and impact on the water management options (Kahil et al. 2016a, 2016b). This groundwater body sustains about 100,000 ha of irrigated agriculture and supplies water to 275,000 inhabitants in the region of Albacete. The region of Albacete is the main user of the aquifer water.

Upstream farmers in the Jucar River Basin belong to the Eastern la Mancha irrigation project that was developed in the 1970s in the Albacete region. The improvements in irrigation technologies and groundwater extractions allow farmers to use the water from the large aquifer. The expansion of the intensive agriculture pushed

water extractions from 50 Mm^3/year in the 1970s to more than 400 Mm^3/year in the 1990s. The large and maintained pressure over this aquifer led to a significant decline in its water table, ending up with the official declaration of the aquifer as overexploited in 1980.[3] Currently, this irrigation region supports a bit more than 100,000 ha of irrigated agriculture and includes nearly 1,000 landowners with assigned water rights.

The disputes in the Basin erupted because the Eastern la Mancha aquifer depletion started showing serious impacts on the hydrology of the Jucar River downstream. The Eastern La Mancha aquifer is linked to the Jucar River stream, and the aquifer used to feed the river with about 250 Mm^3/year in the 1980s (Sanz et al. 2011). Due to the depletion, aquifer discharges to the river have declined considerably over the past 30 years (Fig. 2). The decrease in the Jucar River flow caused several negative impacts on downstream farmers who started facing less water available for their irrigation activities.[4]

Fig. 2. Streamflow depletion in the Jucar River induced by pumping

Source: Perez-Martin et al. (2014).

The conflicts between upstream Albacete farmers and downstream Valencia farmers intensified in the 1990s because an intense drought in the river basin.[5] Albacete irrigators' abstractions, and the decision of the JRBA of closing the Alarcon dam

[3] The water table declined by more than 300 meters because decades of unsustainable extractions with water-balance disequilibrium estimated at around 100 Mm^3/year (Sanz et al. 2009).
[4] A further pressure on the Jucar River is the recent completion of the Jucar-Vinalopo transfer exporting water from the lower Jucar to outside areas south of the basin.
[5] The 1991 to 1995 drought was considered the 'driest four-years of the century'.

contribution to downstream, lead to the partial desiccation (around 10 km) of the Jucar River during 1995-1996 drought. Downstream farmers reacted asking the Jucar Water Basin Authority and other national authorities to prohibit upstream irrigation because the negative impacts on the Jucar flow and on downstream economic activities.

Realizing the political pressure initiated by downstream irrigators through the River Basin Authority, and recognizing the legal rights to the river water by downstream irrigators, upstream users assumed the necessity of controlling their extractions in order to maintain the irrigation in the Albacete region. In 1994, the Water User Association of Eastern la Mancha (JCRMO)[6] was established in order to regulate and control groundwater extractions, and contributing to the sustainable use of water resources in the entire basin. The creation of this institution and the awareness of upstream irrigators triggered the cooperation and the control of extractions between farmers in this region (Esteban and Albiac 2010).

Downstream water users: traditional and modern irrigation districts

Downstream irrigators are located in the downstream Jucar River in the Valencia region. Although this interest group is divided into two sub-groups (traditional and modern irrigators) they share similar interests against farmers upstream. Both sub-groups pursue to limit or ban upstream irrigation to increase downstream water availability. One of the most important characteristics that distinguish downstream from upstream groups is the large number of irrigators with small-size landholding in downstream compared with irrigators upstream. Furthermore, downstream irrigators are organized in several heterogeneous, small and large, water users associations while irrigators upstream belong to a single water user association (JCRMO). The downstream irrigation district covers around 70,000 hectares of irrigation and has around 20,000 irrigators, belonging to one of the more than 50 different Water Users Associations in downstream district.[7]

The traditional irrigators sub-group, located in the lower Jucar, has its origin in the middle ages. Traditional farmers have a profitable agriculture improved during the

[6] The WUA (JCRMO - Junta Central de Regantes de la Mancha Oriental) is an autonomous organization of users managing the aquifer, being an important stakeholder within the Jucar River Basin Authority. One of its main tasks is the control of water withdrawals from the aquifer (upstream). Furthermore, the JCRMO is the sole water user association in the upstream irrigation district (Albacete region).

[7] Water User Associations downstream are very heterogeneous in terms of members' size (ranging between 50 to 10,000 members), irrigation acreage (ranging between 21,000 to 2 hectares), and also several technical characteristics including differences in the source of water (e.g., groundwater, river, channel, etc.)

1960s but based on a longstanding irrigation tradition. Already in the XIII century, these irrigation districts obtained their 'historical water rights' from King Jaime I that declared the Valencia's farmers the sole users of the water bodies of all the hydrological systems in the Valencia region (mainly the Jucar River). Furthermore, one of the main characteristics of these farmers is being an important pressure group in political terms, not just at basin level but also at the national level. Traditional irrigation comprises around 35,000 hectares of irrigation with nearly 7,000 users.

Modern irrigation in the Jucar-Turia channel, which is partially located out of the Jucar River Basin, emerged during the 1970s by using groundwater resources from the numerous small aquifers in this area. The construction of the Jucar-Turia channel in the nineties allowed these farmers to use surface water and expand farmland under irrigation. Currently, this irrigation area contains 25,000 hectares and has nearly 13,000 irrigators.

Urban users: water utilities

The Jucar Basin supplies water to about 2.4 million people of whom about 90% live in the Valencia region (Mediterranean area). Additionally, there is an important seasonal variability in the population because of the massive tourism into the Mediterranean coast during summer. The increasing urban pressure during the driest months aggravates water scarcity, especially for downstream irrigators.

Urban water demand in the Jucar basin consumes around 210 Mm^3 per year to cover the water needs of 300 municipalities. Nearly fifty percent of the urban water supplies originate from surface resources (Jucar River and dams) with the rest coming from aquifers, reservoirs and a small portion from desalinized plants. This Basin has currently five major water companies in charge of the urban water management and distribution. These big water utilities distribute the water to municipalities and utilities in charge of the direct water distribution to households.

Currently, there are not significant conflicts in the Basin for water allocation between urban and agricultural consumers, because of a Spanish law that guarantees urban water provision over all uses. Urban consumers are first supplied, having priority over any other activity, including irrigation. However, some water disputes between urban and irrigation users exist, especially in downstream, because water contamination from irrigation water returns flows.

With this background on the physical, institutional-legal, and socio economic aspects in the Jucar Basin we embark on the development of the survey instrument. The survey allowed us to collect several data with which we have been able to explain some of the differences between the upstream and downstream perceptions and expectations about water policies and water institutions in this Basin.

SURVEY DESIGN

In order to elicit the opinion of the stakeholders' groups (upstream irrigators, downstream irrigators, and water utilities for urban users) questionnaires were designed and administered in the Basin. The objective of the questionnaires was to collect information regarding the opinion of individual stakeholders, about the policies implemented by the River Basin Authority and also the individual's (or its representatives) involvement in affecting these policies. In the process of developing the questionnaires they were discussed in detail with representatives and experts from different government levels (basin and water users associations), and field-tested for feedback. Three questionnaires were designed, responding to the special characteristics of the interest groups (upstream, downstream, and urban). In the case of upstream and downstream, the questionnaires were similar except 3 questions that were added for the downstream (see Annex A). Complete questionnaires are presented in Annexes A (for upstream and downstream) and B (for urban water supply).

The upstream and downstream irrigators questionnaires were anonymous and randomly distributed to individuals in both locations during February to May 2016. Because of the disparity[8] within the structure of the two groups the data collection process was different for each location, as explained below. In all, we sent a total of 435 questionnaires, and we received 369 completed ones, which yields an overall response rate of nearly 85%. After dropping some questionnaires due to missing relevant information, we were left with 336 observations (133 in upstream, 201 in downstream, and 2 from water utilities).

In the case of upstream irrigators, where a single water user association (JCRMO) congregates most of the irrigators in the region, the questionnaire was emailed by the JCRMO. The JCRMO randomly delivered the questionnaire to 200

[8] The disparity refers to the number of members, farmland size, and institutional organization (e.g., a single water users association for upstream irrigators vs. a large number of heterogeneous water user associations for downstream irrigators).

farmers (with a 66% response rate), using the application 'Google Drive' that allows the creation of surveys that irrigators completed and submitted online.

For downstream irrigators, where there are numerous water users associations and a large heterogeneity between farmers, a stratified random interview procedure was applied to reach 230 observations (with a 87% response rate). The questionnaires were handed to irrigators by a consultant visiting the irrigation areas within the Valencia region. Both modern and traditional irrigators were approached and they were selected without any particular order, so that it can be considered a random sampling independent of any factor that could influence the results.

Urban and industrial users are represented by water utilities that distribute water resources to households and industries. We emailed the questionnaire to the main 5 big companies, using the 'Google drive' application, and we received 2 completed questionnaires so far (response rate of 40%).

The questionnaires are divided into three sections. In the first section, we collected data to control for farm characteristics, such as irrigated surface, percentage of fruit trees, source of water, and water user association characteristics (for downstream irrigators). For the case of water utilities, we collected data about water supplied and company size. In the second section of the questionnaire, users stated their opinion about and experience with the three main water policies implemented by the JRBA to address water scarcity: water quotas, water rights, and irrigation technology improvements. In this section we also gathered feedback about the respondents' level of involvement with water authorities for the purpose of influencing the direction of the policy. In the third section, users were asked to identify different ways/measures used by them for approaching water authorities[9]. Additionally, respondents were asked about their perception on the effort and the effectiveness of each measure used to approach and influence water authorities and policy makers.

The responses were processed with Stata 13 for obtaining descriptive statistical analyses. Individual results by interest groups were combined with a comparison between groups, especially for downstream and upstream irrigators. We were especially focused on comparing the differences between the three identified interest groups: upstream irrigators, downstream irrigators, and water utilities.

[9] Following experts' suggestions we included seven different measures: 1) formal and/or informal meetings; 2) demonstrations; 3) use of the media; 4) sending official letters and/or documents; 5) reports; 6) use of political parties; 7) others. We include 'others' to allow users telling us other possible options not included but used to approach water authorities.

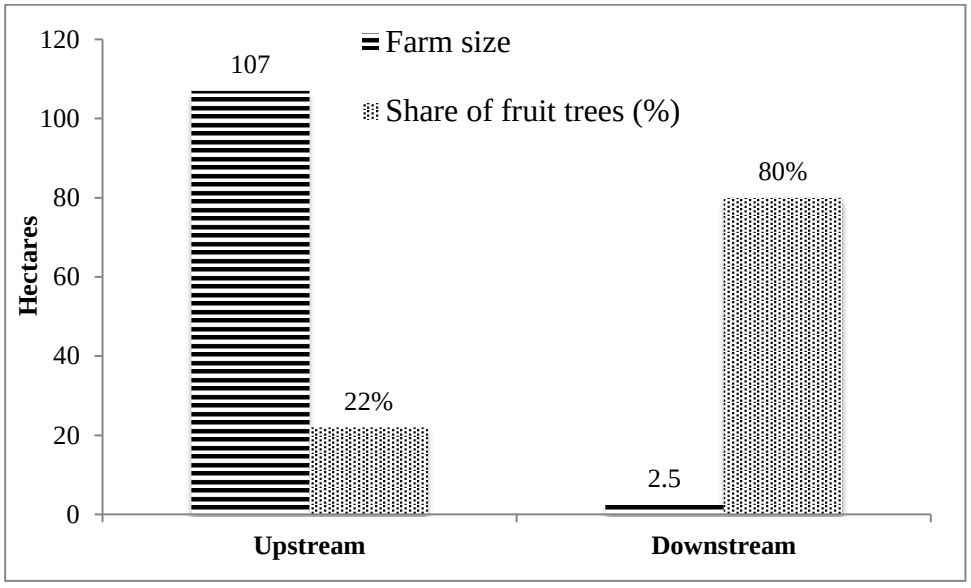
DESCRIPTIVE STATISTICS ANALYSIS AND COMPARISON BETWEEN INTEREST GROUPS

The complete set of results for irrigators and urban utilities are presented in Tables C1 and C2 (Annex C). Here we summarize some of the most important results and main differences between the three interest groups.

Irrigation agriculture users

The first part of the questionnaire is based on irrigators' landholding characteristics. The first main attribute that can be observed from the results is the large difference in the landholding size and utilization between the two districts (Fig. 3). Upstream irrigators answering the questionnaire have on average a considerably larger landholding size (107 ha) with a lower share of fruit trees (22%) compared with downstream irrigators (2.5 ha plots and 80% fruit trees). The largest landholding size in upstream is nearly 1,000 hectares and the smallest nearly 10 hectares. While in the case of downstream, the largest landholding is 25 hectares and the lowest is 0.06 hectares.

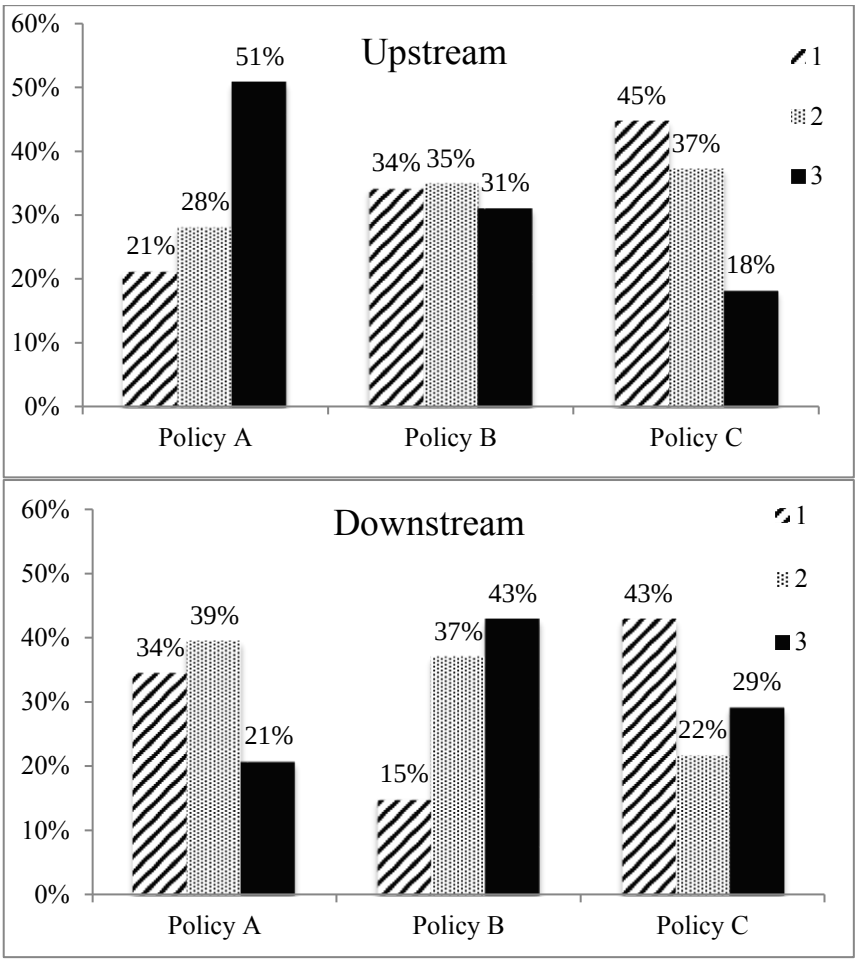
Fig. 3. Upstream and downstream farmland attributes



In the second part of the questionnaire irrigators were asked on their opinion about three policies implemented in the basin to address water scarcity: (1) water quotas or limits in extractions (Policy A); (2) assignment and distribution of water rights (Policy B); and (3) irrigation technology improvement to increase water efficiency (Policy C). We asked irrigators on their general opinion about the effectiveness and

fairness of these policies (queries 3 to 11 in Table C1). Additionally, respondents where asked to rank the policies from the best to the worst in dealing with water shortages. Fig. 4 presents the policy ranking (1 being the best and 3 the worst) for both irrigation districts. Results present a general consensus on the best policy (45% and 43% for upstream and downstream, respectively), which correspond with improvement of the irrigation technology (Policy C). However, the main differences arise in the case of the worst policy that is water quotas (Policy A) for upstream irrigators (51%), and water rights (Policy B) for downstream irrigators (43%).

Fig. 4. Policies ranking in upstream and downstream

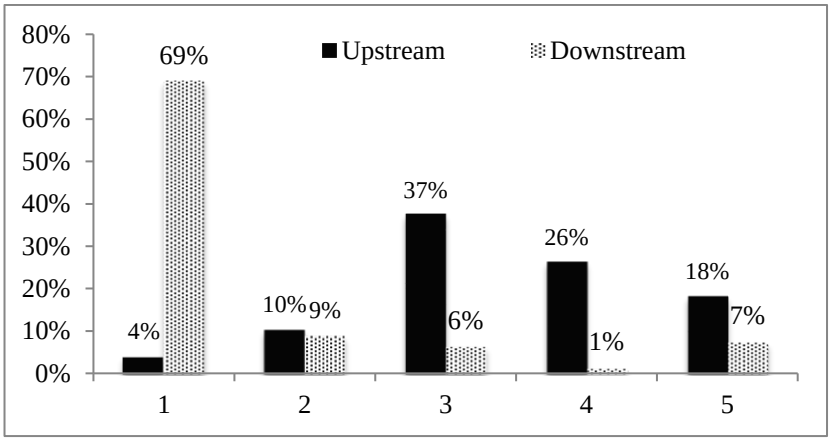


Note: Policy A is water quotas, Policy B is water rights, and Policy C is irrigation modernization. 1 represents the best policy and 3 the worst policy.

The degree of involvement with water authorities is another relevant result. Fig. 5 presents how irrigators in upstream are much more involved with water authorities than those in downstream. While 44% of irrigators upstream are very highly or highly

involved with water authorities, just 8% of irrigators downstream are actively involved with water authorities. Furthermore, the results for upstream show a dissimilar pattern by government level (local, regional, and national). Ranked from 1 (no participation) to 5 (very high participation), upstream irrigators declared larger involvement with basin and local associations (3.9 and 3.5, respectively) compared with their participation with national organizations (3.0). While differences exist for upstream users, there is no difference at all for downstream irrigators' involvement (average results of 1.6 for all levels). [10]

Fig. 5. Irrigators' participation and involvement with water authorities



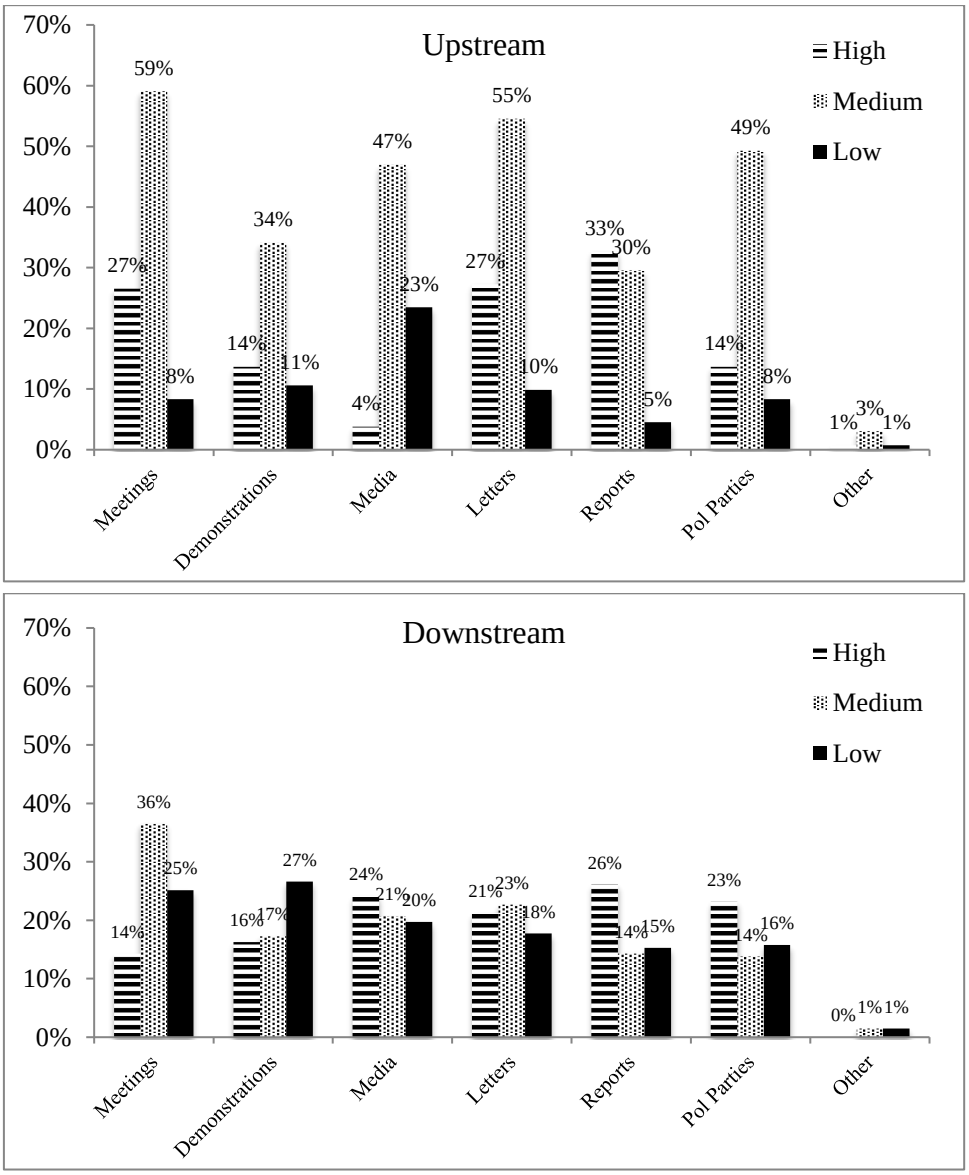
Note: Aggregated data for local, basin, and national level. Ranked from 1 (no involvement) to 5 (very high involvement).

Finally, other significant results are shown in Fig. 6 and 7. These Fig. present the awareness about the main instruments or measures that users, and/or the water organization they belong to, employ to approach and influence water authorities. Seven measures were proposed: (i) formal and/or informal meetings with water authorities; (ii) demonstrations for demanding higher water assignments, or when they rights are violated; (iii) publicizing authorities violations (or water shortages) in the media; (iv) official letters and reports to water authorities demanding for higher water assignments; (v) court reports for any violation of their rights; (vi) use of political parties to get their favor and increase water assignments; (vii) other[11].

[10] Results collected in Table C1, items 15 to 17.
[11] Irrigators were asked for any other particular measure not collected in the questionnaire. A 95% do not select this option at all. From the 5% that select 'other', they do not provide additional measures.

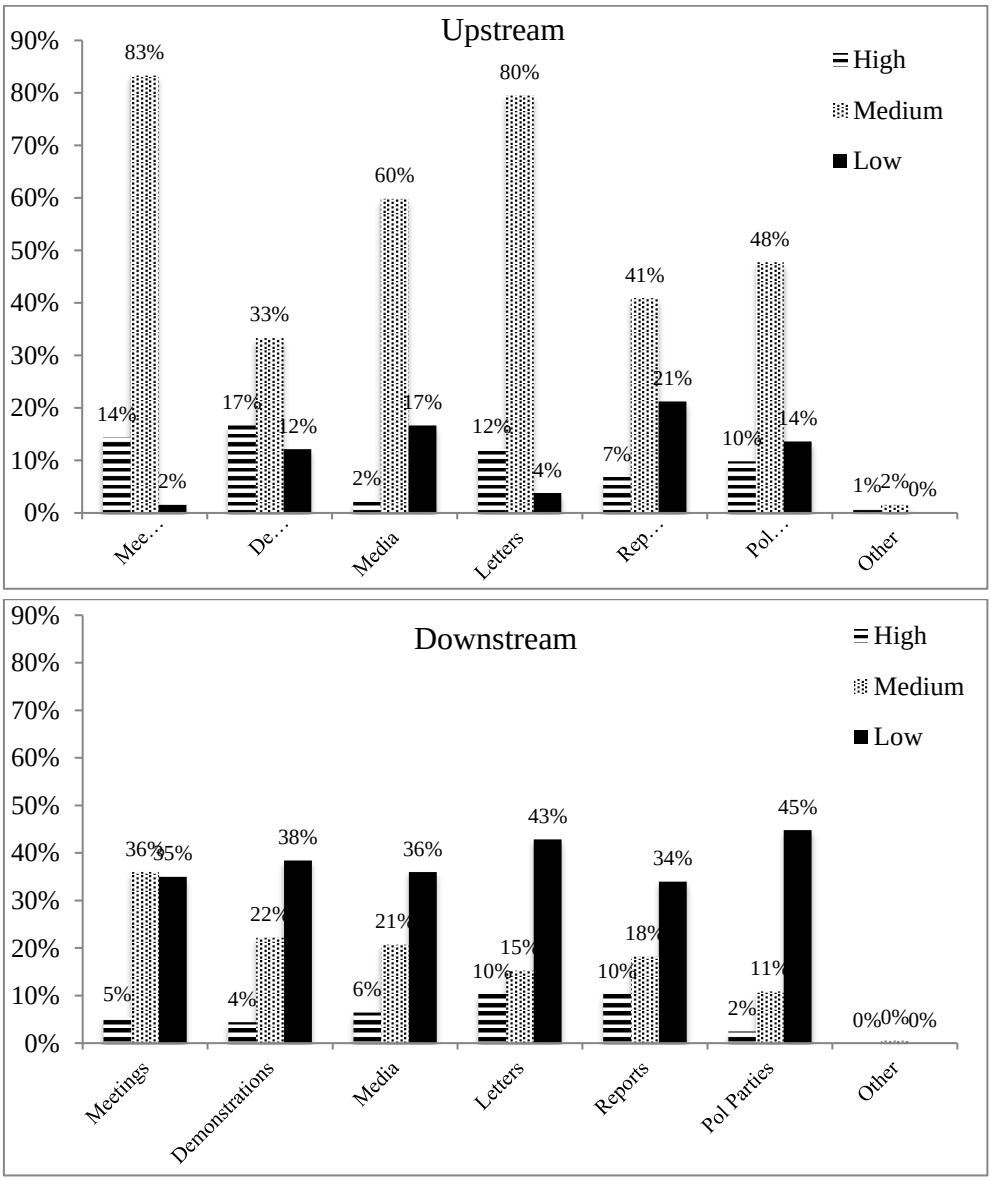
Fig. 6 presents the effort invested in each measure in order to effectively influence policy makers. In the case of upstream irrigators, most of them agreed that in general policies involve a medium effort, especially, meetings (59%), mailing of official letters and/or official documents (55%), and use of political parties (49%). By contrary, the results in the case of the irrigators' downstream show higher variations. For example, a majority of the users ranked demonstrations as a low effort measure (27%), while measures as the media, reports, or use of political parties are ranked as a high effort measures (24%, 26%, and 23%, respectively).

Fig. 6. Effort perception of the different measures



The results for effectiveness are summarized in Fig. 7. Similarly as with the effort, there are noticeable differences between the two-irrigator interest groups. Upstream irrigators classified all measures to have medium effectiveness, following a similar pattern as with the effort. To the contrary, downstream irrigators believe that all measures have low effectiveness; with just meetings having a medium effectiveness level. This is a remarkable result due to the general perception of downstream irrigators is that measures involve a high-medium effort, but have a low effectiveness or reward.

Fig. 7. Effectiveness perception of the different measures



The descriptive statistics results highlight important and sizable disparities between the two irrigation interest groups. These results can have important policy

implications and can be useful in explaining some of the ongoing conflicts between the basin interest groups. We will refer to these aspects in section 5 of the paper.

Water utilities

Table 1 summarizes some descriptive statistics of the main characteristics of the water utilities. Both utilities are big companies that supply around a 60% of the Basin's urban demand in the downstream region. One of the main differences between these utilities is the water source: for 'water utility 2' (U2) more than a half originates from desalinized water (54%); while for 'water utility 1' (U1) more than a half originates from surface water (55%), but with also using a combination of groundwater (20%) and desalinized water (25%). Another difference is the size of the utility, despite that both are sizable companies, U1 supplies three times the water supplied by U2.

Before analyzing the results of the urban responses, it is worth remembering, as stated before, that urban water consumption has, by law, guaranteed water supply over all other water uses. This is the reason that conflicts over water allocations between water utilities and irrigators are less important and not much frequent in the Basin.

Table 1. Summary statistics of water utilities perception* (n=2)

Urban Water Company	**Water Utility 1 (U1)**	**Water Utility 2 (U2)**
Type of company	Mixed (private/public)	Mixed (private/public)
Location	Downstream	Downstream
Number of employees	444	300
Number of clients - households	661,500	200,000
Volume of water supplied (Mm^3/yr)	102	22
Percentage of groundwater	20%	0%
Percentage of desalinized water	25%	54%

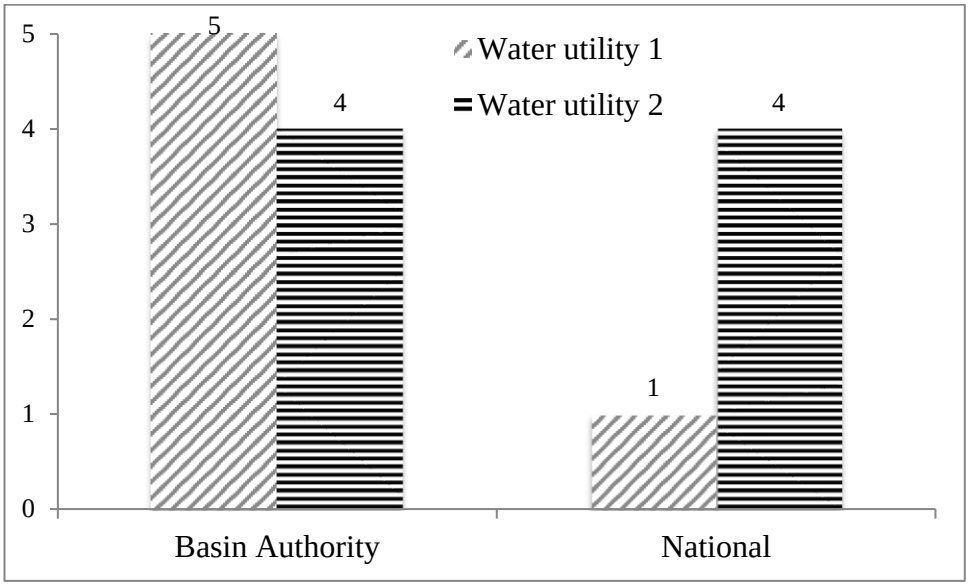
The results show that both water utilities perceive the three policies (water quotas, rights, and modernization) as excellent or good to deal with water scarcity problems (Table C2, items 8 to 10). Additionally, both utilities made the same ranking of policies: the best being Policy C, or irrigation modernization, and the worst Policy A, or water quotas (Table C2, items 17 to 19). This result replicates the perception of upstream farmers.[12]

Similarly to the analysis of the irrigators, we were interested in knowing the participation and involvement of the utilities with water authorities. The results in Fig. 8

[12] The results of the water utilities should be carefully analyzed because, in fact, these companies are not affected by these policies.

reveal a major participation at basin level for both utilities. However, differences are seen at national level involvement; while U2 is highly involved with national authorities, U1 is not involved at all.

Fig. 8. Water utilities participation with water authorities

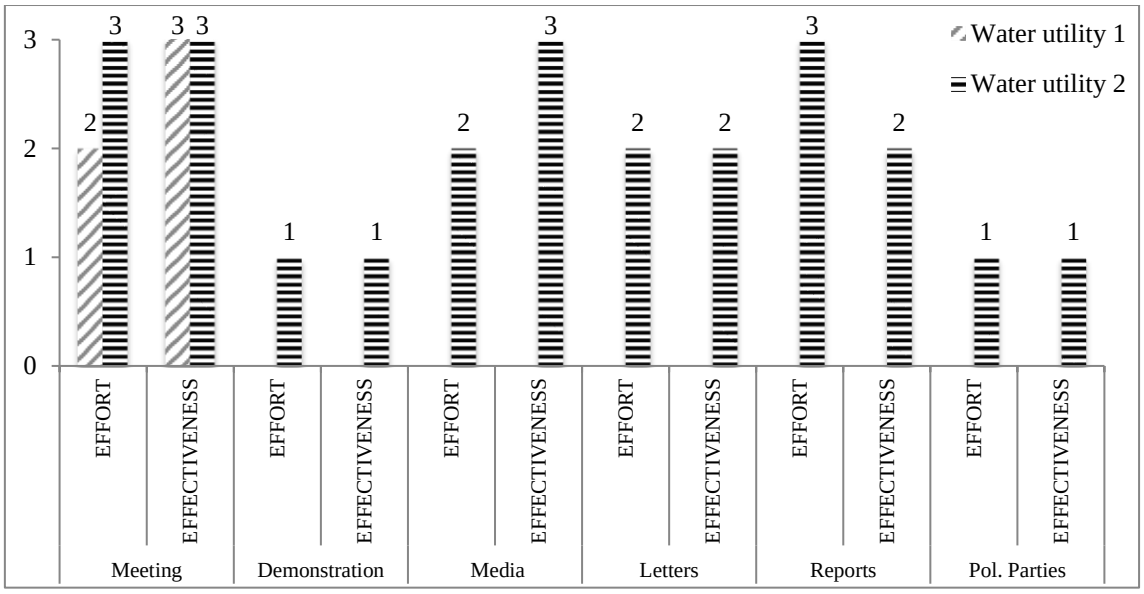


Note: Ranked from 1 (no involvement) to 5 (very high involvement).

Finally, there are also noticeable differences between the utilities' perception about the effort and the effectiveness of the measures used for approaching and influencing water authorities (Fig. 9). For U1 just the meetings activity seems to be a relevant measure that involves a medium effort and it is associated with a high effectiveness. However, for U2 all measures are relevant for approaching authorities.[13] Meetings and reports are associated with a high effort that yields a high and medium effectiveness, respectively, and the use of media and official letters is associated with a medium effort yielding a high and medium effectiveness, respectively. Finally, demonstrations and the use of political parties are both perceived low effort and low effectiveness.

[13] None of the utilities marked 'other', so the result for this measure is not reported.

Fig. 9. Water utilities perception about the effort and effectiveness of measures



Note: Ranked from 1 (low effort/effectiveness) to 3 (high effort/effectiveness).

POLICY IMPLICATIONS

The analysis in the previous section is used to identify and compare the main political issues and perceptions across the different interest groups in order to shed light on the nature of conflicts in the basin.

Policy implication 1: Smaller groups (with sizable landholdings) are more organized than the diverse groups with small landholdings.

The results suggest that farmers upstream have better conditions to be a more effective interest group due to the simpler coordination and lower transactions because the smaller group size (fewer number of members with larger farmlands).

Policy implication 2: More organized interest groups seem to be more proactive and involved with authorities and organizations.

The results also suggest that irrigators upstream, that are more organized and coordinated within a sole water user association, have a higher level of involvement and participation in influencing policy makers and authorities. In the case of the study area, 44% of irrigators upstream reveal a high participation with just a 4% of no participation. In contrast, for irrigators downstream just 8% reveal a high level of participation with 69% of irrigators not participating at all. The level of involvement and participation with water authorities is a very central issue in water policy. In order to elaborate

effective policy reforms, the cooperation and participation of stakeholders is necessary, and even more in the case of public goods and common pool resources (Ostrom 1990).

An additional explanation for the large difference in the effective organization and participation between the two irrigation interest groups is due to economic factors. While most of the income of upstream users relies on irrigation, in downstream, several users have other main economic activities besides irrigation, and thus agriculture is not their major source of income. This is an important element that could also explain differences in participation and lobbying.

Policy implication 3: The level and degree of participation of large involved irrigators depends on the level of government they lobby (local, regional, or national).

More than a 40% of farmers upstream have declared to be highly involve with water authorities, while more than 80% have declared to be relatively involved. However, the results indicate that the level of government largely determines the degree of participation. The largest level of participation is at basin level while the lowest level is associated with national-level water authorities. Most of the upstream irrigators declare to be highly involved with basin authorities while declaring medium-level involvement with national authorities. The results also show that in the case of low-level involved irrigators, the degree of participation with water authorities is low or very low at all government levels. The low participation is not correlated with the government level.

This can be an important result for policy-makers in order to promote the implementation of water policies from different government levels. Depending on the degree of cooperation required, regional and basin water institutions should be the institutions in charge of the policy management instead of national agencies.

Policy implication 4: Proactive irrigators perceive instruments to approach water authorities to be associated with medium-level costs and obtaining medium-level rewards. To the contrary, irrigators with little involvement tend to think that influence measures have, in general, high costs and they obtain low rewards.

One important implication of this result is that irrigators not involved tend to believe that any action to approach water authorities is considerably costly for them and generates low benefits. This means that collective action is, in fact, not valuable at all because costs are much higher than benefits. Conversely, irrigators normally collaborating in organizing the efforts believe that being proactive involves some costs but also considerable rewards or benefits, which compensate the efforts.

Policy implication 5: Notably differences exist in the perception about water policies and institutions' performance between different interest groups.

The survey results reveal sizable differences in opinions about preferred instruments for dealing with water scarcity, depending on the spatial location and sector. Although upstream and downstream irrigators agree on the best policy to address water shortages, which in the particular basin is modernization of the irrigation technology, there are important differences in the opinions on the worst policy. The design and implementation of water policies should be carefully planned to avoid problems and conflicts between stakeholders. Besides, there are also differences between the water utilities' and the irrigators' perceptions. Efficient water policies require the collaboration and cooperation among all stakeholders in order to find a worthy solution satisfying every group.

Policy implication 6: In the context of urban water, higher national involvement implies larger number of measures for approaching water authorities.

One of the main results that can be extrapolated from the water utilities surveys states how an active national participation implies using more instruments or measures for reaching authorities. Water utility 1 that declared to be very involved at basin level, and not involved at national level, was just using meetings for approaching water authorities. However, water utility 2, with high participation at basin and also at national level, declared to use a wide number of measures to reach water authorities. The results suggest that participation or involvement with water agencies at national level notably increases lobbying costs.

CONCLUSIONS

Water scarcity is a critical issue in many basins worldwide, especially in arid and semi-arid regions. The large expansion and intensification of irrigated agriculture has impacted water resources negatively, exacerbating the pressures on such resources. Despite the large efforts and investments by governments, water authorities and private companies to enhance the functioning of water systems and improve water management, water scarcity is a worsening problem with active and recurrent water conflicts in most basins around the world. The groups of stakeholders across sectors and locations show opposite interests and different political power and lobbing capacity, which hinder the efficiency and effectiveness of water policy measures and lead to intense disputes for the use of water resources.

This paper presents an analysis of the perceptions that stakeholders' groups have about policies and institutions to address water scarcity. Stakeholders perceptions have been elicited with a survey collected in an already water stressed river basin, the Jucar river basin in Southeastern Spain, displaying recurrent water conflicts during the last fifty years. The development of irrigated agriculture with major water withdrawals, together with differences in stakeholders groups' political clout, has triggered water disputes between sectors and locations.

The results of the stakeholders survey show what are the perceptions of agricultural users and urban users on the policies implemented in the Jucar basin to address water scarcity. The results from irrigation groups indicate considerable differences among them, driven by landholding size and number of farms, economic activities, and local organization. These differences are the main drivers of explaining users involvement with water authorities and their lobbing capabilities.

The results also highlight noticeable discrepancies between users opinion about water policies to address water shortages. The findings involve several political implications, and demonstrate the necessity of collective action and stakeholders' cooperation in order to achieve a more efficient water regulation. Another remarkable result is the interest groups perception about the effectiveness and level of effort for approaching the water decision-making process. While the more organized interest groups feel that they can get a medium-level reward or benefit with a medium effort in dealing with the decision process; less organized groups think that the efforts are too high for likely very low rewards. This difference in opinion about effort and effectiveness of active lobbing can explain the different degree of user cooperation.

A better knowledge of the perceptions displayed by the groups of stakeholders can be useful for inducing better cooperation between users and authorities, and for acquiring more efficient instruments to solve water stress in the basin. These findings involve useful policy implications that could be relevant for water policy making and the design of sound policy regulations.

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Annex A

Agricultural water users questionnaire

This questionnaire pursues to better understand the relationship between all the water stakeholders of the Jucar River Basin. The main objective is to analyze how water authorities are managing the water resources along this Basin. The data from this questionnaire will be only used for academic purposes.

It is an anonymous questionnaire and all the information will be processed with the maximum confidentiality.

If you do not know the answer of any of the questions, please just leave it blank

1) The collective of people you belong to is:

Farmer	
Ecologist	
Agrifood company worker	
Manager	
Other	

2) Your specific location into the Jucar Basin is:

Canal Jucar-Turia	
Acequia Real del Jucar	
Sueca	
Cullera	
Cuatro Pueblos	
Escalona	
Carcajente	
Other	

3) Role in the organization you belong to:

Manager/Responsible	
Member	

4) Could you provide some approximate information about the water user association your belong to?

Approximate number of members in your organization	Approximate number of hectares of irrigation agriculture

5) Could you please indicate some information about your own farmland:

Approximate number of hectares	Percentage of fruit-trees (0-100%)

6) We are interested in to know your opinion about some water policies used to face water drought periods in the Jucar Basin. We are interested in three water policies:

   A. Water quotas
   B. Definition of water rights
   C. Modernization of the irrigation technology.

i. Starting with Policy A (water quotas). Could you tell us your opinion about this policy in the Jucar Basin?
Being 1 (lowest value/very bad) and 5 (highest value/very good)

	1	2	3	4	5
Do you think is a good policy to face with water drought?					
Do you think water authorities have efficiently managed this policy?					
Do you think this policy treats everyone at same?					

ii. About Policy B (water rights). Could you tell us your opinion about this policy in the Jucar Basin?
Being 1 (lowest value/very bad) and 5 (highest value/very good)

	1	2	3	4	5
Do you think is a good policy to face with water drought?					
Do you think water authorities have efficiently managed this policy?					
Do you think this policy treats everyone at same?					

iii. About Policy C (irrigation technologies modernization). Could you tell us your opinion about this policy in the Jucar Basin?
Being 1 (lowest value/very bad) and 5 (highest value/very good)

	1	2	3	4	5
Do you think is a good policy to face with water drought?					
Do you think water authorities have efficiently managed this policy?					
Do you think this policy treats everyone at same?					

7) The next questions are related with the relationship that you have with the different water authorities in charge of water management in the Jucar Basin.
Being 1 the lowest value (no involvement) and 5 the highest (very high involvement):

	1	2	3	4	5
Do you actively participate in the decisions and/or activities of the water user association you belong to?					
Do you participate in the decisions and/or activities of the Jucar River Basin Authority (JRBA)?					
Do you participate in the decisions and/or activities of the any other water authority different from the previous one? (*for example national water agencies*)					

8) What kind of means has your organization used to influence the JRBA's policy direction and extent?
Mark the ones you recognize.

Formal and/or informal meeting with the water authorities	
Demonstrations	
Publicity on the Media (newspapers, journals, tv)	
Letters to water authorities	
Reports (go Court when the rights are violated)	
Using the help and/or collaborations of Political Parties	
Others (indicate):	

9) Please assign a cost value or effort to each of the items previously selected

	High	Medium	Low
Formal and/or informal meetings			
Demonstrations			
Publicity on the Media (newspapers, journals, tv)			
Letters to water authorities			
Reports (go Court when the rights are violated)			
Political Parties			
Others			

10) Please assign a revenue value or effectiveness to each of the items previously selected

	Not Effective	Somewhat Effective	Highly Effective
Formal and/or informal meetings			
Demonstrations			
Publicity on the Media (newspapers, journals, tv)			
Letters to water authorities			
Reports (go to Court when the rights are desecrated)			
Political Parties			
Others			

We appreciate your help filling out this questionnaire

** This questionnaire was distributed to farmers in Albacete (upstream) and Valencia (downstream). The questionnaire was almost the same except for three questions that were not asked in the case of Albacete. Questions 1, 2 and 4 that specifically refer to the farmers' water users association are not valid in Albacete due to the fact that in this area all farmers belong to the same water users association (JCRMO).*

Annex B

Urban water users – Water Utilities questionnaire

This questionnaire pursues to better understand the relationship between all the water stakeholders of the Jucar River Basin. The main objective is to analyze how water authorities are managing the water resources along this Basin. The data from this questionnaire will be only used for academic purposes.

It is an anonymous questionnaire and all the information will be processed with the maximum confidentiality.

If you do not know the answer of any of the questions, please just leave it blank

1) Your company is:

Private company	
Public company	
Mixed of private and public company	

2) In the Jucar Basin you are located in:

Upper Jucar (upstream)	
Lower Jucar (downstream)	

3) We are interested in to know your opinion about some water policies used to face water drought periods in the Jucar Basin. We are interested in three water policies:
   A. Water quotas
   B. Definition of water rights
   C. Modernization of the irrigation technology.

   i. Starting with Policy A (water quotas). Could you tell us your opinion about this policy in the Jucar Basin?
   Being 1 (lowest value/very bad) and 5 (highest value/very good)

	1	2	3	4	5
Do you think is a good policy to face with water drought?					
Do you think water authorities have efficiently managed this policy?					
Do you think this policy treats everyone at same?					

   ii. About Policy B (water rights). Could you tell us your opinion about this policy in the Jucar Basin?
   Being 1 (lowest value/very bad) and 5 (highest value/very good)

	1	2	3	4	5
Do you think is a good policy to face with water drought?					
Do you think water authorities have efficiently managed this policy?					
Do you think this policy treats everyone at same?					

iii. About Policy C (irrigation technologies modernization). Could you tell us your opinion about this policy in the Jucar Basin?
Being 1 (lowest value/very bad) and 5 (highest value/very good)

	1	2	3	4	5
Do you think is a good policy to face with water drought?					
Do you think water authorities have efficiently managed this policy?					
Do you think this policy treats everyone at same?					

4) The next questions are related with the relationship that you have with the different water authorities in charge of the Jucar water resources management.
Being 1 the lowest value (no involvement) and 5 the highest (very high involvement):

	1	2	3	4	5
Do you participate in the decisions and/or activities of the Jucar River Basin Authority (JRBA)?					
Do you participate in the decisions and/or activities of the any other water authority different from the previous one? (*for example national water agencies*)					

5) What kind of means has your organization used to influence the JRBA's policy direction and extent?
Mark the ones you recognize.

Formal and/or informal meeting with the water authorities	
Demonstrations	
Publicity on the Media (newspapers, journals, tv)	
Letters to water authorities	
Reports (go Court when the rights are violated)	
Using the help and/or collaborations of Political Parties	
Others (indicate):	

6) Please assign a cost value or effort to the selected previous items.

	High	Medium	Low
Formal and/or informal meetings			
Demonstrations			
Publicity on the Media (newspapers, journals, tv)			
Letters to water authorities			
Reports (go Court when the rights are violated)			
Political Parties			
Others			

7) Please assign a reward value or effectiveness to the selected previous items.

	Not Effective	Somewhat Effective	Highly Effective
Formal and/or informal meetings			
Demonstrations			
Publicity on the Media (newspapers, journals, tv)			
Letters to water authorities			
Reports (go Court when the rights are vulnerated)			
Political Parties			
Others			

We appreciate your help filling out this questionnaire

ANNEX C

Summary of the statistical results form the questionnaires

Table C1. Summary statistics of the questionnaires' results in upstream (Albacete) and downstream (Valencia) irrigation areas (Jucar Basin, Spain)[$]

Interest Group		Upstream	Downstream
1. Average of ha per farmland		107 (160.20)	2.5 (3.65)
2. Percentage of fruit-trees per farmland		22% (37.35)	80% (32.21)
3. Opinion about Policy A (water quotas)		2.9* (1.32)	3.4* (1.32)
4. Opinion about Policy B (water rights)		3.4* (1.50)	2.8* (1.50)
5. Opinion about Policy C (irrigation technology)		4.2* (1.03)	3.6* (1.45)
6. Water authorities' performance implementing Policy A		3.0* (1.16)	2.7* (1.35)
7. Water authorities' performance implementing Policy B		2.8* (1.30)	2.3* (1.33)
8. Water authorities' performance implementing Policy C		2.8* (1.04)	3.0* (1.42)
9. Equal users treatment of Policy A		2.9* (1.17)	2.2* (1.42)
10. Equal users treatment of Policy B		2.4* (1.15)	2.1* (1.39)
11. Equal users treatment of Policy C		2.7* (1.12)	2.8* (1.59)
12. Ranking of Policy A		2.3[ψ] (0.80)	1.9[ψ] (0.75)
13. Ranking of Policy B		2.0[ψ] (0.81)	2.3[ψ] (0.71)
14. Ranking of Policy C		1.7[ψ] (0.75)	1.8[ψ] (0.86)
15. Involvement with your irrigators' association (local)		3.5[ξ] (0.97)	1.6[ξ] (1.21)
16. Involvement with the basin authority (JRBA)		3.9[ξ] (1.01)	1.6[ξ] (1.17)
17. Involvement with any other water authority (national)		3.0[ξ] (0.98)	1.6[ξ] (1.20)
18. Main measures to approach water authorities (*Percentage of farmers that recognize this policy*)	Meetings	94%	79%
	Demonstrations	58%	63%
	Media	74%	67%
	Letters	92%	66%
	Reports	67%	58%
	Political Parties	71%	57%
	Other	4%	3%

19. Effort	Meetings	1.8[#] (0.58)	2.1[#] (0.71)
	Demonstrations	1.9[#] (0.65)	2.2[#] (0.83)
	Media	2.2[#] (0.55)	1.9[#] (0.82)
	Letters	1.8[#] (0.61)	1.9[#] (0.80)
	Reports	1.6[#] (0.62)	1.8[#] (0.84)
	Political Parties	1.9[#] (0.55)	1.9[#] (0.85)
	Other	2.0[#] (0.63)	2.5[#] (0.55)
20. Effectiveness	Meetings	1.8[#] (0.38)	2.4[#] (0.62)
	Demonstrations	1.9[#] (0.68)	2.5[#] (0.62)
	Media	2.2[#] (0.46)	2.5[#] (0.67)
	Letters	1.9[#] (0.40)	2.5[#] (0.74)
	Reports	2.2[#] (0.61)	2.4[#] (0.76)
	Political Parties	2.0[#] (0.57)	2.7[#] (0.53)
	Other	1.7[#] (0.58)	2.0[#] (0.0)
Number of observations/ Sample (n)		133	201
Percentage of respondents of the population		0.13	0.01

[$]Values express in average with the standard deviation in parenthesis (SD).

*Ranked from 1 (very bad) to 5 (excellent).

[Ψ] Ranked from 1 (best policy) to 3 (worst policy).

[ξ] Ranked from 1 (no involvement) to 5 (very high involvement)

[#] Ranked from 1 (low effort/low effectiveness) to 3 (high effort/high effectiveness)

Table C2. Summary statistics of the questionnaires' results for urban users – urban water companies (Júcar Basin, Spain)

Urban Water Company		**Water Utility 1 (U1)**	**Water Utility 2 (U2)**
1. Type of company		Mixed (private/public)	Mixed (private/public)
2. Location		Downstream	Downstream
3. Number of employees		444	300
4. Number of households		661,500	200,000
5. Approx. volume of water supplied (Mm^3/yr)		102	22
6. Percentage of groundwater supplied		20%	0%
7. Percentage of desalinized water supplied		25%	54%
8. Opinion about Policy A (water quotas)		5*	4*
9. Opinion about Policy B (water rights)		5*	4*
10. Opinion about Policy C (irrigation technology)		5*	4*
11. Water authorities' performance implementing Policy A		5*	3*
12. Water authorities' performance implementing Policy B		2*	3*
13. Water authorities' performance implementing Policy C			3*
14. Equal users treatment of Policy A		1*	3*
15. Equal users treatment of Policy B		1*	3*
16. Equal users treatment of Policy C		-	3*
17. Ranking of Policy A		2^{ψ}	2^{ψ}
18. Ranking of Policy B		1^{ψ}	1^{ψ}
19. Ranking of Policy C		3^{ψ}	3^{ψ}
20. Involvement with the JRBA		5^{ξ}	4^{ξ}
21. Involvement with other water authority (national)		1^{ξ}	4^{ξ}
22. Main measures to approach water authorities (X when the measure is used by the company)	Meetings	X	X
	Demonstrations		X
	Media		X
	Letters		X
	Reports		X
	Political Parties		X
	Other		
23. Effort	Meetings	2	3
	Demonstrations		1
	Media		2
	Letters		2
	Reports		3
	Political Parties		1
	Other		
24. Effectiveness	Meetings	3	3
	Demonstrations		1
	Media		3

	Letters		2
	Reports		2
	Political Parties		1
	Other		

* Ranked from 1 (very bad/not at all) to 5 (very good/at all).

ψ Ranked from 1 (best policy) to 3 (worst policy).

ξ Ranked from 1 (no involvement) to 5 (very high involvement)

Ranked from 1 (not or low effort/not or low effectiveness) to 3 (high effort/high effectiveness)