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## Breaking Out of the Governance Trap in Rural Mexico

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**ABSTRACT:** The purpose of this study is to explain the governance trap afflicting water agencies of rural municipalities in the Mexican state of Sonora. This trap is based on hierarchical governance arrangements of low complexity that produce a short-term vision. Organisations are isolated from one another, governance mechanisms are closed, and an atmosphere of distrust prevails among stakeholders, resulting in a lack of coordination and the loss of resources, including water. We show how a multiple-use water services scheme can become a governance trap when it allows the over-exploitation of a single source of drinking water by users who do not pay for the service, in locations where the majority of water users have the ability to pay. The study reviews the evidence of two rural regions in Sonora, Mexico. It explains how a past intermunicipal experience failed, and also suggests how a new scheme of intermunicipal authorities could break such governance traps. Specifically, it provides evidence that in small communities, collaborative large-scale arrangements for water governance are more effective than they are in a single municipality. Building governance capacities within and between water agencies and users would thus be advantageous. Although intermunicipal bodies are more complex than traditional arrangements, requiring additional time and resources for decision-making, they result in more sustainable decisions.

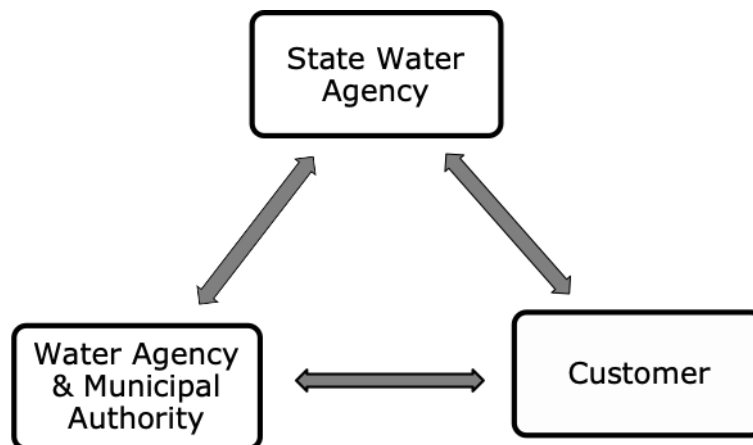
**KEYWORDS:** Governance trap, intermunicipal water authorities, capacity building, water governance, rural regions, Mexico

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### INTRODUCTION

There are three main actors in the governance of small rural water agencies in Mexico. One is the customer, who consumes a significant amount of water through a small pipe network, is not used to paying for it, and receives irregular service. The second level of actors comprises the local water agency and the municipal authorities. They maintain a clientelistic relationship with the consumer, covering the costs (mainly electricity for pumping) within the municipal budget. These authorities could lose elections if they charge for water but, if they do not, they sooner or later are forced to ask state governments to cover their expenses. Finally, there is the state water commission, an agency of the state or regional government, which seeks to improve and modernise rural water services throughout the region; it may threaten to withhold support for excessive expenses and demand that local water agencies and municipal authorities charge for the service and make it self-sufficient. The question is primarily one of who pays the costs and who receives the benefits. The problem can be characterised as a tragedy of the commons, where there are short-term rent-seeking individual behaviours and undesirable long-term social results. It is a governance problem because what is at stake is the degree of coercion and its political-electoral impact. For this reason, we call it a governance trap (Polterovich, 2007).

Figure 1. The three main authors in the governance of rural water in Mexico.



A governance trap is set when stakeholders' focus on the short term produces inefficiency in coordination. The lure of short-term individual benefits makes it easy to fall into the trap, and once the trap is closed it is difficult to escape because the door opens from the outside. The trap is formed when the inhabitants of a community take for granted the right to intensive use of water without paying for it, or paying only a symbolic price that does not cover the cost; it is the result, also, of a water agency that is not autonomous but relies on decisions from public officials. Candidates in electoral campaigns reinforce the trap with promises to maintain intensive water use without full cost recovery; community residents then use the power of their vote to obtain the benefit of free or underpriced water. The lure of the trap is the ability to use a large amount of water and pay little or nothing for it. Water consumers who question the situation realise that everyone else is falling into the trap, and that their individual avoidance will make no difference. They cannot open the trap on their own nor even with the help of others because if someone decides to leave, the others prevent their departure. If municipal authorities go along with a state water agency that tries to remove the trap by encouraging the municipality to collect the correct rates, they and their political party will pay the price and lose elections. In this way, people have settled into a comfort zone and are unwilling to give it up. The problem is how to free prisoners from a trap which they do not want to leave. The present study seeks a solution to this conundrum.

A governance trap is an inefficient yet stable pattern of behaviour that endures mainly through cultural inertia (Polterovich, 2007); we view it as a situation in which incentives make it easy to enter but difficult to leave. We also recognise that water policies are made and implemented in specific institutional contexts. There is thus a need to focus on the larger institutional context beyond particular organisations and individuals (Merrey et al., 2007). A central idea behind the concept has to do with the politics of water, which places power relations among the three actors (or stakeholders) at the analytical centre of water governance studies (Mollinga, 2008). It is precisely the focus on politics that makes such analysis a challenge (Svendsen et al., 2005). The problem is an important one for its far-reaching implications: its effect on public financial and budgetary arrangements (who gets what); its relation to improvement and professionalisation of water management and the abandonment of clientelistic political relationships; and, most importantly, the question of local water scarcity and environmental sustainability. All of these are relevant to United Nations Sustainable Development Goal (SDG) 6, access to clean water and sanitation (UN, 2015).

In this study, we adopt the perspective of narrative as explanatory strategy. This perspective focuses on the importance of ideology in the formulation of stakeholder discourses, highlighting the particular

societal settings in which these discourses emerge (Molle, 2008). To this end, we describe the governance situations in 14 rural communities. Field research in each included a documentary review, site visits, and interviews with local informants. Two questions are asked: How does the governance trap work? How is it possible to break out of it? In the first part of this article we present the concept of building governance capacities as opposed to the concept of the governance trap. We then provide a detailed description of the 14 rural municipalities selected and a brief description of water governance in the state of Sonora, where the municipalities are located. Next, we explain the governance trap in the communities and propose a model for intermunicipal authorities as a way to break out of the trap. Finally, we offer our conclusions.

### **WATER GOVERNANCE CAPACITY AND THE WATER GOVERNANCE TRAP**

Capacity building is a catchword in the public administration literature that can be interpreted in many ways (Ospina, 2002). The issue of water governance capacity has regained importance since the market has failed to solve public problems by itself. With the return of the state as an essential actor in development, it has been necessary to improve the quality of its intervention. In particular, it is important to highlight the institutional 'rules of the game' (Tobelem, 1992; Rosas, 2008). The theoretical framework of capacity building has been centred on sustainability and development, where an approach based on autonomy (not dependency) and systemic (not separate) activities is crucial (Eade, 1997). The core of the capacity-building approach is the ability to identify and solve long-term problems (Jänicke, 1997). Here, we consider that capacity building in water governance requires taking into account the institutional perspective.

From a general perspective, an institution is a relatively stable collection of rules and practices defining appropriate behaviour for specific groups in specific situations (March and Olsen, 1998). It is important to recognise institutions as the result of culture rather than as a building, an office, or a written law. Institutions are the result of a historical process that shapes organisations marked by the decision-making patterns of the stakeholders involved (North, 1990; Cádiz-Cota, 2011). Decision patterns are the result of the stakeholders' interpretations of the rules of the game. That is, they reflect the quality of formal and informal rules, where the former are written and the latter are the dominant practices (North, 1990). For instance, decision makers in the Italian Mafia follow the rules imposed by the informal Sicilian code or they face physical sanctions, and the decision patterns in Tibetan Buddhism obey the written precepts of its code or they face moral sanctions. The study of institutions involves taking into account both the rules and practices of stakeholders.

Every governance framework involves attention to such institutional rules of the game. A current trend in research on institutions is to focus on governance schemes and mechanisms like capacity building in the context of 'new governance'. New governance refers to a framework of cooperation in decision-making, as opposed to the traditional governance framework of strong governmental direction. The new governance perspective recognises the insufficiency of governmental action to solve increasingly serious problems (Aguilar-Villanueva, 2012; Rittel and Webber, 1973). In order to face such problems it is necessary to shift from hierarchies to network arrangements. However, network governance also poses challenges, one of which is when a lack of stakeholder capacity for sharing and cooperation in water projects results in poor network arrangements (Tropp, 2007). Water governance capacity thus requires both the older bureaucratic framework and the newer cooperative forms.

Water governance capacity refers to the ability to steer policy issues forward in a sustainable way, where different stakeholders have different approaches to problems and their solutions (Kooiman, 2003). We argue that the governance trap is related to the inertia that stems from stakeholders' reluctance to leave their comfort zone, while governance arrangements are ineffective in the present and unsustainable for the future. We endorse the idea of the governance trap as a low-level equilibrium scenario (Nelson, 1956; Spiller and Savedoff, 2000; Pineda-Pablos et al., 2007), where both water

agencies and water users have problematic practices. On the one hand, water agencies provide poor quality services owing to low prices and users' failure to pay. On the other hand, water users are unwilling to pay because resources are wasted. This low-level equilibrium constitutes a comfort zone around a service that is poor but cheap. In Table 1, we present our theoretical framework. The approach is two-sided: one side includes the characteristics of water governance capacity and the other the features of the water governance trap.

Table 1. Water governance capacity and the water governance trap.

Features	Water governance capacity	Water governance trap
Governance mechanisms	Open	Closed
Organisation interactions	Connected	Isolated
Stakeholder interactions	Trust	Distrust
Stakeholder equilibrium	Win-win	Lose-lose
Goal perspective	Sustainable	Immediate
Complexity level	High	Low

Water governance capacity entails having open mechanisms, connected organisations, trust between stakeholders, win-win equilibria, a sustainable goal perspective, and a high level of complexity. Open mechanisms mean that public, private, and civil society organisations should work together in an open manner, using accessible language understandable to the general public (Rogers, 2002). Connected organisations are those whose approach crosses boundaries and leads to action in different domains, levels, and sectors. It should be emphasised that water governance requires not only the development of capacities of the individual elements that make up the system, but also the refinement of connective capacities among the different organisations involved, including water users (Edelenbos and Teisman, 2013). This emphasis on connective capacity endorses the idea that water policy effectiveness is achieved through the contributions of different stakeholders, in contrast to the traditional idea that effectiveness depends only on governmental capacity.

Trust is an important prerequisite to developing cooperative arrangements among multiple stakeholders. Trust requires reliability, willingness to give the benefit of the doubt, and the avoidance of opportunistic behaviour (Edelenbos and Klijn, 2007). Trust develops when there are interdependencies between the different interests at stake which actors must negotiate in order to obtain mutual benefits with win-win results, that is, when stakeholders cooperate to accomplish outcomes that mean an improvement for all or prevention of an undesirable situation (Klijn and Koppenjan, 2000). To achieve sustainable outcomes, goal perspectives should recognise the points of view of different stakeholders. However, sustainability is a moving target that needs to follow a necessarily complex strategy (Voss and Kemp, 2006) that includes nonlinear dynamics, self-organising arrangements, and co-learning (Teisman et al., 2009).

The water governance trap, however, entails closed mechanisms, isolated organisations, distrust between stakeholders, lose-lose equilibria, short-term-goal perspective, and a low level of complexity. With closed mechanisms, particular groups develop their own values and pursue their own goals, rather than working towards more general goals that transcend specific group interests (Easton, 1999). Isolated organisations breed instability in policy, a decrease in the number of veto players and in cohesion, and an increase in congruence (Tsebelis, 1995). The governance trap is, in general, vulnerable to problems with checks and balances and with distrust. When people do not make an effort to build trust within and between organisations, they tend to act only for their own benefit and even to sabotage the work of others (Braithwaite, 1998).

With a lose-lose equilibrium appears a vicious circle, such as when water users do not pay because the service is deficient, and the service does not improve for lack of resources (Pineda-Pablos et al., 2007). Clearly, both users and authorities lose in such a situation: the provision of service is deficient for everyone. A short-term-goal perspective in stakeholders also contributes to a trap because actions are based primarily on reactions to urgent issues and on issues that erupt because of previous neglect. The short-term view can be useful effectively when there are systematic objectives, but it becomes destructive in the absence of proactivity – when it is purely reactive (Merton, 1957). In systems of low complexity, highly hierarchical governance systems prevail. But system complexity is useful for ensuring checks and balances among stakeholders, insofar as it promotes a constant questioning of assumptions in policymaking. Highly complex systems require network governance systems that integrate cooperation from public, private, and social actors to solve common problems (Felin and Zenger, 2014).

In the literature on water policy, the governance trap idea has been studied mainly from the multi-scalar governance and water politics perspectives, where investigators have called for closer attention to the interrelationships of power, networks, and scale (Norman et al., 2012). The local scale has generally been considered the best level at which to develop effective water governance arrangements; however, there are studies suggesting that all scales include political struggles that can produce successful or unsuccessful arrangements, according to variables other than scale (Brown and Purcell, 2005). The governance trap is thus a concept with an anthropocentric emphasis. Especially in Latin America, as Esteban Castro (2008) argues, water governance has failed, owing to paternalistic, largely top-down practices, and undemocratic processes.

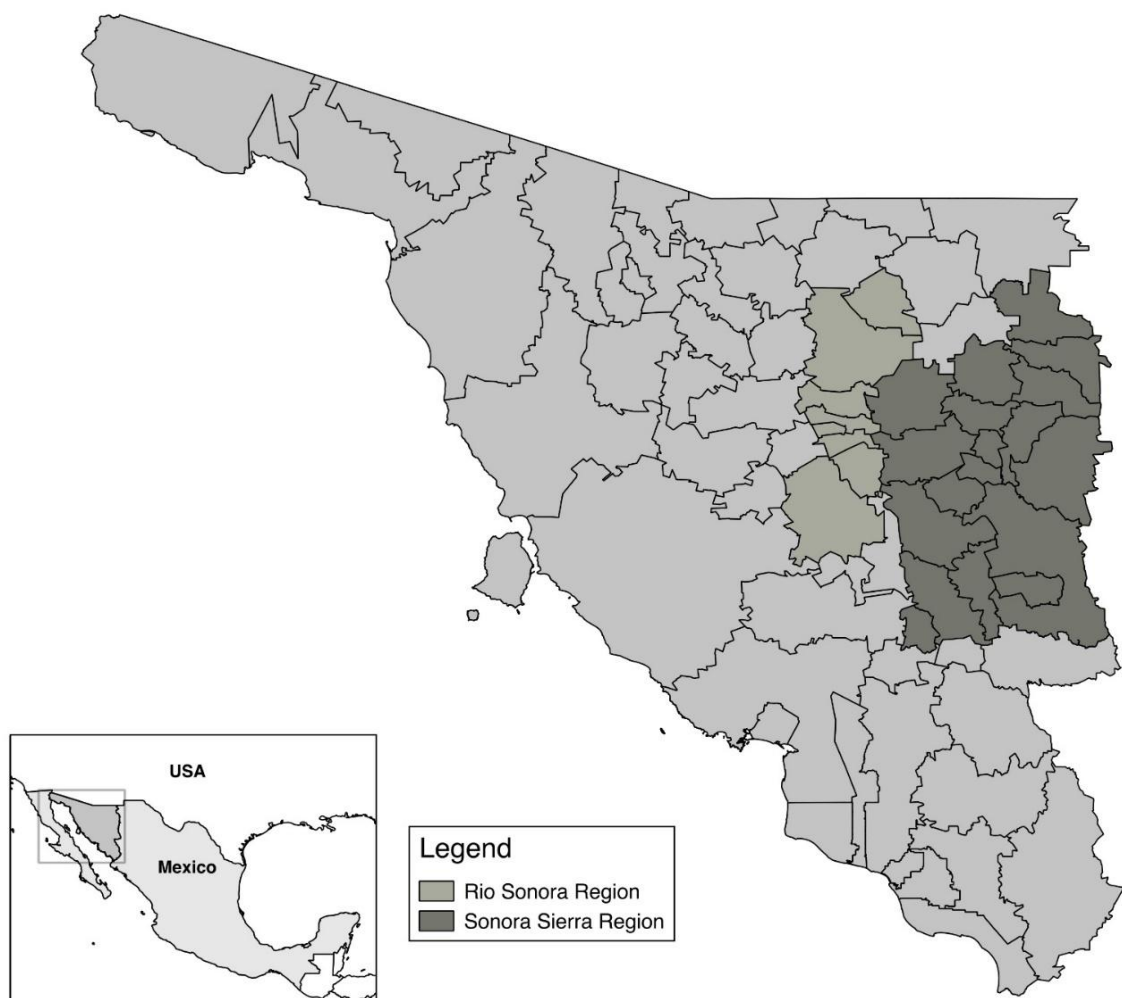
The governance trap is also related to the capture of public space by all, or the majority, of the stakeholders involved. For instance, although the multiple-use water services scheme is a desirable arrangement favouring the poor in contexts such as rural and peri-urban spaces (Butterworth et al., 2004), the over-exploitation of free water is an example of a governance trap. That is, although it is true that some contexts need multiple-use water services schemes, the details of the specific context make the difference between an effective arrangement and a failed one. In this article, we show how a multiple-use water services scheme can become a governance trap when it allows the over-exploitation of a single drinking water source while additional sources are put to other uses. For instance, drinking water can be wasted on cattle – when there is a spring exclusively for livestock – because ranchers prefer to fill tanks at home at night because it is more convenient, even though it is less efficient. The practice is maintained because the absence of water metering leaves it up to water users to be conscientious about conserving water; where there is a lack of such conscientiousness, the situation will fall into a governance trap that allows for waste.

Governance traps appear not only in poor areas; they can be present even in locations where the majority of water users have the ability to pay, and thus where multiple-use water services schemes can work. The governance trap can be tangled when the organisational scheme is hierarchical and centralised, because in such situations it is a small number of actors who make decisions, and there are incentives to maintain the status quo. On the other hand, when there is a networked, decentralised organisational scheme actors will be balanced against each other, and in this way the system will arrive at changing equilibria through ongoing negotiations. In this sense, the ideal circumstances for a governance trap include an absence of water metering, users with the ability to pay but with a culture of non-payment that makes them reluctant to do so, a central agency that administers the provision of water services that is not self-sustaining and must rely on operating subsidies from other agencies, and an environment in which electoral politics is an important influence on the actors who run the agency. In order to escape the governance trap, at least one of these elements must be broken. We will propose the centralised organisational system as an initial target.

**A BRIEF DESCRIPTION OF WATER GOVERNANCE IN THE STATE OF SONORA**

An effective culture of water use is of greatest necessity in countries with low water quality or a scarcity of water. Mexico’s availability of water is among the lowest in the world. Indeed, 16 percent of the country’s aquifers are over-exploited and there does not seem to be the necessary governance capacity to implement policies aimed at reducing consumption. Only 20 percent of wastewater is treated, and the rate of reuse is almost nil. Eighty percent of untreated wastewater is discharged directly into rivers, lakes, and oceans (CONAGUA, 2016). The culture of water use in Mexico includes a lack of awareness about excessive consumption and about the effects of poor water quality on the environment and human health, both among water users and in most of the agencies charged with providing it (Domínguez, 2006). In addition, traditional governance culture in Mexico is historically characterised by hierarchical organisation based on centralised decision-making, where political machines compete with democratic institutions (Merino, 1998).

Figure 2. Rio Sonora and Sonora Sierra regions in the state of Sonora, Mexico.



Source: Elaborated by authors with INEGI shapefiles.

In the state of Sonora the current legal framework for water is based on the 1999 reform of Article 115 of the Constitution, which assigns to municipalities the responsibility for providing water and sanitation

services. The Sonora Water Law is based on the idea of promoting a new water culture that supports different agricultural, industrial, urban, and environmental uses. The law also establishes the possibility of municipal coordination with state and federal agencies, as well as with the private sector and civil society. Under the reform, the role of the state government went from being a provider of water services to being a regulatory and support entity for municipalities. Under the new law, the state water system is the backbone of the water system in Sonora.

The central objective of the state water system is to provide criteria and information to the various stakeholders involved in water policy, in order to strengthen and evaluate decision-making. This system is grounded in a body called the State Water Council, which meets at least twice a year. The governor chairs this council and the executive member of the state water commission is its technical secretary. It is made up of the state's 72 mayors, the managers of the municipal water agencies, and the state minister of agriculture, the latter as coordinator of the state water system. In addition, the governor can also invite representatives from the private sector and civil society, and from the national water commission. The implementation of this legal design is not very practical, since many actors are involved in a single annual meeting; there is no evidence that the objectives are actually carried out.

The state water commission promotes research and technological innovation in the water sector through incentives and strategic alliances. It is also in charge of promoting the professionalisation of human resources in water agencies. Municipalities are charged with developing local water programs, including the provision of drinking water, drainage, sewerage, treatment, and final disposal of wastewater. Each municipality can provide the service directly, or in coordination with the private sector or with other municipalities. The relevant legislation provides the framework for intermunicipal water authorities, which require the approval of more than two-thirds of the municipalities involved, and whose property and legal authority are independent of the municipal councils.

The current governing board of intermunicipal authorities is made up of the mayor of each municipality involved, a representative of the state water commission, the manager of the regional office of the national water commission, and the president of the intermunicipal advisory council. The mayors choose one of their own to be president of the governing board; if they cannot agree on a candidate, the presidency rotates. The board designates a manager to run the authority. The advisory council is made up according to the individual regulations of each authority, usually by representatives of chambers of commerce and other business organisations.

The structure defined by this state legislation, instituted in 2006, has not been successful. The agencies it created have increased revenue but reduced customer satisfaction with the quality of service. The purpose of the present study is to understand what happened, and to investigate the lessons offered by this experience. The study seeks to analyse whether the intermunicipal authority is a viable solution. The following are detailed descriptions of the conditions for the provision of drinking water in selected rural areas in Sonora where the model of the intermunicipal authority was implemented.

### **THE PROVISION OF DRINKING WATER IN RURAL REGIONS OF THE STATE OF SONORA**

Rio Sonora and Sonora Sierra, two rural regions in the state of Sonora, each made up of small municipalities, were selected for the intermunicipal water authority governance model when the model was implemented by the state government in 2003-2009. In this article, we explain the failure of this intermunicipal scheme, and how it could succeed by breaking out of the prevailing governance trap. We use document analysis and semi-structured interviews. The unit of analysis is the interaction between the stakeholders involved in drinking water policy in these rural regions of Sonora; the relevant data are the stakeholders' interactions affecting water governance capacity. In Table 2, we present an overview of the municipalities that make up the Rio Sonora region.

Table 2. Municipalities in the Rio Sonora Region (2015).

Municipality	Population (inhabitants)	Population density (inhab./km <sup>2</sup> )	Houses with access to drinking water (%)	Houses with access to sewerage (%)	Average annual total precipitation (inches)
Aconchi	2756	7.50	97.70	97.70	17.71
Arizpe	2677	0.90	94.70	98.20	16.59
Bacoachi	1554	1.30	94.70	97.30	17.48
Banamichi	1612	2.00	98.20	99.00	16.69
Baviacora	3312	3.90	97.20	98.40	12.65
Huepac	927	2.20	99.00	99.00	16.69
San Felipe de Jesus	407	2.70	98.60	99.30	18.45
Ures	8704	2.80	90.40	97.30	16.93

Source: Instituto Nacional de Estadística y Geografía–INEGI (2015).

Municipalities in this region have small populations which are spread over a vast territory, with a high rate of access to drinking water and sanitation services. In addition, the region receives about 17 inches of rain per year. Based on the semi-structured interviews, Table 3 presents the current water-financing scenario in the region.

Table 3. Water revenues in the region.

Municipality	Users paying on time (%)	Monthly fixed water rates (US\$)*	Water agency annual revenue (US\$)	Water agency annual expenditure on electricity (US\$)
Aconchi	10	6.86 (household)	8250	30,900
Banamichi	40	3.14 (household) 11.43 (commercial)	17,150	79,550
Baviacora	24	5.71 (household) 11.4 (small business) 17.1 (large business)	36,000	62,000
Huepac	40	3.14 (minimum rate) 5.14 (maximum rate)	13,715	34,290
San Felipe de Jesus	70	2.86 (household) 2.29 (empty house)	5830	13,030
Ures	20	6.40 (household) 9.28 (commercial)	59,600	40,000

Source: Semi-structured interviews with water managers (2017).

\*Conversion rate: US\$1 = \$17.50 Mexican pesos.

These municipalities have low rates of on-time payment, and water rates are inadequate because they are fixed and there is much waste. The water managers describe average consumption as more than a thousand litres per inhabitant per day. Thus, annual revenues are not enough to cover even the cost of energy, except in the municipality of Ures. Since water is obtained as groundwater, its intensive use



also represents an intensive use of energy, and these water agencies are financially vulnerable to high energy costs. We describe below the situation of each municipality based on the semi-structured interviews with water managers.

In the municipality of Aconchi, a toxic mining spill in the Rio Sonora aggravated the situation of low revenue collection from water bills. People do not want to pay because the municipality does not have a new well. They say that other municipalities have a new well some distance from the river, but they continue with their old well, which they believe is contaminated. However, there is also a weak culture of payment throughout the region, as proven by the other arguments for not paying that are put forward in municipalities with no mining spills. There are many leaks in the town's water system, and four houses receive no water because of the low pressure resulting from intensive use by others. The town has no hill to distribute water by gravity, which increases the cost of extraction. During the implementation of the previous intermunicipal arrangement, water meters were installed, but people removed them because they were accustomed to using large amounts of water at low cost and did not want to pay more. Here, the governance trap is evident in the refusal to use water meters even though users have the economic resources to pay, and the rejection of price increases because of their culture of intensive water use.

The municipality of Banamichi has the same tradition of using large amounts of water without paying for it. The main part of the community includes two-thirds of the municipality's population; the other third is distributed between two small localities. The municipal government must cover liabilities of the water agency for about US\$4860 per month, which is more than twice the monthly revenue from water bills. As in the other towns along the Sonora River, the elderly are the first to pay; their monthly federal assistance payment of US\$33 pays their water bills. The toxic mining spill in the Sonora River has aggravated the payment situation, since the state and municipal governments decided to stop charging for water to compensate residents for the contamination caused by the spill. Two years have now passed without water charges and people want this situation to continue; there are even false rumours that it will continue for five more years. This non-payment negatively affects the culture of water use. In this case, the governance trap is evident in the financial unsustainability of the water agency, which hampers proper investment planning.

In the municipality of Baviacora, non-payment for water service is a serious problem. There are 810 water connections in the municipality and only 250 pay promptly. Those who do not pay argue that the water is contaminated by the spill. However, municipal officials say that these people have historically not paid and are using the spill as a pretext. People have removed the water meters from homes and shops. As in Banamichi, the elderly are those who pay most reliably. People in the community of San Jose are especially reluctant to pay because some have cattle, which greatly increases their water use. The revenue of the water agency is not enough even to pay for the energy costs of pumping the water from wells. The mayor thus diverts resources from the municipal budget to cover the deficit. According to the interviewee, people have enough money to pay, but they believe that water should be free. Curiously, the majority of the poorest people pay their water bills regularly. There is significant staff turnover in the local water agency, since staffing depends on the three-year electoral cycle, and those who do not pay wait for the election of more flexible officials in order to receive discounts and regularise their situation. Here, the governance trap is evident in the short-term vision of administrators of the water agency who sometimes forgive users' debts, which produces resentment in the users who pay for their service on time. In addition, none of the water officials interviewed identified poverty as a reason for not paying on time. In fact, the poorest in the community are the ones who are most diligent about paying for their service.

In the municipality of Huepac, there is no culture of water use that emphasises its value; water is wasted and there is a high rate of non-payment. Roughly a cubic metre of water per inhabitant per day is consumed. Most people use drinking water to feed their livestock. Even though there are special wells for this purpose, it is more convenient to fill a one-cubic-metre tank with drinking water during

the night. In the morning, it is common to see a large amount of water overflowing from tanks. The system of potable water and drainage is obsolete, with many leaks. The interviewee emphasised that the elderly pay promptly, which he ascribes to the fact that they once had to carry water every day. Now they value the convenience of getting water from the tap at a low price. In general, since the contamination of the Sonora River, people have been more reluctant to pay for water. In this case, the governance trap is evident in the low level of interaction among stakeholders. The culture of water payment has not been passed from parents to children: older parents insist that their adult children pay for their water but the children refuse so, out of embarrassment, some older parents pay their children's bills.

The main short-term problem in the municipality of San Felipe de Jesus is a chlorine dispenser: they have the needed chlorine, but they do not have the apparatus necessary to mix it with the water. The problem has now existed for a year and a half. The water manager says he has been asking for assistance from the state water commission, with no response. There are water meters in homes, but they do not work. Traditionally, there has been a culture of non-payment for water service, but the current mayor has started an aggressive collection campaign. People have responded to the fines, but this tactic raises the question of whether people will punish the mayor's political party in the next election. However, the municipality is small, without political subdivisions, and when there are leaks in the water system the municipal public services agency responds quickly, and people are satisfied with the service. Here, the governance trap is evident in the complex low-level governance arrangements for water service; although this water agency has high water payment rates, it has a serious lack of funding for investment in equipment due to the small size of its population. A subsidiary governance system is required for such smaller agencies in order to take advantage of economies of scale.

The municipality of Ures has low pressure; water does not reach the house roof tanks or the bathroom showers. The main community of the municipality pays a fixed rate, while the small communities pay a community fee which basically pays the energy bill for pumping water from the wells. Of the households in the municipality, 80 percent are not up to date on their water bill payments: 300 families owe 6 to 12 months, 200 families owe 2 to 3 months, and only 80 families are up to date. The Guagui community stands out as one in which everyone pays on time. The water culture in Ures results in leaks and waste of potable water, and there is an incentive to use more water simply because people feel that their neighbours use more water but pay the same. The situation has also been complicated by the toxic spill: people are uncertain if their water is fit for human consumption, which has in turn had a negative impact on users' attitudes about payment. Municipal officials are promoting further studies of the quality of well water, as people distrust the results presented by the national water commission. In this case, the governance trap is evident in the distrust characterising stakeholders' interactions: water users distrust the different water agencies, but they also distrust each other because there is no shared water culture. For some users it makes sense to conserve water and pay for it, while for others water use is a human right even at high levels of consumption and whether or not they pay for it.

Municipalities in the Sonora Sierra region are more populous than those in Rio Sonora; they are also dispersed over a vast territory, but with high rates of access to drinking water and sanitation. Like the municipalities in Rio Sonora, those in the Sonora Sierra also have fixed water rates and few users who pay on time. The average consumption is also around a cubic metre per inhabitant per day. The combination of fixed low water rates, high groundwater consumption, and high energy costs makes for a difficult financial situation. The Sierra region has greater rainfall than the Rio region, an average of 19 inches per year. Table 4 shows the financial scenario in this region, based on the semi-structured interviews.

Table 4. Municipalities and water use in the Sonora Sierra Region (2015).

Municipality	Population (inhabitants)	Population density (inhabs./km <sup>2</sup> )	Houses with access to drinking water (%)	Houses with access to sewerage (%)	Average annual total precipitation (inches)
Arivechi	1163	1.60	97.00	94.80	22.27
Bacadehuachi	1083	1.00	92.40	94.70	19.32
Bacanora	802	0.70	92.30	95.40	20.48
Bacerac	1367	1.00	81.50	84.60	22.04
Bavispe	1457	0.80	92.20	97.50	16.80
Cumpas	6109	3.00	95.30	97.30	18.14
Divisaderos	717	1.90	93.40	97.10	19.32
Granados	1064	2.90	99.10	99.40	19.12
Huachinera	1231	1.00	83.40	93.90	16.81
Huasabas	890	1.10	98.90	99.60	19.32
Moctezuma	4967	2.60	98.70	99.30	18.11
Nácori Chico	2019	0.70	71.00	91.00	19.32
Sahuaripa	5626	1.10	87.30	94.50	23.65
San Javier	557	1.00	61.50	95.90	21.65
San Pedro de la Cueva	1481	0.70	89.50	95.20	15.25
Soyopa	1420	0.80	79.90	90.50	24.05
Tepache	1230	1.60	85.40	97.50	15.25
Villa Hidalgo	1523	1.00	98.00	93.20	19.32

Source: Instituto Nacional de Estadística y Geografía (INEGI), 2015.

The municipality of Arivechi has a water consumption of approximately one cubic metre per inhabitant per day. Drinking water is wasted on household plants and trees, and on cattle. There is a spring exclusively for livestock use. However, ranchers prefer to fill tanks at home during the night because it is more convenient. The interviewee says that it is more efficient to take water from the spring, because in half an hour a rancher can fill the same tank with a pump, while filling the water tank with tap water takes about eight hours. There is one community where the drinking water system uses gravity and does not have high energy costs; its residents pay less than a dollar per month in a self-managed community arrangement. Ranchers value the paid-for water they use on their ranches more than the household water which they refuse to pay for, even though the household price is low. Regarding the intermunicipal water authority, the interviewee considers that it created more problems than it solved. The local water agency is still paying for low-quality plastic water meters that continue to leak, prompting people to remove and replace them. In this case, the governance trap is evident in a lose-lose stakeholder equilibrium, since the local drinking water system is trapped in a logic of unsustainable resource exploitation without any actor able to stop it. The other side of the coin is the self-managed community, where the actors cooperate every month to pay for the distribution of drinking water. Although it is true that their gravity system keeps expenses low, the actors in that community take care that water is not wasted in a way that causes greater expense to the community.

In the community with the governance trap, no one tries to reduce indiscriminate exploitation of water that is not paid for.

Table 5. Water revenues in the Sonora Sierra Region (2016).

Municipality	Users paying on time (%)	Monthly fixed water rates (US\$)	Water agency annual income (US\$)*	Water agency annual expenditure on electricity (US\$)
Arivechi	50	3.43 (household) 5.71 (commercial) 1.71 (elderly)	6180	20,000
Bacanora	20	4.00 (household) 2.00 (empty house) 2.60 (elderly)	1890	10,065
Cumpas	60	8.13 (household) 4.00 (empty house)	161,150	102,900
Divisaderos	90	5.71 (household) 2.86 (empty house)	17,830	19,890
Huasabas	40	4.57 (minimum rate) 6.86 (maximum rate)	12,345	13,715
Moctezuma	60	4.57 (minimum rate) 6.57 (maximum rate)	137,150	97,375
Sahuaripa	40	3.14 (minimum rate) 5.14 (maximum rate)	42,860	68,575
Tepache	80	5.71 (household) 2.86 (minimum rate) 17.14 (maximum rate)	63,775	27,430

Source: Semi-structured interviews of water managers (2017).

\*Conversion rate: US\$1 = MXN\$17.50.

In the municipality of Bacanora, 80 percent of the population is concentrated in the main community, while the rest is divided into two nearby communities. All the inhabitants pay their bills; they do not require enforcement mechanisms. Recently, leaks in the drinking water system were reduced when the pumping system was changed to one that is gravity-based. The current mayor has also begun a policy of cutting service to the minority who do not pay. The interviewee affirms that government employees, who are commonly assumed to not pay for water, have been the first target of the cuts. There is a traditional policy that schools, the city hall, the health centre, and other governmental agencies do not pay for water. The next step in this municipality is to install water meters in houses, although they know it will be difficult to overcome opposition to such a measure. Here, the governance trap is evident in distrust among stakeholders. Although there is a high rate of water bill collection, water users' belief that government employees and offices historically do not pay for the service gives rise to a general feeling of resentment. The governance trap does not allow for the promotion of new projects because of this distrust of municipal and state authorities.

In the municipality of Cumpas, although the municipal government is the largest user of water (with nearly 200 water connections), it does not pay for the service, which is consistent with the tradition

that municipal offices do not pay for water. State and federal government offices do pay for water, but with long delays. The interviewee states that families that do not pay their water bills are clearly identified. There is an urgent need for a strategy to improve water culture, since there is a large amount of waste. There are about 3000 head of cattle in the municipality, many of which drink water from the potable water system. For these reasons people do not accept water meters and are not willing to pay for the water they consume; many people consider water a governmental responsibility that should be free because it is a human right. There is a good deal of hydraulic infrastructure in the municipality that has been abandoned because of staff turnover. One neighbourhood has no service because it requires the connection of nine metres of pipe that pass under a federal highway. A permit must be acquired from Mexico City, more than 1300 miles away – a process fraught with many bureaucratic obstacles – and, in the meantime, these people are without tap water. In this case, the governance trap is evident in the isolated interactions of different organisations. The continuity of water projects between municipal administrations is very low, since every three years a new government brings new projects that set back many of the advances that had already been achieved. In addition, there are no adequate mechanisms for fostering relationships between different levels of government which would help enable the resolution of local water problems.

In the municipality of Divisaderos, there are 300 water connections, 50 of them in the uninhabited houses of people who live outside the municipality, mainly in Hermosillo, the state capital. According to the interviewee, at the beginning of the current municipal administration there were 40 families not paying for water because they were friends or relatives of the previous administration. The new government is requiring everyone to pay, regardless of friendship or family connections. Water service has been cut off to those who do not pay, which has been a difficult process: every month the water manager shuts off service, escorted by police. People become very upset and threaten the water manager, a woman. One violent-looking person, who was fined because he refused to pay, reconnected the water service himself; a clandestine water connection has been detected inside a home whose owner has not allowed authorities to enter. Strikingly, despite a 90 percent rate of timely bill payment, there are financial problems in the water agency. These are caused by people wasting water, not using water meters, and using large amounts of water for quenching cattle thirst and farm irrigation. Extensive water use also means high energy consumption, and therefore higher costs. When it rains there are great savings for the water agency, as there is less use of water for cattle and plants. According to the interviewee, the high rate of timely bill payment is at risk in the next election, because it is probable that the new water manager will use the office in a political way, and the three-year effort to strengthen awareness about payment will disappear. Here, the governance trap is evident in the distrust among stakeholders, since the power of the local water agency is not sufficient to enforce the rules. Certain individuals who do not comply with collective norms threaten the local authority with violence and thus achieve their particular objectives with impunity. There is no rule of law that ensures local justice.

The municipality of Huasabas, along with Granados and Villa Hidalgo, sold water rights so that the state capital would have access to more water through the Independencia Aqueduct (Pineda-Pablos, 2017; Moreno-Vázquez, 2014). These municipalities now require either new sources of supply or an improvement in their current systems. The local water agency in Huasabas is administering a new well to augment the town's water supply. The interviewee believes that the previous intermunicipal water authority was a failure due to excessive centralisation. For example, he mentioned that repairing leaks was very inefficient, with ditches left open for several days or even weeks. The staff of the previous intermunicipal agency argued that projects were not finished due to lack of tools and materials. In this case, the governance trap is evident in centralisation and closed governance mechanisms. The centralisation in governance mechanisms, both in the previous intermunicipal arrangement and in the current municipal water agency, have placed responsibility with a single organisation rather than with a co-governance system of multiple organisations that provide resources to solve local water problems.

The interviewee in the municipality of Moctezuma says the most serious problem there is the lack of resources for the water agency, which causes a vicious circle because the lack of resources prevents investment in better service. They have no operation manuals, procedures, protocols, or internal regulations; there is no administrative structure for the delegation of tasks such as collection or accounting. The interviewee notes that the situation of water agencies in small municipalities requires the support of agencies with greater financial capacity. Another problem is the inability of the local water agency to effectively use the resources it might receive because they are held in the municipal treasury. The resources it has are used without planning – for emergencies, or to take advantage of incentives in state and federal programs. The most reliable bill payers are the elderly and the poor. Cutting the water service of those who do not pay is more expensive and time consuming than cutting electricity or cable television. The municipality has a small number of its users under a measured-service scheme – the only one in this study to do so – and it is one of the few municipalities whose revenue exceeds its energy costs. The metering of service is clearly responsible for keeping energy costs low, as a fixed-fee policy provides an incentive to use more water. Here, the governance trap is evident in the low complexity of the governance scheme. The local water agency is responsible for collecting and providing the service, but the decisions about expenditures are made centrally by the municipal treasury. The priorities for investment in rehabilitation of the pipe network depends on the criteria of the mayor and not the director of the local water agency, which privileges a political-electoral logic over a technical one. We believe that if the governance system were more complex – consisting of distinct organisations with checks and balances – it would probably be more effective in providing sustainable water services.

The municipality of Sahuaripa consists of a number of small communities. Some are difficult to reach: Natora, for example, is a nine-hour journey by automobile over a dirt road. These communities request support from the municipal water agency, but the response is slow due to lack of resources. The infrastructure in the municipality is aging – the pipe network system in its largest community is 30 years old – but one of this municipality's advantages is the availability of surface water. The small communities here organise themselves to meet the costs of water distribution; in fact, the interviewee states that these communities pay more reliably than the larger ones. Another advantage is that this municipality has a fund from mining income that is an important resource for covering the cost of equipment. However, the interviewee considers the water agency's lack of autonomy to be a crucial problem. It has no ability to plan investment, since the revenue collected goes to the municipal treasury where it is administered by the mayor. The culture of water use can be summarised as "I pay for water and use it the way I want". In addition, in a small community where everyone knows everyone else, conflicts are personalised. The opposition political parties take advantage of any problems to make loud complaints. In this case, the governance trap is evident in the short-term perspectives of stakeholders. Although the municipality has extraordinary revenues from its hosting of a mining company, the local water agency cannot plan investment because its finances are managed by the municipal treasury. The spending logic is thus reactive rather than proactive, which results in higher expenses from lack of planning. In addition, long-term objectives such as the sustainable management of water services are undermined by the fierce disputes between political parties and the determination to discredit the opposition in the course of the struggle for power.

The municipality of Tepache has high rates of payment for water service, but also high rates of consumption since homes customarily have fruit trees; the absence of water meters encourages waste. The current municipal administration has used police surveillance to prevent farmers from using municipal water for cattle – there is a well for this purpose, and 87 ranchers pay US\$11.50 a month to use it. This is one of the few rural municipalities in Sonora that is financially self-sufficient, but it does not have the financial resources to make large investments. Here, the governance trap is evident in the low complexity of the governance scheme. The inability of the local water agency to make investments in infrastructure – despite its high collection rates – is explained by a lack of economies of scale. As a

small population with fixed rates, it cannot afford to carry out large projects; however, a more complex governance scheme, with cooperation among municipalities and with the state government, could enable it to make long-term investments.

In sum, the situation of municipalities in rural Sonora is precarious, since there is a high rate of water consumption, no metering of water use, and no culture of payment for water even though users have the ability to pay. In addition, water agencies have no autonomy from municipal administrations; there is high staff turnover with the change of administration every three years; and there is a high degree of financial vulnerability. It is a lose-lose situation, with municipalities caught in a governance trap.

### **WATER AGENCIES IN RURAL SONORA: CAUGHT IN A GOVERNANCE TRAP**

Although multiple schemes of water use can be effective in situations of poverty, when there is a governance trap the situation is different. The multiple schemes are contextualised by an environment without water metering, where users have the ability to pay but, for various reasons, do not want to do so.

As we have noted, a governance trap in water administration entails closed mechanisms, isolated organisations, distrust among stakeholders, lose-lose equilibria, a short-term-goal perspective, and a low level of complexity. These are the characteristics of municipalities in rural Sonora. As local water managers openly admitted in interviews, water agencies develop closed mechanisms with other agencies and users; the incentive system promotes opportunism rather than cooperation; and opportunism is a common practice among the strongest stakeholders. However, in some water agencies and with the largest water users, distrust among stakeholders means isolation between organisations pursuing common goals. For instance, local water agencies feel that the State Water Agency, instead of collaborating on solving problems, mainly just asks for information. In addition, local water agencies have a short-term- rather than a long-term-goal perspective, with long-standing problems in the provision of drinking water and sanitation services. Neither local businesses nor residents have done their part to pay for or demand better service. This scenario has plunged these governance systems into a deep lose-lose situation.

According to interviews conducted with two directors of the State Water Commission, the state's small water agencies have serious administrative problems, including low levels of revenue collection, obsolete fixed rates, and high rates of staff turnover. They add, however, that the intermunicipal authorities have successfully improved the situation. In the period 2005-2009, these authorities promoted the following priorities: micro and macro water metering, commercial and accounting systems, computer systems, vehicles, and training. In addition, the commission provided five million pesos to each authority to cover the costs (mainly energy) of their initial months of operation. However, managers from the local water agencies consider the intermunicipal authorities to be a failure. Although revenue increased, quality of service deteriorated.

The failure of the authorities was the interference by political interests. Some municipal mayors blocked initiatives such as micrometering. The commission also played a part in the failure of the authorities because it took a paternalistic attitude instead of promoting local capacities. It should be noted that after the dissolution of the intermunicipal authorities, some small water agencies are still in legal limbo because they did not return to the legal status of municipal agencies. Institutional weakness is the defining feature of most small water agencies in Sonora. Indeed, the present study lacks much information and desirable statistics because this information is not available.

Given this opacity and lack of information, it is important to emphasise that there are many discrepancies between the official information and that collected by others, especially in data regarding physical efficiency (COLSON-CEA, 2008). Previous studies have recommended increasing effectiveness in Sonoran water agencies by changing the way the smaller ones are administered. The main challenge

they face is lack of autonomy, but they also have no reliable metering systems, and they lack healthy financial systems, since their finances are intertwined with those of municipal governments (Pineda-Pablos and Salazar-Adams, 2008).

In sum, the governance situation is characterised by a number of problematic factors, including a paternalistic culture and the absence of a culture of payment. Popular perception is that the resources allocated to alleviating the effects of the toxic mining spill in the Sonora River went to the wealthy. It is mainly the elderly who pay on time, and younger people are not aware of the issues surrounding water resources. The previous intermunicipal authority was poorly implemented and designed, especially because it was not autonomous. People are willing to pay only when the water agency cuts off their service. The inefficiencies of some business groups have a detrimental effect on the community at large; cattle associations have not organised to dig and maintain their own wells, and ranchers use household water for their cattle despite having special wells for that use. Financing is not autonomous since municipal governments determine the amount of investment in local water agencies. There is no timely maintenance of water systems, and municipalities tend to spend only when problems become urgent, which increases water agencies' costs. Some small communities have self-financing, where members pay their proportion of the energy costs for pumping. The previous experience of the intermunicipal authorities meant that revenue collection increased but the quality of the service deteriorated, since the authorities were located far from the users.

Although the two intermunicipal water authorities were set up to try to break the governance trap, the effort was not successful because the complexity of the governance system was not increased. That is, the organisation was fragmented, with a high level of distrust among stakeholders, and the decision-making process was focused on short-term goals. All these features of the water governance trap entail an overly simple, low-complexity system of governance, which increases the likelihood of falling into the governance trap. Here can be found the key to strengthening water governance capacities and avoiding the governance trap, since simple, low-complexity governance arrangements do not encourage cultivating knowledge to improve public policy. As Brugnach and Ingram (2012) argue, knowledge production needs to include integrative practices to cope with ambiguity and move from bureaucratic processes towards cooperative arrangements based on deliberation, open space for dialogue, negotiation, and learning.

Despite the failed experience of the intermunicipal scheme, we believe that appropriately designed intermunicipal water authorities could be an effective response to the problem of simplicity in the water governance trap. The case of the rural Sonoran water agencies offers lessons about the trap of simple hierarchical governance models in contexts with short-term visions. One way to break out of this trap is by increasing the complexity of the governance model, mainly through including a design where decision-making processes require negotiation between the many stakeholders through public dialogue.

#### **INTERMUNICIPAL WATER AUTHORITIES AS A RESPONSE TO THE GOVERNANCE TRAP**

The findings of this study support the idea that governance networks cope better with complexity than with hierarchical mechanisms alone, however we believe it is necessary to strengthen hierarchical mechanisms in order to have better network governance arrangements. Although the intermunicipal water authority governance structure was implemented ten years ago in Sonora, no significant results were achieved. The governance structure was not sustainable because the state government took the lead, and there was not enough decentralisation to successfully involve other actors, especially municipal governments.

The absence of real decentralisation was the core failure in the implementation of the proposal; no process of decentralisation or empowerment of local actors was carried out. We believe that an appropriate way to implement this proposal is to strengthen governance capacities among the



stakeholders involved, especially water agencies. More than ad hoc solutions, what is needed are real mechanisms to modify the balance of power, costs, and benefits. These mechanisms require a real decentralisation and strengthening of local entities, so they can connect with state and national agencies. Clearly, the most significant factor in the governance trap is the culture of water use in rural Sonora. Here lies the central issue: the leverage to demand better service does not come from users. On the contrary, users – especially the largest ones – benefit from the inefficiency of the system. They have done so for years, and this benefit is part of their water culture. For them, water is a historic right that the government must provide, since their only source of income is from agriculture and livestock. They argue that if you take away their water you take away economic support for their families. However, the interviews suggest that those who use the most water and pay the least are the wealthiest members of communities.

The solution to a governance trap that is advocated by water users is to increase the complexity of the system. In the case of rural Sonora, the new intermunicipal water arrangement needs a shared scheme, with the state government serving as financial agent and a state water agency collecting income and removing the political cost to mayors. The state agency should administer resources and budgets, from which municipal water agencies can request resources for technical projects. The budget should make provision for regional investment, the nature of which should be determined by the mayors involved. The municipal water agencies should be responsible for providing drinking water and sanitation services but should not have any role in the revenue collection process. With this shared scheme, stakeholders would increase their water governance capacity through open mechanisms, connected organisations, relationships of trust, win-win equilibria, sustainable goal perspectives, and a high level of complexity. Table 6 outlines this shared scheme.

Table 6. Shared scheme as a response to the water governance trap.

Level	Stakeholder	Main responsibility	Main water governance capacity promoted
State government	State water agency	Collection of income	Hierarchical governance: enforcement
Municipal government	Municipal water agency	Service provision	Network governance: open and connected
Intermunicipal	Intermunicipal water authority	Distribution of income among municipalities based on local projects; decision-making on regional projects	Network governance: sustainable vision, trust, and win-win
Citizenry	Water users	Watchdogs in decision-making for local and regional projects	Network governance: high-complexity arrangements

This shared scheme is based on intergovernmental cooperation and is monitored by citizen watchdogs. First, revenue collection should be enforced by the state government since this governmental level is further removed from the people and can withstand the opposition to metered consumption. (It should be noted that the greatest success among the intermunicipal water authorities' past strategies was the increased collection of bill payment.) Secondly, service should be provided by a municipal water agency, where municipal stakeholders can require transparency and public accountability. Third, the intermunicipal water authority should be in charge of distributing revenue among municipalities for local projects. This agency should also make decisions on regional projects which are referenced to the basin level, and where trust is a key factor in developing win-win solutions. Finally, water users should be given a role as watchdogs over the decision-making processes for both local and regional projects. With public involvement, the complexity of the governance system would increase since the learning

process and the reaching of agreements would take more time. The complexity of these processes avoids the governance trap that stems from a simple structure rewarding short-term vision.

In summary, the proposal of intermunicipal water authorities in rural areas addresses a governance trap by involving stakeholders who divide their management tasks and share governance responsibilities in a collegial body – thereby avoiding the governance trap that appears when the responsibility for water governance lies mainly with one actor. Such was the case of the Sonora State Government with the intermunicipal water authorities in the period 2005-2009. The same governance trap appeared when the municipal governments took full charge. The solution to the governance trap is thus based on increasing the complexity of the system by dividing and sharing responsibilities among the stakeholders involved.

Indeed, making the system more complex implies a rearrangement in stakeholders' power positions, which would surely encounter resistance. The operational feasibility of our proposal relies on checks and balances, and it requires the commitment of mayors to an intermunicipal arrangement. We believe that it would be an incentive for mayors to receive money from state collection of water bills without having to pay the political costs of measuring and charging for water consumption. This system would be more complex, we feel, and would increase the interdependencies between organisations. The state government would also have the incentive of stronger intermunicipal water agencies with fewer financial bailouts of municipalities. The main losers in this new intermunicipal arrangement would be the water users, since they would pay more for water. We propose a parallel state investment to make alternative sources of water for livestock more accessible as compensation for this loss.

## CONCLUSION

The problem is how to break out of a trap where the prisoners do not want to leave. We propose the scheme of an intermunicipal water authority as a response to this governance trap, but a different one than the previous experience in rural Sonora. A shared governance structure is the way to liberate the stakeholders involved. We believe the main alliance must be between the state and municipal water agencies, since all of them would share the political costs. Specifically, the separation of the state's role as revenue collector and the municipalities' role as service providers is crucial to the success of this intermunicipal initiative. In addition, the intermunicipal authority would be the element that has more of a learning process since stakeholders must exchange their culture of hierarchical management for a new collaborative-network culture. The big losers in this institutional change would be consumers, who would lose their comfort zone and pay a higher and fairer price for their water. They would likely fight to go back to the comfort zone. If the state-municipality alliance is strong enough to resist them, then consumers will press hard for the water agencies to provide their services as effectively as possible. Breaking out of the governance trap requires separating the responsibility of water agencies from that of their municipality so that the political cost of institutional change is dispersed among them. In the long run the water service is likely to professionalise and become more reliable and efficient.

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