INSTITUTIONAL ARRANGEMENTS FOR INTEGRATED WATER RESOURCE MANAGEMENT IN MEXICO

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Abstract.
The decentralized policy adopted in Mexico for water management in the early nineties included a reform of the normative framework and the modification of the organizational structure surrounding water issues. However, after fifteen years of implementation of this policy, water problems persist and even seem to have increased. We consider that the institutional framework redefinition was not completely achieved, mainly because some policy measures were not included in the decentralized policy design, and because it did not consider important characteristics of the social environment in which it would be applied. Some of the specific topics discussed are the scope of this institutional framework and the failures in some institutional arrangements related to incentives and restrictions for participants in local management systems. The analysis is developed through both Williamson's and Ostrom's theoretical approaches, recovering empirical evidence from the author's research work.

Key words: Decentralization of water management, Common Pool Resources, Mexico.

For a long time, water management was based in the assumption of its public-good character, which justified an equal public character of water management systems. In the late XXth century, a general movement emerged encouraging private participation on water management and the so-called commodification of water (Barlow and Clark, 2002). Through a comparative analysis of European water systems, Bernard Barraqué (1995) discussed this trend and related it to a crisis in municipal water management since in Europe most of the countries had implemented municipal management for water services. According to Barraqué, a financial crisis and increasing difficulties in water availability lead some European countries to change the management model to get private participation into the sector.

Although this change occurred in the eighties for European countries, all through the nineties many developing countries followed this wave, modifying their legal framework in order to allow a wider private participation in water sector. This policy of private participation was seen by some local actors as a danger for the human right to water, since private companies could give water a commodity character and only those who pay would have access to it. Private participation had different outcomes and impacts in the countries where it has been adopted. In Latin America, the most relevant experiences have been those of Buenos Aires City and Cochabamba, in Argentina and Bolivia, respectively. Both cases are well known for all the difficulties involved in the development of private participation and the social rejection of this form of management. Private interest in managing water systems decreased, even if firms continue participating in several stages of water cycle, mainly water treatment and construction of infrastructure.

However, the debate concerning the nature of water, considering it as a public good or as a commodity, is still unsolved. It is not an irrelevant discussion, since the implications of considering water either as a public good or as a commodity will be an important element in defining the institutional framework for water management. In economics, a public good has two main features: non-rivalry and non-excludability. By the first feature, a public good's consumption by an individual does not imply any reduction on other's consumption; by the second one, it is not possible to exclude individuals that have not contributed to the public good provision from its consumption. From this perspective, water could not be considered a pure public good. In this paper, we state that water management's issues would be better understood if we consider water as a common-pool resource.

The common-pool resource concept was proposed by Elinor Ostrom (1990) in discussing Garret Hardin's identification of "the tragedy of the commons" (1968), meaning a situation where the users of a resource undertake consumption strategies that lead to the resource's destruction. According to Harding, this situation had no technical solution, since the individual maximizing strategies would inevitably lead to that tragic ending. Ostrom disagreed on the assumption of inevitability and she has developed a systematic work of studying concrete experiences where the tragedy had been avoided. On that basis, she defined the common-pool resources (CPRs) as "natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits to its use" (Ostrom, 1990: 30). Even if they constitute a collective form of property, since the excludability is possible CPR are not public goods. However, given the high cost of this excludability, they cannot be considered as private goods either.

Through the analysis of several successful experiences of CPRs management, Ostrom (1990) found out that all the collectivities involved in them had an institutional framework that made possible their self-organization. It is important to mention that this institutional framework is designed by the resource users (appropriators, in Ostrom's terms), and being a creation of their own, it has enough legitimacy to be obeyed, respected and enforced. According to her analysis of long-enduring CPRs institutions, Ostrom identifies some design principles to construct them; they are synthesized in Table 1.

Table 1
Design principles proposed by Elinor Ostrom

1. Clearly defined boundaries
2. Congruence between appropriation and provision rules
3. Collective-choice arrangements
4. Monitoring
5. Graduated sanctions
6. Conflict-resolution mechanisms
7. Minimal recognition of rights to organize

And an additional principle, referring to CPRs inside larger systems:

8. Nested enterprises

Source: Ostrom (1990: 90).

On a later work, these design principles are complemented by the consideration of some contextual variables that could have an influence in the structuration of collective action for managing CPRs (Ostrom, Gardner and Walker, 1996):

a) The actors' preferences, concerning potential actions and results.
b) The ways in which actors acquire and use information, as well as their knowledge about the resource.
c) The criteria applied to choose a specific course of action.
d) The resources that actors mobilize in a given situation.

In this point of her work, Ostrom had softly moved her main interest from the study and analysis of CPRs management to the study of action situations, which in turn would be the basis for her Institutional Analysis and Development (IAD) framework. In order to analyze an action arena, some specific variables must be considered (Ostrom, Gardner and Walker, 1996):

Table 2
Variables of analysis proposed by Elinor Ostrom

1. Participants
2. Positions
3. Actions
4. Potential outcomes
5. A function mapping actions into realized outcomes
6. Information
7. The costs and benefits assigned to actions and outcomes

Source: Ostrom, Gardner and Walker (1996).

In general, participants are mainly the appropiators or users of the CPR. However, the possibility of including an external actor in order to monitor compliance with the rules is still present. On the other hand, each actor holds a position inside the system either as part of the appropiators or as the agent in charge of monitoring; at the same time, if the collectivity is organized by a rotation system to use the CPR, the position of legitimate user will also rotate among them. Action is related to resource appropriation, while potential outcomes depend on the orientation of rules to conform a cooperative strategy. This relationship could be represented through a function mapping how they are linked to each other. Finally, the effectiveness of the institutional arrangement is based on the information shared by all participants, including knowledge of the rules and sanctions and also knowledge about resource characteristics which influence its production and provision. The institutional arrangement for local water management systems result from the combination of these elements.

The point on Ostrom's work is to identify the conditions needed to allow appropiators to develop capacities of self-organization, so they could devise optimal rules to use the CPR and modify their own action constraints. In proposing design principles to achieve this goal, her theoretical and conceptual framework is directly linked to the economic approach of institutional analysis.

A basic concept of this institutional approach is Douglass North definition of institutions as "the rules of the game in a society or (…) the humanly devised constraints that shape human interaction" (North, 1993: 13). Rules structure incentives for human exchange, which is exactly what Ostrom's work is about. Both, North and Ostrom, accept the maximizing assumption of neoclassic economics, putting it into a context of constraints and opportunities provided by institutions.

In a more recent work, Ostrom (2005) defines institutions as "the prescriptions that humans use to organize all forms of repetitive and structured interactions including those within families, neighborhoods, markets, firms, sport leagues, churches, private associations and governments at all scales" (Ostrom, 2005: 3). From both definitions we can conclude that institutions structure social life and at the same time they are structured by social life.

In the case of water, the institutional arrangement concerns the set of rules and incentives that define who are the individuals that have the right to get into the sector and participate in water management, and also which are the faculties of each participant.

In Mexico, water resources are not homogeneously distributed through national territory. To show the differences, we can quote Tortolero (2000) who mentions that water availability for a citizen of Baja California reaches 100 m^3/d, while a citizen in Chiapas would have 17 000 m^3/d. At the same time, "in the last 40 years water availability for each Mexican inhabitant has fall from 11,000 m^3/y to 4,900 m^3/y. If this trend continues, in 25 years the amount of water available for year would reach 2,500 m^3, this could lead to important conflicts" (Carabias, 2004: 58).

Since demand exceed extraction capacity, several regions face a problem of over exploitation of aquifers and use of groundwater with high extraction and treatment costs. These problems which appear to be essentially technical could be treated from an institutional approach:

“Different water institutions handle many issues from assessments, quality, rights and water prices to management of water services, and their performance will be influenced by wider capacities related to power exercise and human resources” (Grey and Sadoff, 200: 29).

Therefore, effective water management requires solid institutions to contribute to a responsible management based on equity. On a micro level, as is suggested by Ostrom’s analysis of CPR’s, some institutional arrangements can help to achieve this goal if it favors the adoption of cooperation strategies on behalf of all sectors involved in water management. In contrast, a well designed technical solution could be blocked if the current institutional arrangement does not establish incentives for cooperation.

In Mexico, during the nineties, a decentralized policy was implemented for water management. As part of this new policy, there was a deep modification of the institutional arrangement in work. Concrete measures included the possibility of participation of private firms on water sector, and also the inclusion of citizens participation through representation of different users in public water agencies. Other concrete actions were:

1. Creation of National Water Commission (Comisión Nacional del Agua, Conagua) in 1989, regulatory agency for water sector.

2. Organization of national territory in hydrological-administrative regions, taking as point of reference natural basins, and complemented by the creation of Basin Councils (Consejos de Cuenca).

3. Urban water use was declared under the jurisdiction of municipal governments, with the support of state governments. This included municipalities’ faculties for signing allocation deeds with private firms.

4. Faculties for National Water Commission (Conagua) of surveillance of all participants in water systems, in order to guarantee law enforcement, and also for acting as a referee in case of conflict.

After the National Water Law (Ley de Aguas Nacionales), each state was charged with the creation of state laws that should be congruent with the federal law. However, this institutional change seem to have a moderate impact on water situation in Mexico, even if more than ten years have passed by. We will comment on this situation using the theoretical framework of CPR’s mentioned above.

CPR’s theoretical framework applied to water problems in Mexico.

Following Ostrom’s and her colleagues definition of CPR’s, their two main characteristics are: a) difficulty of excluding individuals that could benefit from resource provision without contributing to it; b) the fact that each unit used by an appropriator reduces the provision for the collectivity. The first feature is present in the case of water since excluding non-cooperating individuals is technically possible but politically unfeasible. The second feature applies clearly to the case of water, since water consumption by a user decreases its availability for other users, in other words, they are competing for the resource.

Nevertheless, most important to classify water as a CPR is the fact that in its use there are several actors with different levels of participation using water sources repeatedly and therefore establishing an interdependent relationship. Moreover, water presents the treats of the natural resources analyzed by Hardin in his discussion of the tragedy of the commons, being a shared resource basic for the surviving of every collectivity its rational use should guarantee its long term provision. However, in the absence of effective incentives to stimulate cooperation, water can easily be overused.

The problem of water management in Mexico can be discussed through the three problems for CPR’s identified by Ostrom (1990):

1. The problem of provision of an institutional framework for water.

In the case of Mexico, before decentralization this framework was defined by a central authority. In transferring water to local governments, a greater engagement of local authorities in key decisions concerning water was intended. However, federal government keeps the faculty of institutional design. Thus, in reality the new institutional design was centrally defined and reproduced at the local level. Municipalities had not the faculty of designing an institutional framework according to their particular features and needs.

Moreover, Basin Councils and Water State Commissions were all based in a similar design, based on the representation of users. That means that users have not been directly involved in the institutional design for water management, it is always done by some governmental authority of the three different government levels.

2. The problem of establishing a credible engagement between actors involved in a water management system.

In his analysis of contracts, Williamson (1989) underlines that credible engagement facilitates exchange and alliances between those who are interested in preserving their relationship. In CPR's case, this implies the recognition on behalf of appropriators that they have to share the resource and use it in a collective way. Ostrom (1990) mentions two conditions necessary or achieving this commitment: 1) that appropriators be sure that other members of the collectivity will assume it in the same measure; 2) that they conceived the cooperation strategy as the one that would give them more benefits in the long term. That means that benefits of this long term strategy are more attractive than those of the individual, short term strategies leading to selfishness and non-cooperation. Besides that, Ostrom (1990) shows that since appropriators are in charge of defining the terms of commitment that increases its legitimacy and credibility.

This is important since if individuals perceive that there is a credible commitment, the institutional arrangement would have more chances of lasting. In terms of Goodin (1996), it will be strengthen enough to make possible its adaptation to new situations. This is fundamental if we consider that one of CPR's main features is the fact that appropriators are linked by a repeated and permanent use of the resources, which makes very important long term benefits.

Is Mexican context an appropriate scenario for constructing such credible commitments? In an article about institutional change in water sector for several developing countries, Meublat and Le Lourd (2001) outline how quick Mexican water institutional reform took place, and how easily Salinas' government (1988-1994) could dictate a new law. This efficiency could be explained by the centralized organization of government at the time, allowing a quick acceptance of new rules. Given the strong control mechanisms of federal government at the time, it was easy to construct the credibility of commitments: local actors interested in maintaining the privileges received from federal government will be ready to follow the new rules of the game.

However, this situation reflected a contradiction: the decentralized model was based in democratization and opening of water management systems, but credibility of their commitments depended on the control capacity of national government. Thus, the new institutional arrangement created a tension on the system.

3. The problem of mutual surveillance between users and water managers.

Since his discussion of the tragedy of the commons, Hardin (1968) pointed out the importance of responsibility on behalf of a CPR users, underlying the necessity of a "mutually accorded coercion", in order to orientate individuals' choices. However, the author did not develop this idea nor illustrated it through some empirical examples.

From the experiences analyzed by Ostrom (1990), the commitment was enforced and became more credible thanks to the application of graduated sanctions on behalf of those in charged of

its surveillance and monitoring. This is important since being themselves resource appropriators made it possible for supervisors to have a greater interest in detecting and sanctioning failures.

In the case of water, there is a general acceptance of the idea that provision difficulties could only be solved through a shared responsibility perspective. However, in Mexico, only Conagua has monitoring and sanctioning faculties and users' participation through civil associations is limited. Monitoring, therefore, goes in a one-way sense.

Either at the local level is possible to find mutual surveillance, it is only the public authority who monitors civil society. Concerning monitoring, the institutional arrangement is clearly limited and potential modifications should establish differentiated surveillance mechanisms for each kind of user.

We can also ask if the institutional design principles proposed by Ostrom (1990) apply for Mexican water management. We will develop a brief discussion about them:

1. Clearly defined boundaries. The National Water Law helped to define water property rights, mainly concerning irrigation systems. It is an important achievement considering that agricultural use is the greater water consumer in Mexico. However, this achievement remains incomplete while it does not consider other users (domestic, industrial and services).

2. Congruence between appropriation and provision rules
   This principle is accomplished in a limited way, since state governments are the ones that thorough the state water law, establish which are the features that must be adopted by municipal water utilities. Moreover, as it was mentioned before, state laws reproduce a model defined by federal government and they do not reflect local social dynamics.

3. Collective-choice arrangements
   Neither this condition is accomplished since users are represented in the administrative boards of municipal water utilities. Moreover, this administrative boards do not establish water sector regulation. Consequently, individuals directly affected by the rules are not the ones that define them.

4. Monitoring
   Water surveillance in Mexico is an exclusive faculty of Conagua, leaving this design principle unaccomplished. Even if, having users' representation we can consider that municipal water utilities are accountable before them, once again the problem is one of quality of representation. Moreover, monitoring capacity of this utilities is relative and is often limited to follow the private firm work in case of an allocation deed.

5. Graduated sanctions
   In a similar way, sanctions are established in each contract and they refer mainly to the activity of the private firm. Where there is not allocation deed, sanctions are defined in state level thorough local water law and the present a great variety.

6. Conflict-resolution mechanisms
   In the case of an allocation deed, this mechanisms should be defined in the contract, but even in those cases the agency charged of solving these situations is Conagua, in other words, the centralized office. There are not conflict control mechanisms locally defined, nor are the discussed by local appropriators.

7. Minimal recognition of rights to organize
   In our description of institutional arrangement we mentioned that the local institutional framework is constructing according to the federal model, therefore there is not a real knowledge of the capacity of self-organization on behalf of local actors.

We can conclude concerning both the managing of conflict and the principles of institutional design that their definition and application in water management in Mexico were implemented without a real integration of appropriators in order to achieve a successful implementation.

Even if we must avoid a reductionism explaining water decentralization failure with the argument of a complete subordination of local authorities to national government, we must recognize that in water sector the key decisions are still concentrated on the national instances. That is one of the reasons why Mexico's water problems persist. We consider that a fundamental element to make the necessary adjustments in the institutional arrangement is the effective involvement of water actors.

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