

7. Evaluation of public participation towards sustainable water management: an institutional perspective

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I. INTRODUCTION

Sustainable water management has been on the global agenda for more than thirty years. The United Nations Conference for Water was held in 1977 as the initial effort on an international level. However, water issues faded from the agenda until the 1990s, at which time they gained a new impetus. Through the International Conference on Water and the Environment, which proved to be a major initiative for action through the Dublin Principles (ICWE 1992). The Dublin Principles outlined the challenging need to integrate the following dimensions of sustainable water management:

- *ecological*: respecting water as a vital, limited and vulnerable resource needed for survival and development;
- *social and institutional*: enabling access to water, ensuring equity among the stakeholders of all sectors and taking into account the concerns, perspectives and interests of all stakeholders through participation; and
- *economic*: considering water as an economic good that is demanded by competing sectors and requires cost-effective processes for finding, development, storage and distribution of water as well as the operation and maintenance of infrastructures.

As reflected in all these dimensions, the limited water resources should be divided among the competing domestic, industrial and agricultural sectors. In many countries, the agricultural sector has the highest share of total water use due to crop irrigation. Therefore, the impact of water use in irrigation is

significant for sustainable water management. On the one hand, enough irrigation water must be supplied in order to produce food. On the other, demand for irrigation water should reflect a concern for sustainable water use, since nothing should threaten the availability of water resources to other sectors or the sustainability of soil resources.

Irrigation systems, that is the physical and institutional elements that enable the withdrawal of water from the source, and movement of the water to the root zone of land (Small and Svendsen 1990), enable the use of water for irrigation. Collective action is needed for sustainable management of these systems, since they constitute examples of common-pool resources (CPRs) due to the following characteristics (Ostrom 1990):

- Excluding the potential water users from the irrigation system might be costly, not only in economic or social terms, but also due to technical or institutional constraints.
- Since irrigation water is subtractable, i.e., the units withdrawn by a user cannot be used by others, over-extraction of water resources by a group of users might cause availability problems for other users.
- The public infrastructure, i.e., the physical components that support the provision of irrigation water to the users, should be maintained in order to ensure continuous water supply.

In recent decades, it has been widely accepted that public participation, that is, the involvement of individual and/or organised public members in the decision-making processes, brings about an opportunity to improve environmental management by incorporating the knowledge, values and perspectives of the public (Eden 1996; Dietz 2003; Pound et al. 2003). The situation is no different for water management, as demonstrated by the policy documents and scholarly literature. Participation of stakeholders was among the Dublin Principles almost two decades ago (ICWE 1992). The Water Framework Directive, enacted as the major water policy document of the European Union, set ambitious goals for participation (CEC 2000). In the recent scholarly literature, public participation is mentioned as a building block of water management (Kallis and Nijkamp 2000; Jaspers 2003; Mostert 2003; Delli Priscoli 2004; Creighton 2005; Sijbesmaa and Postmab 2008).

Since farmers are the users of water in the agricultural sector, they can play a key role in achieving sustainable water management. The actions of both individual farmers and their organisations are of particular importance due to the relationships that they bring about (Small and Svendsen 1990). Institutions constitute a key variable with regard to actions, since they have multiple functions such as shaping the permitted, prohibited and allowed actions, reducing uncertainty by providing structure to human interactions

and creating a common meaning for actions and outcomes (North 1990; Ostrom 1998). Through participation, farmers and their organisations can establish institutions, that is the formal and informal rules of action, for sustainable water management.

With regard to farmers' participation in the management of irrigation systems, the concept of participatory irrigation management (PIM) has become relevant in the last two decades (World Bank 2007). PIM enables the participation of individual farmers and their water user organisations (WUOs) in the decisions related to irrigation management. PIM is implemented in many countries where irrigated agriculture is practised. The major motivation to implement PIM has not always involved the farmers in management decisions, but has decreased the burden of operation and maintenance costs on public water agencies. Accordingly, the widespread implementation of PIM, especially in developing countries, has been a part of development assistance or privatisation programmes that aimed at transferring the irrigation systems from public agencies to WUOs or private organisations (Svendsen and Meinzen-Dick 1997). Nevertheless, there is ample evidence from many countries that PIM contributes to sustainable irrigation management and to the capacity building of individual farmers and their WUOs (Groenfeldt and Svendsen 2000; FAO 2004).

Development of 'frameworks that can facilitate the direct involvement of appropriators in governing common-pool resources' is suggested as a means of achieving collective action in CPR management (Ostrom et al. 1994, p. 242). Such frameworks essentially require users' participation in the decision-making processes of collective action, and the following benefits are expected from participation (Ostrom et al. 1994; Johnson 1997; Marshall 1999; Ostrom 1999):

- *Providing opportunities for learning individually and collectively:* Users can learn from the experiences of other users and ascertain the impacts of individual actions (both by themselves and by other users) on resource sustainability. They can also comprehend the costs and benefits of breaking and following the rules.
- *Building a sense of ownership:* Participation demonstrates to the users that each of them has a stake in the state of the resource that they use and that their knowledge and perspectives are important for the sustainability of the resource. Thus, it becomes more probable that the users adopt the rules and adapt them to local circumstances.
- *Improving compliance:* Through participation, users can keep track of their own actions as well as the actions of other users and make sure that collective commitments are kept by everyone. Participation

also enhances the perception of the users that the sanctions are imposed on those who violate the rules.

These benefits can reinforce each other as participation processes occur in time. When users participate in the decision-making processes, they have more opportunity to understand and adopt the rules by learning from each other, to provide their local knowledge for devising equitable and efficient rules and to follow those rules effectively (Baland and Platteau 1996). Hence, it can be suggested that participation of users fosters collective action in CPR management and that building participatory institutions contributes to collective action.

Given the connection of public participation and collective action to sustainable water management, it can be worthwhile to evaluate the institutions of public participation related to those of collective action. Accordingly, answering the questions below can contribute to the evaluation of public participation from the standpoint of institutions:

- What are the institutions of the decision-making processes of CPR management?
- Which institutions of collective action shape the participatory mechanisms?
- How can the institutions of participatory mechanisms be systematically extracted from the institutions of collective action?

In order to answer these questions, one needs to explore the institutional characteristics of participatory mechanisms that can contribute to the establishment of institutions of collective action. In the scholarly literature, there are various approaches to evaluate public participation activities – see Ashford and Rest (1999), Chess (2000), Rowe and Frewer (2004) and Özerol and Newig (2008) for reviews of approaches to evaluate public participation. However, to our knowledge, no institutional approaches have been developed with the goal of evaluating the degree that participation fosters collective action in CPR management. Therefore, our motivation in this chapter is to develop such an approach and to introduce a set of principles to evaluate the institutions of public participation, particularly for the case of irrigation water management.

II. BASIC CONCEPTS: COLLECTIVE ACTION, COMMON-POOL RESOURCES, INSTITUTIONS AND SOCIO-ECOLOGICAL SYSTEMS

Collective action is defined as ‘the activities that require the coordination of efforts by two or more individuals’ (Sandler 1992, p. xvii). CPRs such as forests, fisheries and irrigation systems, are characterised by the need of users to engage in collective action (Ostrom et al. 1994). An elaborate study of collective action for sustainable management of CPRs should address all related variables that are identified as follows (Ostrom 1999):

- attributes of the resource and the community;
- institutions about management; and
- interactions among the variables.

As explained for the irrigation systems above, CPRs have three basic attributes that call for collective action. However, collective action problems may arise due to these attributes. Subtractability of the resource and difficulty of exclusion may cause the users to have incentives to extract the resource excessively and to free-ride with regard to the maintenance of the infrastructure. As a result, the system may become prone to deterioration and even extinction. The major attributes of the community are the values of behaviour, the level of common understanding about how the system works and the extent of homogeneity in the preferences (ibid.). Additionally, the users’ awareness of and capacity to engage in collective action can be considered crucial for the sustainability of the CPR. Constituting the final set of variables, institutions are the formal and informal rules inherent in the system (North 1990; Ostrom 1990).

Anderies et al. (2004, p. 18) define a socio-ecological system as ‘a subset of social systems in which some of the interdependent relationships among humans are mediated through interactions with biophysical and non-human biological units’. Given the interdependency of and the interactions among the resource and the users, an appropriate approach could be to discuss CPRs on the scale of a socio-ecological system and to explore the achievability of collective action within a single system. Such a system would comprise CPR, resource users and other elements that enable the users and CPR to interact with each other.

The institutional approach to collective action asserts that a collective action situation is the sum of institutions that shape the actions of actors and the interactions among the actors. Rules defined at different scales affect the structure of collective action situations and in turn the way that individuals act and the outcomes of the socio-ecological system (Ostrom 1998). It is

inevitable that the outcomes at different scales interact with the rules at the same or at different spatial and temporal scales. If the design of the rules at each scale is not aligned with the dynamics of social and ecological elements, then problems can be experienced at the system level. The match between the institutions and the key physical attributes of socio-ecological systems is referred to as ‘institutional fit’ (Ostrom 1990).

The rules that interact at different scales are called ‘nested rules’, that is, one set of rules defines how other sets of rules can be revised and changed (Ostrom 1998). An approach to categorise the nested rules of collective action is to put them into three hierarchical levels: operational, collective choice and constitutional choice (Kiser and Ostrom 1982). At the lowest level, the operational rules affect the operational situations, for example, provision, extraction, monitoring and enforcement. The rules at the upper level are the collective-choice rules, which define how the operational rules are made and by whom the operational rules can be defined and changed. Finally, the rules at the constitutional-choice level indirectly affect the operational level actions since they define how the collective-choice rules are changed. The number of hierarchical levels can be increased for defining the meta-constitutional situations (Ostrom 1999).

III. A CONCEPTUAL FRAMEWORK OF COMMON-POOL RESOURCE MANAGEMENT

The basic elements of the CPR as a socio-ecological system mentioned before are the resource, resource users and public infrastructure. Anderies et al. (2004) identify public infrastructure providers and external environment as two additional elements. Public infrastructure providers, for example, officers from public agencies, are responsible for the appropriation and provision of the resource to the users and they constitute a crucial element for studying public participation. External environment includes the sources of disturbance to the resource and infrastructure (e.g., weather and geological events) and to the users and providers (e.g., economy and political system). We acknowledge that external environment has a crucial impact on the functioning of socio-ecological systems. Nevertheless, for the purpose of keeping the focus on interactions between the resource and humans, that is the users and providers, we exclude the external environment from consideration. Actions enable the interaction of users and providers with other elements within the underlying formal and informal rules. Therefore, we consider them as the fifth element of the framework. In order to reach a compact set of actions, we utilise Ostrom’s (1990) design principles of institutions for

sustainable management of CPRs. These principles and the basic action(s) that can be inferred from each principle are summarised in Table 7.1.

Table 7.1 Design principles for institutions and related actions

<u>Design principle</u>	<u>Related action(s)</u>
The individuals or households who have right to use resource are clearly defined	Users use the resource
There is a proportion between the amount of resource used and the effort devoted to infrastructure maintenance	Users use the resource Users maintain the infrastructure
Monitors are the users themselves or they are accountable to the users Users who violate the rules are sanctioned by the monitors and/or the users	Monitors monitor resource use Monitors monitor infrastructure maintenance Users organise to assign monitors Users organise to sanction violation
The users who are affected by the rules about resource use can modify those rules There are low-cost, local arenas for conflict resolution among users or between users and providers Users have the rights to devise their own institutions Activities for the above principles are organised in multiple layers of nested enterprises	Users/providers regulate resource use Users/providers regulate infra-structure maintenance Users organise to change existing rules Users organise to devise new rules

Source: Developed by the author on the basis of Ostrom (1990).

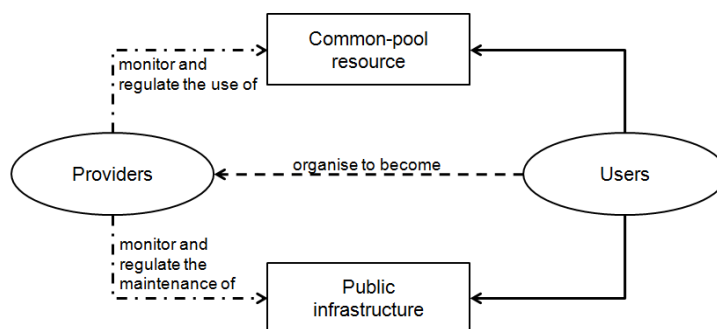
Based on Table 7.1, the actions of users and providers can be categorised into five main groups:

- Users use the CPR.
- Users maintain the public infrastructure.
- Providers – or organised users – monitor and regulate the use of CPR.
- Providers – or organised users – monitor and regulate the maintenance of public infrastructure.
- Users organise to become providers and take action.

Having identified and described all the elements and their interactions, the resulting framework is illustrated as shown in Figure 7.1.

IV. APPLICATION OF THE FRAMEWORK TO THE CASE OF IRRIGATION SYSTEMS

Participatory institutions indicate users' involvement in the rule-making processes. Therefore, 'participatory rule-making' can be used as an umbrella



Notes

Directed arrows from users imply the actions that users take directly, i.e., 'use' and 'monitor', and the actions that they take indirectly through participation, i.e., 'regulate' and 'monitor'. If users take the action of 'organise to become', then they act like providers through participatory mechanisms. Hence the actions of providers, i.e., 'regulate' and 'monitor', can be partly or entirely taken over by the users themselves.

Figure 7.1 A conceptual framework for CPR management

term to imply user participation in the decision-making processes regarding the definition, enforcement and revision of the rules. The degree of participatory rule-making can be assessed by investigating the existence of actions that the users take in the rule-making processes. As explained in the above framework, use, maintain, regulate, monitor and organise are the five basic actions, and all the rules related to these actions are institutions of collective action. When the users take action in CPR management, they participate in the rule-making processes, too. Hence, participatory rule-making occurs within the institutions of collective action and the institutions of public participation can be inferred from within the institutions of collective action.

In the following subsections, we elaborate on the institutions of participation by applying the framework to irrigation systems, which constitute an example of CPRs, and categorise the institutions of participation as nested rules by adapting the above-mentioned three-level hierarchy. The empirical data are gathered through the secondary analysis of findings from a field study (Özerol 2007). Before the discussion of institutions, we briefly present the context, scope and methodology of the field study.

Description of the Field Study

The field study aimed at collecting and analysing empirical data as part of the evaluation of public participation during the development of indicators for sustainable water use in irrigation. It was carried out in 2005 in Harran

Plain, a region located in south-eastern Turkey. In the last two decades, irrigation development investments have been made within the scope of a regional development programme (GAP – South-Eastern Anatolia Project), so irrigated agriculture has been practiced since 1995. With regard to the impacts of irrigation on the sustainability of water and soil resources, problems were reported about water-use efficiency, drainage and soil salinity (Kendirli et al. 2005; Yazar et al. 2002).

The State Hydraulics Works (DSI) and WUOs are the two key stakeholders of irrigation management in the region. DSI is the public organisation responsible for the planning, development and administration of water resources at national level. It has a general directorate and 26 regional directorates. Two officers of the regional directorate responsible for Harran Plain were interviewed. WUOs are the legal entities comprising the local authorities and representatives of farmers after the transfer of irrigation management from the DSI. They are responsible for the distribution of water to farmers, as well as the operation, maintenance and repair of the irrigation infrastructure. Five out of the 11 WUOs in the region were contacted. In addition to the interviews with two organisations, conversations were made with farmers.

Qualitative data collected through the interviews and the review of related documents were used for an institutional analysis of irrigation water use. The context was examined in terms of the attributes of the resource, providers and users, as well as the social and cultural conditions of the region. The rules at constitutional-choice, collective-choice and operational levels, the outcomes at the system level and the actions of the stakeholders were investigated and discussed.

Institutions of Participation

We use the findings from the secondary analysis of the field study to discuss the interactions of actors with other elements and to formulate a set of questions related to the rules at each level. We also identify possible answers for each question, since there can be one or more answers depending on the local context. In order to provide questions with a standard structure, we investigate the seven types of working rules, that is, entry and exit, position, scope, authority, aggregation, information and payoff rules (Ostrom 1998) and utilise the ADICO format, which consists of the following components (Crawford and Ostrom 1995):

- *Attributes*: the properties of the group to which the rule applies.
- *Deontic*: the operator from deontic logic that specifies whether the rule permits, obliges or prohibits a certain action or outcome.

- *Aim*: the action or outcome that the rules refer to.
- *Conditions*: the set of variables that specify when, where and how the rule applies.
- *Or else*: the sanction assigned to detected noncompliance with the rule.

Zero-order institutions

There are institutions about resource use and infrastructure maintenance, whether or not the users participate in decision-making processes. These rules form the basis for the ‘use’ and ‘maintain’ actions linking users to resource and infrastructure, respectively. In other words, the users cannot engage in collective action without the establishment of these rules. Such rules can be called the ‘zero-order institutions of participation’. The questions to reveal the zero-order institutions and their possible answers are presented in Table 7.2.

Zero-order institutions can have a direct impact on the sustainability of the CPR and the infrastructure, since they are the underlying institutions that shape how the resource is used and how the infrastructure is maintained. If there is a problem with the definition and enforcement of these rules, it is likely that there is a collective action problem, too. So, the zero-order institutions should be tailored according to the attributes of the resource and the infrastructure. For instance, if the resource is highly subtractive, attention must be paid to the efficiency, fairness and enforceability of the rules (Ostrom 1990; Ostrom et al. 1994).

First-order institutions

The actions ‘use’ and ‘maintain’ are not directly related to the decision-making processes of irrigation management but rather to the inputs, outputs and boundaries of the processes of water use and infrastructure maintenance. Participation of users in the decision-making processes can be assessed by investigating whether or not the actions assigned to providers, that is, ‘regulate’ and ‘monitor’, are taken by the users, too. When the users participate in the definition and enforcement of the zero-order institutions, they have the opportunity to make rules during two basic processes, namely regulation of resource use and infrastructure maintenance and monitoring of resource use and infrastructure maintenance. Accordingly, the rules related to regulation and monitoring shape the way that rules about use and maintenance are defined, enforced and monitored. This higher level of rules also includes those about the participation of users in the processes for the definition, enforcement and monitoring of the rules about resource use and infrastructure maintenance. We call such rules the ‘first-order institutions of participation’.

Table 7.2 Questions for studying the zero-order institutions of participation

Use of irrigation water		Maintenance of irrigation infrastructure	
Questions	Possible answers	Questions	Possible answers
What are the requirements to have permission to use water?	<ul style="list-style-type: none"> • Field near the main irrigation canal • Membership to WUO • Payment of fees 	Who is obliged to do the maintenance works?	<ul style="list-style-type: none"> • All users • Users without managing duties • Hired workers
When are the users permitted to use water?	<ul style="list-style-type: none"> • During the irrigation seasons • According to a distribution schedule 	When must the maintenance works be done?	<ul style="list-style-type: none"> • Before/after irrigation seasons • Whenever there is a leakage or damage
What are the irrigation methods that the users are permitted (or obliged) to use?	<ul style="list-style-type: none"> • Drip irrigation • Furrow irrigation • Spray irrigation 	In what ways are the users permitted (or obliged) to contribute to maintenance?	<ul style="list-style-type: none"> • Labour • Supplying equipment • Payment of costs
What is the basis to determine the irrigation fee that each user is obliged to pay?	<ul style="list-style-type: none"> • Size of land • Type of crop cultivated • Irrigation method 	What is the basis to determine the maintenance costs that each user is obliged to pay?	<ul style="list-style-type: none"> • Size of land • Type of crop cultivated • Irrigation method
Which actions are prohibited?	<ul style="list-style-type: none"> • Using excess water • Not complying with the distribution schedule • Not paying the irrigation fee 	Which actions are prohibited?	<ul style="list-style-type: none"> • Not joining the maintenance works • Damaging the infrastructure
What sanctions are imposed on the users that take prohibited actions?	<ul style="list-style-type: none"> • Monetary fine • Prohibition to use water for a certain time • Extra contribution to maintenance 	What sanctions are imposed on the users that take prohibited actions?	<ul style="list-style-type: none"> • Monetary fine • Prohibition to use water for a certain time

Answering the two questions for each zero-order institution reveals the first-order institutions of participation. First, ‘by whom’ questions identify the actors that are permitted or obliged to regulate and monitor resource use and infrastructure maintenance. Second, the (non)participatory mechanisms, which are used for the rule-making processes, are found out by answering ‘how’ questions. Based on the questions of zero-order institutions, the questions and possible answers for the first-order institutions are identified as listed in Table 7.3.

Table 7.3 *Questions for studying the first-order institutions of participation*

Use of irrigation water	Maintenance of irrigation infrastructure	
<i>By whom and how . . .</i>	<i>By whom and how . . .</i>	<i>Possible answers</i>
Are the permissions to use water given?	Are the people that do the maintenance works assigned?	<i>By whom?</i>
Are the periods to use water set?	Is the timing of maintenance set?	<ul style="list-style-type: none"> • WUO board (with members from local authorities) • WUO manager • WUO officer(s) • WUO member users • Elected users
Are the permitted (or obliged) irrigation methods identified?	Are the ways to contribute to maintenance identified?	<i>How?</i>
Is the basis to determine the amount of water that each user is permitted to use selected?	Is the basis to determine the maintenance efforts that each user is obliged to devote selected?	<ul style="list-style-type: none"> • Board meeting • Decision of manager/officer
Is the basis to determine the irrigation fee that each user is obliged to pay selected?	Is the basis to determine the maintenance costs that each user is obliged to pay selected?	<ul style="list-style-type: none"> • Group meeting (representative users) • Voting • Consensus
Are the prohibited actions defined?		
Are the sanctions for prohibited actions defined?		
Is the compliance to rules monitored?		<ul style="list-style-type: none"> <i>By whom?</i> • WUO officer(s) • WUO member users • Elected users • External monitors <i>How?</i> • On-site inspection • Data collection and analysis

Participation of users in regulation and monitoring implies that users are involved in actions that are assigned to the providers in the framework. First-order institutions lay out the scope of participatory mechanisms that enable such actions, and the answers to ‘by whom’ and ‘how’ questions reveal the extent to which users participate in the rule-making processes. In this respect, two significant attributes of the system are the size and homogeneity of the user group. When the number of users is high, it can become difficult and time-consuming to agree on rule definition and to enforce the rules (Baland and Platteau 1996; Ostrom et al. 1999). As the size of the group increases, involving representative users in the rule-making processes might be preferred. However, selecting the adequate number of representatives might not be straightforward and it can bring about the issues of fairness and equity, particularly for heterogeneous groups. If there are ambiguities

ties about the definitions of rules or if the rules are not effectively enforced, the 'regulate' and 'monitor' actions can result in problems with resource use and infrastructure maintenance.

Second-order institutions

Although necessary, the observation of extensive participation is not sufficient to conclude that participation is effective in contributing to sustainable CPR management. For instance, the self-interest of the participants about the rule-making processes can be a barrier before effective participation. Some participants might manipulate the participation situations to fulfil their self-interests, which can even contradict collective interests and threaten resource sustainability. Definition of sanctions is an example of such situations. Participation can lead to a decision to sanction excessive water use only with monetary fines, which can decrease the financial burden caused by irrigation fees. However, continuing excessive water use can cause long-term problems on soil quality, decrease the water available to other users, and create conflicts between upstream and downstream users.

The considerations mentioned above can be incorporated into the analysis by investigating the institutions at a higher level. Since these institutions will be about the institutions of participation, they can be called 'second-order institutions of participation'. Second-order institutions shape the action 'organise' in the framework and have outcomes in terms of revision of the existing rules and definition of new rules. The evaluation of second-order institutions facilitates answering the question: 'How are the users organised to change the rules towards sustainable CPR management?'. Other questions that can be asked in order to reveal the second-order institutions of participation are presented in Table 7.4. For a comprehensive assessment, the questions should be answered for all first-order institutions.

Similar to the first-order institutions, the number of users within the system has an impact on the degree of organisation, too (Ostrom et al. 1999; Anderies et al. 2004). It affects the type and number of participant users as well as the timing and frequency of participation. If the users constitute a small group, each actor can act both as a user and a provider. However, within a large group, it would be necessary to form multiple organisations or to assign different tasks to different users.

If some users cannot be actively involved in the rule-making process, information channels and feedback mechanisms should be established and effectively used for ensuring healthy communication. Informing all the users about the decisions and employing feedback mechanisms increase the transparency of the rule-making processes, too. Additionally, the above-mentioned benefits from public participation, namely learning, ownership

and compliance, are correlated with, among others, the effectiveness of communication.

Table 7.4 Questions for studying the second-order institutions of participation

Questions	Possible answers
What are the possible reasons to change the rule?	<ul style="list-style-type: none"> ▪ Request from the users/providers ▪ Frequent non-compliance ▪ Redundancy ▪ Social/economic/ecological/technological change
Which users are permitted to participate in changing the rule or crafting a new rule?	<ul style="list-style-type: none"> ▪ All users ▪ Elected users ▪ WUO members ▪ Land - owner users
What is the proportion of users that are involved in changing the rule?	<ul style="list-style-type: none"> ▪ From 0% to 100%
What is the proportion of the rule revisions that involve the users?	<ul style="list-style-type: none"> ▪ From 0% to 100%
What is/are the phase/s of the rule-changing process that users participate in?	<ul style="list-style-type: none"> ▪ Identifying the need to change the rules ▪ Defining alternative revisions for the rules ▪ Crafting the revised rule ▪ Giving feedback on the revised rule
When are the non-participant users informed about the revisions made?	<ul style="list-style-type: none"> ▪ Right after the decision is made ▪ After a time lag
How are the non-participant users informed about the revisions made?	<ul style="list-style-type: none"> ▪ Written announcements ▪ Verbal announcements ▪ Upon individual request ▪ Through ad hoc/regular meetings
How are the opinions and inquiries of non-participant users taken and responded to?	<ul style="list-style-type: none"> ▪ In writing ▪ Verbally ▪ Through ad hoc/regular meetings

V. CONCLUSIONS

In this chapter, an institutional approach is proposed in order to evaluate the participatory mechanisms incorporated into the rules of CPR management. Based on the premises of institutional approaches to collective action, it is proposed that public participation in the rule-making processes about CPR management can contribute to collective action towards resource sustainability. For investigating the relevance of the proposition, a conceptual frame-

work depicting CPR management is developed and applied by elaborating on the interaction of actors with other elements through the institutions of collective action and by formulating questions that facilitate the assessment of the institutions of participation under three nested categories.

For a given socio-ecological system, studying the institutions at three levels has two major implications in terms of participation. On the one hand, the zero-order institutions exist in all systems, whether or not participatory mechanisms are in place. On the other, the existence of participatory rules in first and second levels is an indication of the users' degree of organisation, which is manifested directly by the second-order institutions. The questions formulated for the first- and second-order institutions facilitate assessing the degree of organisation at each level. The answers to the questions about first-order institutions will show the extent to which the users participate in the processes for definition and enforcement of rules about regulation and monitoring of resource use and infrastructure maintenance. If the users are organised in order to change the rules about regulation and monitoring, they would have second-order institutions in use. It can be expected that the more the users are organised, the more they participate in the rule-making processes and in turn the more effective the rules become.

The coherence and completeness of the proposed framework and the categories of institutions can be improved and tested by developing an evaluation tool with criteria and indicators for each level and applying the tool in a real-life setting. Interaction of participation rules with social, ecological and economic factors can also be incorporated into the evaluation tool. In order to reflect on possible interactions, indicators can be defined and monitored for each dimension. For the above example about sanctions, the amount of water used, the quantity of monetary fines collected (or accrued) and the results of soil quality measurements can be used to evaluate whether or not there is a need to change the rules about sanctioning excessive water use. Finally, the participation of users during the development and application of the tool can create further opportunities for participatory rule-making.

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