Co-management: concepts and methodological implications

Lars Carlsson[a,*], Fikret Berkes[b]

[a]Division of Social Sciences, Luleå University of Technology, S-971 87 Lulea, Sweden
[b]Natural Resources Institute, University of Manitoba, Winnipeg, MB, Canada R3T 2N2

Abstract

Co-management, or the joint management of the commons, is often formulated in terms of some arrangement of power sharing between the State and a community of resource users. In reality, there often are multiple local interests and multiple government agencies at play, and co-management can hardly be understood as the interaction of a unitary State and a homogeneous community. An approach focusing on the legal aspects of co-management, and emphasizing the formal structure of arrangements (how governance is configured) runs the risk of neglecting the functional side of co-management. An alternative approach is to start from the assumption that co-management is a continuous problem-solving *process*, rather than a fixed state, involving extensive deliberation, negotiation and joint learning within problem-solving networks. This presumption implies that co-management research should preferably focus on how different management tasks are organized and distributed concentrating on the *function*, rather than the structure, of the system. Such an approach has the effect of highlighting that power sharing is the *result*, and not the starting point, of the process. This kind of research approach might employ the steps of (1) defining the social-ecological system under focus; (2) mapping the essential management tasks and problems to be solved; (3) clarifying the participants in the problem-solving processes; (4) analyzing linkages in the system, in particular across levels of organization and across geographical space; (5) evaluating capacity-building needs for enhancing the skills and capabilities of people and institutions at various levels; and (6) prescribing ways to improve policy making and problem-solving.
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1. Introduction

There is a growing literature that explicitly focuses on how social and ecological systems are, or may be, linked in order to promote sustainability. This research can be divided into two broad categories. The first category consists basically of case studies that reveal the existence of an extremely rich variety of systems of management of common-pool resources. The second type of research sets out to find empirical and theoretical support for the prospects of suggesting, and deliberately building management systems that fulfill well-known criteria for sustainable use (Burger et al., 2001; Ostrom et al., 2002). The concept and principles of *co-management* have been an integral part of both of these types of research. This article is based on the presumption that the two lines of research could be merged and synthesized, even thought this is not the primary aim of the present article.

Typically, co-management of common-pool resources, such as fisheries and forests, are depicted as some kind of power-sharing arrangement between the State and a community of resource users. This picture is based on an ideal image of the State as some kind of monolithic structure, and neglects the fact that not only communities, but also the State itself has many faces. By over-emphasizing the formal aspect of such power sharing arrangement, one might run the risk of disregarding the functional side of co-management which should be understood as a continuous problem-solving process.

In this article, we argue that an alternative way of understanding systems of co-management is to *start* from this latter assumption. This presumption implies that research should preferably focus on how different

* Corresponding author. Tel.: +46 920 91814; fax: +46 920 72223.
E-mail address: lars.carlsson@ltu.se (L. Carlsson).

management tasks are organized and distributed and thus concentrate on the function, rather than the formal structure, of the system. Such an approach has the effect of highlighting that power-sharing is the *result*, and not the starting point, of the process. The basic argument that is put across is that a better understanding of these processes establishes a more firm foundation, not only for research but also for collective action.

The first objective of the article is to convey the argument that co-management should be understood as an approach to governance, and not merely as some kind of formalized power sharing arrangement. The second objective is to provide arguments why co-management may be a good approach to organizational development and decision making. The third objective of the article is to suggest a research agenda that is based on the assumption that co-management can be approached and analyzed as networks of relationships that often form sophisticated management systems

The article is organized around three broad questions which make up one of the major parts of the paper and correspond to the three objectives:

1. What is co-management and how should the phenomenon be understood?
2. What is co-management good for?
3. How can real-life instances of co-management be approached and analyzed?

2. What is co-management?

In relation to natural resources, the term management can be understood as the 'right to regulate internal use patterns and transform the resource by making improvement' (Ostrom and Schlager, 1996: 131). These activities can be preformed by single actors or jointly by groups of individuals or as a result of cooperation among different groups.

Collaborative management, or co-management, has been defined as 'the sharing of power and responsibility between the government and local resource users' (Berkes et al., 1991: 12). Singleton (1998: 7) defines co-management as 'the term given to governance systems that combine state control with local, decentralized decision making and accountability and which, ideally, combine the strengths and mitigate the weaknesses of each.'

The World Bank has defined co-management as 'the sharing of responsibilities, rights and duties between the primary stakeholders, in particular, local communities and the nation state; a decentralized approach to decision-making that involves the local users in the decision-making process as equals with the nation-state' (The World Bank, 1999: 11). This definition is illustrated in Fig. 1. In essence this is the same definition as the one adopted by the World Conservation Congress,
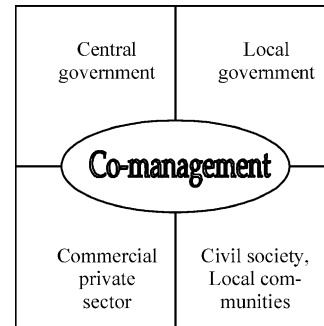

Fig. 1. Stakeholder categories and co-management (source: The World Bank, 1999: 11).

Resolution 1.42: 'a partnership in which government agencies, local communities and resource users, non-governmental organizations and other stakeholders negotiate, as appropriate to each context, the authority and responsibility for the management of a specific area or set of resources' (IUCN, 1996). It should be noted that this latter definition regards the State as only one among a set of stakeholders.

Co-management can be understood as 'a situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources' (Borrini-Feyerabend et al., 2000: 1). The idea is that an agency with jurisdiction over an area (usually a state agency) might develop 'a partnership with other relevant stakeholders (primarily including local residents and resource users) which specifies and guarantees their respective functions, rights and responsibilities with regard to the (area)' (Borrini-Feyerabend, 1996: 8).

Pinkerton utilizes two different models to conceptualize co-management between, what she calls, folk-managed systems and state managed systems. On the one hand there is a '*horizontal* continuum from nearly total self-management to nearly total state management'. On the other there is a 'vertical contracting out model of state management' powers which is characterized by devolution of rights (Pinkerton, 1994b:322–25, emphasis added). This way of reasoning has proven fruitful for analyzing a number of problems that are associated with management of CPRs (Pinkerton, 1989; 1994a). Although these models are not mutually exclusive it should be noted that they are based on an implicit dichotomy comprised by something called the State and local resource users.

Co-management can be looked upon as a continuum from the simple exchange of information to formal partnership (Pomeroy and Berkes, 1997). In this article, we do not discuss where the possible optimum may be on this scale. Such judgments, if possible, depend on how one considers the trade-off between different criteria for success. For instance, economic efficiency objectives might be made at the expense of equity objectives (Ostrom et al., 1993: 116

ff.). Co-management presupposes that parties have, to some extent, agreed on an arrangement, but the actual arrangement often evolves; it is a process rather than a fixed state (Beck, 2000: 4).

Thus, the definitions and conceptualizations of co-management in the literature have some common underpinnings.

- They explicitly associate the concept of co-management with natural resources management.
- They regard co-management as some kind of partnership between public and private actors.
- They stress that co-management is not a fixed state but a process that takes place along a continuum.

Nevertheless, most definitions of co-management have problems in capturing the complexity, variation and dynamic nature of contemporary systems of governance (Carlsson, 2000; Berkes, 2002; Plummer and FitzGibbon, 2004). There are a number of complexities rarely accounted for in the conventional conceptualizations of co-management: (1) complexities of the State, (2) complexities of the community, (3) complexities of the dynamic and iterative nature of the system, (4) complexities of the conditions available to support the system, (5) complexities of co-management as a governance system, (6) complexities as a process of adaptive learning and problem solving, and finally (7) complexities of the ecosystem that provides the resources that are being managed.

Regarding the first point, suffice to point out that different management tasks within the same resource system can be subject to different couplings and agreements with the State. In fact, it can also be the case that different parts of 'the State' have different agreements or collaborative connections with a given community. This will be discussed later in the article.

Regarding the second point, communities themselves may be complex systems consisting of different interests by gender, ethnicity and socioeconomic group, as one finds for example in mountain villages in the Himalayas (Berkes et al., 1998). Many authors have cautioned that communities are rarely coherent and homogeneous units (Brosius et al., 1998; Agrawal and Gibson, 1999). Communities are constantly changing, and it may be useful to think of them as multidimensional, cross-scale social-political units. The behavior of communities in a co-management situation may be highly unpredictable. Some communities may choose to speak with a single voice despite differences of interests within the community; others may be characterized by a lack of such cohesion in the face of within-community differences. Some recent conceptual work promotes a view of communities that neither relies upon nor promotes the 'unitary community' as the appropriate realm of social interaction and decision-making (Little, 2002).

The third type of complexity concerns the fact that co-management is by nature a dynamic and iterative system.

In contrast to the ideal image of formal organizational hierarchy, co-management should not be conceptualized as 'one shot' only. The system should be understood as a process in which the parties and their relative influence, positions and activities are continuously re-adjusted.

The fourth set of complexities has to do with the fact that all types of collaborative arrangements are highly dependent on to what extent parties recognize the legitimacy of one another. Thus, successful co-management depends on whether external circumstances are conducive for developing such systems. These exogenous factors involve some sense of security of resource tenure, their right to organize, availability of appropriate financial resources, facilitation support and so on (Ostrom, 1990), together constituting an important determinant extraneous to the characteristics of the parties or the natural resources they are supposed to manage.

The fifth and sixth form of complexity will be discussed in detail in subsequent sections of this article. But, at this junction it should be stressed that governance of natural resources is preformed in many different ways. While the ideal image of the State is closely associated with the concept of *government* co-management might as well be understood as a special type of *governance* (Borrini-Feyerabend, 2004, Borrini-Feyerabend et al., in press). Hence, good governance of natural resources can be accomplished both with and without the participation of a formal government. Co-management of specific areas and resources is carried out with the participation of different actors that typically try to find ways to learn from their actions and adapt the behavior to the consequences of their own, and other's, actions, otherwise they cannot form any collaborative arrangement. How such governance systems are configured is likely to vary and is, thus an empirical question.

Regarding the final point, the behavior of ecosystems and how they respond to resource exploitation may also be highly unpredictable. A major change in ecological thinking of the last two decades is the recognition that nature is seldom linear; ecosystem processes are dominated by an essential quality of uncertainty (Gunderson and Holling, 2002; Berkes et al., 2003). These complexities have implications for different styles of resource management, including co-management. Command-and-control kind of resource management is a poor fit for ecological uncertainty. Instead, the adaptive management approach can be used, in which policies are treated as hypotheses and management as experiments from which managers can learn, so that uncertainty and surprises are accepted (Holling, 1978; Holling and Meffe, 1996). Management processes can be improved by making them adaptable and flexible through the use of multiple perspectives and a broad range of ecological knowledge and understanding, including those of resource user communities. Such management systems tend to have capacity to adapt to change and are

better able to deal with uncertainty and surprise (Berkes and Folke, 1998; Folke et al., 2002).

2.1. Different images of co-management

In order to investigate the relationship between the State and the Community and to unpack the concept of co-management, we might ask the following question: What do we mean really, when regarding co-management as some kind of process between public and private actors, e.g. between the State and a local community of resource users? Fig. 2 illustrates four different alternatives. The *first* version, *co-management as an exchange system*, (top image of Fig. 2) describes co-management as some kind of relation between separate spheres of dominance fraternizing with each other ('the State' and a 'community community sphere'). This conceptualization of co-management includes exchange of information, goods and services. In essence, it is the lower steps of Arnstein's ladder of citizen participation (Arnstein, 1969). For the sake of simplicity, we do not distinguish between local, regional and central public authorities. All are included in the sphere labeled with a capital 'S'. However, it should be remembered that the State as well as the private sector encompasses a rich variety of organizations and units. In Fig. 2, the private sector is exemplified by a community of resource users, labeled 'C'.

The second image of *co-management as joint organization* is depicted in Fig. 2 as overlapping sectors. According to this view, co-management is a matter of the intercepting part of the spheres. For instance, representatives of the State and groups of resource users might form joint management bodies or cooperative units and they might participate in joint decision making. According to this image of co-management, each sector keeps its authority and its relative autonomy. Thus, co-management could be envisaged as the creation of a formalized arena for cooperation. However, public authorities and stakeholders sometimes form quasi non-governmental organizations where borders between sectors are blurred. In this case, it is an open question whether one can talk about separate spheres of authority.
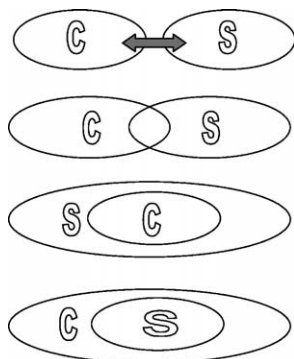
The two subsequent images of co-management illustrated in Fig. 2 can be labeled as 'nested'. The third image in Fig. 2, *co-management as a State-nested system*, represents a rather common situation. The State might be the de facto holder of all the legal rights in a certain area or a particular resource system. The private actors might be entrusted, e.g. with the right to manage or appropriate resources on state owned land or on state owned fishing grounds. The utilizers might set up independent organizational units that have a substantial degree of independence. For instance, many fishing systems have this quality and the same goes for the reindeer husbandry in Scandinavia or forest commons in Norway.

The other form of nested systems, *co-management as a community-nested system*, (the bottom image in Fig. 2) has a similar but reversed structure. Here the State operates within the realm of a 'non-public' sphere, and resource users might exercise all legal rights associated with an area or resource system. For example, forestlands, fishing grounds, or grazing lands may be legally owned by individuals, or by groups of users. However, the State can put a number of restrictions on the management of these systems. For example, State authorities often put restrictions on and monitor private logging enterprises, and they set up bodies to regulate and coordinate private fisheries.

From these examples one should not draw the conclusion that this type of co-management always implies that the State exercise its authority towards hesitant or resistant private actors. Even though state agencies may monitor and exert authority for purposes of taxation or law compliance, this form of fraternizing might as well be based on mutual agreements. It is well known that appropriators and resource holders often have a need for so-called third party solutions. These are often provided by the State and other public authorities.

Finally, it should be emphasized that the four types of co-management that have been discussed so far can be combined and, in fact, are often combined. For instance, regular exchange of information can easily be combined with nested versions of co-management. Even if there are overlapping sectors, there might be a general need to set up joint groups. This may serve an introduction to the fifth image of co-management, here called *co-management as network* (Fig. 3).

The *fifth* version of co-management appreciates the fact that the State is fragmented and has many faces. In Fig. 3, The State is illustrated as a set of pyramids, hierarchies, that altogether make up what we usually use to call the State. Thus, the State consists of numerous authorities and agencies that might be associated with different groups and functions of a resource system. In most societies, regional and local administrative actors have close relations with local groups or communities of users. It is also a well-known fact that many public authorities sell their services on a commercial basis, for example, the provision of seedlings from state nurseries. These considerations imply that 'the State' should not be regarded as a unity, neither by its structure, nor by its function (Carlsson, 2000, 2003;

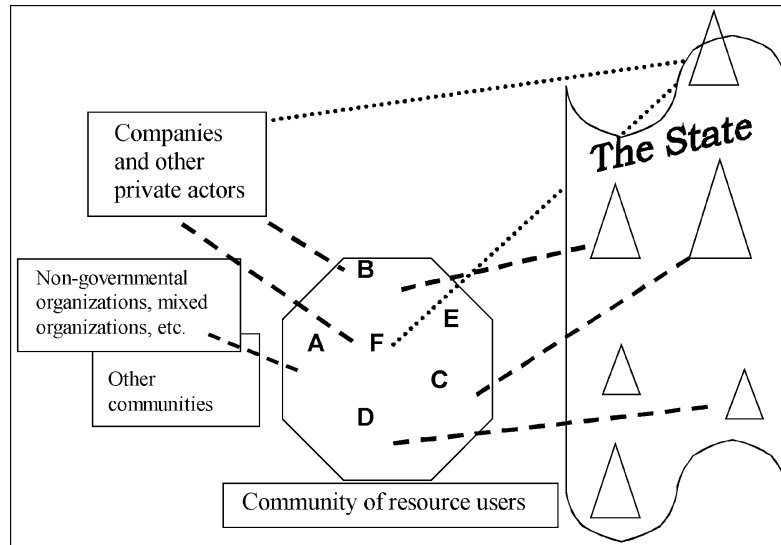Fig. 2. Four images of co-management.

Fig. 3. Example of a co-management network.

Ostrom, 1985). Thus, the fifth version of co-management encompasses the idea that in many real-life cases, we can expect to find rich webs of relations and agreements linking different parts of the public sector to a similarly heterogeneous set of private actors, all within the same area or in the same resource system.

In Fig. 3 different types of management tasks are illustrated by the labels A–D. For example, one state authority is involved in one type of task while another might be related to a different one. The dotted lines indicate that relations between actors might be dissimilar, both in terms of content and intensity. For example, within the same community of resource users, private companies might be involved in the planning of harvesting (perhaps the community has bought this service from company) at the same time as State authorities have an important say on how the activities should be performed. In Fig. 3, these sets of relations are illustrated by the differently dotted lines to the same task, e.g. 'F'. This is how many social networks work. The network approach to co-management appreciates that it is the totality of such relations that make up the system, the co-management network.

It should be obvious that this latter image of co-management makes everything more complicated. What are the implications of this? If co-management is everything, it might as well be nothing? Perhaps the concept of co-management dissolves only to be resurrected and dressed in another, and perhaps more suitable, terminological clothing? One obvious candidate for this is the concept of governance.

2.2. Understanding co-management as governance

Borrini-Feyerabend argues that the notion management, in association with co-management, should be understood 'as a process by which a site […] is identified, acquired and declared; relevant institutions are built and/or enter into operation; plans are designed and implemented; research is undertaken; and activities and results are monitored and evaluated, as appropriate' (Borrini-Feyerabend, 1996: 8). This is a broad definition that may include a wide range of activities. By contrast, Short and Winter (1999) prefer to restrict the term management to day-to-day activities, rather than to decision-making structures or administrative systems. However, this latter view of management does not pay any attention to the fact that all resource management regimes are embedded in a wider institutional context.

This idea of embeddedness is one of the cornerstones of institutional policy analysis (Ostrom, 1990; Imperial, 1999). Kiser and Ostrom (1982) emphasize that three layers of rules (constitutional rules, collective choice rules and operational rules) shape every institutional arrangement. Constitutional rules specify the terms and conditions for governance. They stipulate who possess the decision right concerning access and utilization of a resource as well as who is eligible to share the benefit of its use. Collective choice rules regulate how decisions are made, for instance, in order to decide the level of harvesting or the technological input. Operational rules regulate the daily activities, e.g. the intensity of harvesting or methods of cultivating. The three layers of rules form a hierarchy, with the rules on a higher level deciding the degrees of freedom for those on the lower.

> Constitutional decisions establish institutional arrangements and their enforcement for collective choice. Collective decisions, in turn, establish institutional arrangements and their enforcement for individual action. […] Constitutional choices precede and constrain collective choices (Kiser and Ostrom, 1982: 209–210)

This means that the constitutional level can be understood as a system of rules specifying the terms and conditions of governance, while governance itself 'includes includes the setting of rules, the application of rules, and the enforcement and adjudication of rules' (Feeny, 1988: 172). Even though co-management might be demonstrated in the day-to-day activities (guided by operational rules) of a community of users, these are performed under the umbrella of collective choice rules. Thus, constitutional rules set the framework for decision making on the middle level where co-management is predominantly exercised.

The difference between operational rights and collective choice rights is crucial. Ostrom and Schlager emphasize that 'it is the difference between exercising a right and participation in the definition to future right to be exercised' (Ostrom and Schlager, 1996: 131). However, if constitutional issues are unclear regarding who has the legal right to be a member of a community, this would of course affect the possibility of reaching binding co-management agreements among parties.

One possible consequence of this discussion is that systems of co-management, especially as they are understood to be the model in Fig. 3, might as well be described as systems of *governance*. However, like co-management, the conceptualization of governance is somewhat unclear. One line of research prefers to restrict the concept to the attempts by the State to adapt to its environment. But a more common use of the concept reserves the notion for the societal coordination of social systems. These processes may or may not include the State; hence, governance is possible even without a government. 'Thus, in the first approach, which could be labeled state-centric, the main research problem is, to what extent the State has the political and institutional capacity to 'steer', and how the role of the State relates to the interests of other influential actors; in the second approach, which is more society-centred, the focus is on co-ordination and self-governance as such, manifested in different types of networks and partnerships' (Pierre and Peters, 2000: 3).

This is how most co-management systems may be understood, namely, as governance structures. These structures might be composed by a rich variety of actors coupled to one another by a significant number of relations involving the State, local resource users, commercial actors, NGOs, and a whole range of other public and private actors. Thus, real-life co-management systems might as well be described as *networks* that, according to their qualities, can be labeled in different ways.

One basic feature of social networks is the fact that the activities of two formally separated parties can be coordinated by a third party. This has been emphasized by Lindblom (1965) who discussed the phenomenon under the heading 'the intelligence of democracy'. Among other things, this type of indirect coordination has the effect that information and other resources are pooled and allocated to serve specific purposes even though no single decision

maker make such a decision. Thus, decision making within in a network context is often more informal and diffuse as compared to formal decision making. This has to do with another feature that is relevant when regarding co-management as a network activity, namely, the difference between decision making and problem solving (Simon, 1989).

Decision making implies a process where actors make choices between diverse alternatives, whether this is done under considerable uncertainty or not, with different calculations of specific levels of risks, etc. Problem solving, on the other hand, has to do with the process of generating the very alternatives to be decided upon. This is typical for co-management, which is a process that typically involves many actors who engage in problem solving activities in relation to a natural resource. Problem solving tends to be a trial-and-error activity in which different lines of actions are tested and evaluated. Thus, the network approach to co-management and governance is built on a different logic than political-administrative hierarchy. While the latter is built on the assumption that the system is ready-made and can be used for specific management purposes, co-management is a vehicle that is constantly constructed and rebuilt.

Relating these ideas back to the literature on environment and resource management, some co-management networks may have the quality of *epistemic communities*, that is, 'network[s] of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area' (Haas, 1992: 3). For instance, local fishermen in close cooperation with scientists and public officials manage many fisheries.

Other co-management systems can be described as *issue networks*: 'shared knowledge group[s] having to do with some aspect (or, as defined by the network, some problem) of public policy' (Heclo, 1978: 103). Another network concept that might capture what we want to describe is the *policy community*, a label for 'shared experience, common specialist language, staff interchange, and frequency and mode of communication' (Hogwood in Jordan, 1990: 327). A policy community is 'a special type of stable network which has advantages in encouraging bargaining in policy resolution. In this language the policy network is a statement of shared interests in a policy problem: a policy community exists where there are effective shared 'community' of views on the problem' (Jordan, 1990, p. 327). Along similar lines, Cash and Moser (2000) talk about *boundary organizations*, a type of institutional arrangements that have the function of mediating between different parties such as scientists and decision-makers, and between these actors at different scales.

To summarize, most instances of collaborative or joint management of natural resources are more complex and sophisticated than might be concluded from the mainstream image of co-management defined as the sharing of power and responsibility between the government and local resource users. Exchange of information, allocation of

resources, as well as a number of other couplings, including more formal agreements, make up particular webs of relations among different actors. These webs have different qualities that can be described in different ways. However, they should be understood as *governance systems* and as such they literally govern specific areas or resource systems. The very co-management of fisheries, forests, grazing land, and other local resources is the visual and substantial outcome of these governance systems.

We do not argue that the concept of co-management should be abandoned or replaced, only that it may be more enlightening to think of existing webs of co-management as governance systems. What is the advantage of conceptualizing co-management as governance systems and networks? This will be discussed in the subsequent sections of this article. We might start this discussion by restating one of the questions in the introduction of the article: What is co-management good for?

3. What is co-management good for?

Why has co-management been looked upon with such positive connotations? The immediate answer is simple; co-management is a logical approach to solving resource management problems by partnership. Partnerships are often essential. Local users alone can hardly manage most natural resources in the complex contemporary world. At the same time, we have overwhelming evidence that centralized management of local resources is problematic. Even very centralized systems are dependent on the local level, for example, for the knowledge and skills of local users. Since many resource management systems are cross-scale, different management problems must be solved simultaneously at different levels (Berkes, 2002). Obviously, some kind of allocation of tasks is necessary. Thus, co-management, as broadly defined, is probably the rule, rather than the exception, and we should expect to find a substantial variety of arrangements.

Pinkerton (1989) has discussed a number of tasks that can more easily be accomplished by establishing well functioning co-management systems: (1) data gathering, (2) logistical decisions such as who can harvest and when, (3) allocation decisions, (4) protection of resource from environmental damage, (5) enforcement of regulations, (6) enhancement of long-term planning, and (7) more inclusive decision-making. However, before suggesting co-management as a general remedy for all common property problems, one must ask if co-management is necessitated by the fact that management power has been taken away from the local community in the first place. If so, power sharing might as well be an attempt of state authorities to increase the legitimacy of their domination. To offer a co-management agreement might, in fact, be a means of codifying an existing situation, or it might be an attempt by the State to offload a regulatory function that is proven too expensive to manage.

It should also be emphasized that, depending on the criteria for evaluation, a given type of co-management arrangement may be assessed differently. For example, if equality among members is a matter of concern, joint management that perpetuates existing inequities may not be regarded as desirable. A case in point is women's organizations (*mahila mandals*) involved in forest protection in the Manali area, northern India. These organizations tend to reflect existing hierarchies in rural society, and are therefore biased against the poorer and less powerful women (Berkes et al., 1998). Such inequalities will be reflected in the co-management system of which the community is a part. Hence, co-management can bring about a degree of power-sharing but without necessarily eliminating power relations within the community. Thus, co-management is not a panacea for all problems in society and is not good or bad per se. What is it good for then?

3.1. Allocation of tasks

Many existing management systems need to operate at both the small-scale and at the large-scale, and there are different kinds of skills and knowledge that are necessary to do so. This is possible because co-management brings together a variety of different capacities and comparative advantages. For example, marginalized producer groups in remote areas of the world need external markets for the realization of the value of the goods they produce. But they need links to the market through persons who know the structure of the demand, or have access to different types of commercial networks. This is only one example of allocation of tasks, but the principle is something that permeates all types of co-management systems. Division of labor enables specialization to increase efficiency. Cash and Moser (2000) refer to this phenomenon as utilizing scale-dependent comparative advantages. These can be thought of as unique knowledge, technical capacity or specialization that is characteristic of a specific scale.

3.2. Exchange of resources

Local groups may have a need for certain types of resources that they are themselves unable to provide, such as technology, scientific expertise, and a diversity of information. But, they may possess resources needed at the center, such as information about harvesting volumes or status of the resource. If we consider that co-management systems not only consist of relations between a community and the State, but may be composed of a number of couplings among a rich variety of actors, it is easy to imagine that the web of resource dependences is likely to be far more complicated than indicated. In fact there exist two complementary theories that explain why networks emerge. The first is the theory of power relations and the second is

the theory of resource dependency (Thrasher, 1983; Thrasher and Dunkerley, 1982). Both are relevant for explaining how co-management is understood in this article. Here we regard them as two approaches that can be combined. 'A basic assumption about network relations is that one party is dependent on resources controlled by another, and that there are gains to be had by pooling of resources' (Powell, 1990: 303). Hence, networks do no alleviate power relations. First, some actors are linked to one another because one part controls the other due to his possession of certain knowledge, information, or legitimacy. Second, uneven distribution of resources is in itself a source of power. The fact that one part controls a resource that is needed by another results in an asymmetric relationship.

3.3. Linking different types and levels of organization

Co-management is a means of linking different types of organization. According to Max Weber's image of bureaucracy, different layers of organization are linked to one another within in a framework of coherent hierarchy. Co-management, by contrast, is a process by which representatives from different levels of organizations and types of organizations coordinate their activities in relation to a specific area or resource system. In practice it means that, for instance, state employed experts might work in concert with the board of a local community of resource users. In comparison with hierarchic ways of organizing management, the latter is more responsive to local circumstances. It is also likely that the flow of information is faster and more effective and that problems are addressed at a more appropriate level within the organization. In short, co-management agreements serve the purpose of constituting linkages among organizational groups that might not be otherwise connected.

3.4. Reduction of transaction costs

'Transaction costs are the costs of measuring what is being changed and enforcing of agreements' (North, 1997). These costs can be divided into long-term and short-term costs. Empirically, it is not easy to distinguish between activities aimed at a long-term reduction of transactions costs or for more immediate purposes. Although it may be the case that the initial phases of the establishment of co-management increase transaction costs, one positive, but often neglected, effect is the possibility that well tailored systems help reduce transaction costs. If, as we believe, most instances of co-management consist of fairly rich webs of relations, these networks have certainly evolved over time. If we scrutinize the function of individual links in these networks, we will find that they have to do with information, legal relations, and monitoring, features that are usually associated with the exercising of property rights. However, it is easy to appreciate that if (as a result of an

agreement) representatives of State authorities are entrusted the right monitor the access to or appropriation of a resource, this will reduce conflict among members of the community. Consequently, users do not have to dedicate time and resources for solving these conflicts, thus reducing transaction costs.

3.5. Risk sharing

It is a well-known fact that, for instance, many agriculture based communities tend to diversify their crops. This has the effect that they simultaneously uphold biodiversity and spread the risks, over time and within the same institutional arrangement (Colding et al., 2003). If one crop fails, they still have a resource base for their subsistence living. In short, they do not put 'all eggs in one basket'. The same type of reasoning can be applied to institutions and governance systems. Systems that are composed by single administrative units and practice monolithic decision systems are more vulnerable than are polycentric arrangements and redundancy (Low et al., 2003). This logic can also be applied to co-management networks. Webs of relations that have evolved over time make up diversified management arrangements. These webs serve the purpose of spreading the risk among involved parties. For example, it is less risky to share some management tasks among a number of actors, as compared to relying on one actor for their accomplishment.

3.6. Conflict resolution mechanisms, power sharing

The establishment of co-management systems may function as a means of conflict resolution between communities of local resource users and the State (Pomeroy and Berkes, 1997; Singleton, 1998). The processes of negotiation, bargaining and setting up co-management agreements that codify the rights and responsibilities of involved parties (local groups, the State, commercial actors, etc) reduce conflicts and might even function as a more long-term problem solving mechanism. Successful reduction of conflicts is essential for long-term planning and for the willingness among individuals to invest in creating appropriate institutions (Ostrom, 1990).

4. How can real-life instances of co-management be investigated and analyzed?

One main argument in this article is that, although ecosystems and institutional systems show a large diversity, our tools for conceptualizing and analyzing co-management are strikingly blunt, and more research needs to be done to refine these tools. Given that there exist a significant variety of ways in which commons institutions are linked, both across space and across levels of organization, two alternative approaches emerge. First, co-management

systems might be mapped and analyzed with the presumption that they should be understood as a set of formal couplings between different levels of organization. Examples include formal and mutually binding agreements spelling out the sharing of power between the State and groups of resource users, as in native land claims agreements in Canada (Berkes, 2002). This approach risks having the real-life actors regarded as external to the process, and in the worst case, only regarded as attributes to formally decided power-sharing agreements. It is a well-known fact within social science that the structure of formal political administrative systems as well as the content of formal agreements may have little in common with how real-life actors behave. When it comes to the management of common-pool resources this has been emphasized by Ostrom and others (Ostrom, 1992: 22).

An alternative way of understanding systems of co-management is to start from the assumption that the parties are involved in a process of iterative problem-solving, as in adaptive management. Using this focus, the native land claims agreement, for example, in the James Bay area can be seen as, not an end to itself, but rather as a means to create the political space within which communities and other groups can develop the knowledge and skills to solve their own problems. Cases traced over time spans of two to three decades, from both Canada and Sweden, indicate that problem solving oriented co-management combines two characteristics (Olsson et al.,). The first is the *dynamic learning* characteristic of adaptive management, or learning-by-doing in an iterative way (e.g. Holling, 1978), and the second is the *linkage* characteristic of cooperative management (e.g. Pinkerton, 1989; Berkes, 2002). Folke et al. (2002: 20) have used the term, adaptive co-management, to refer to this 'process by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self-organized process of trial and error'. Adaptive co-management, by definition, is an inclusive and collaborative process in which stakeholders share management power and responsibility (Olsson et al., in press).

There are certain methodological implications of this alternative view of co-management. If co-management is a matter of collaborative problem-solving, the research approach should preferably be task-oriented, concentrating on the function, rather than the formal structure, of co-management. Such an approach has the effect of highlighting that power-sharing is the *result*, not the starting point, of the process. It supports the observation of many researchers that co-management is the result of extensive deliberation and negotiation—a process rather than a fixed state. This kind of research approach to co-management might employ the following steps.

(1) *Define the social-ecological system under focus*. First we must define our unit of analysis, i.e. the group, community or resource system we are interested in. This is not a trivial task. For, example a single river might contain a number of valuable species that are utilized by many different groups. By the same token, all real-life communities rely on a number of different resources. However, because of practical reasons, the choice the researcher has to make is whether the organizing principle should be a certain group/community, an area, or a particular resource. Either way, the goal should be to define and get a good picture of the action arena and how it is structured (Ostrom, 1990; Imperial, 1999).

(2) *Map the essential management tasks to be performed and the problems to be solved*. The second step is to figure out how people behave in order to manage the resource. What are the activities that must be performed? How are these related? What types of short-term, medium-term, and long-term management decisions must be made, and who is entitled to make these decisions? What are the specific types of problems related to the access and appropriation of the resource? How are these problems solved?

(3) *Clarify the participants in co-management activities and related problem-solving processes*. The third step is to figure out who participates in the activities listed under point two. This way we reconstruct the web of relations in the particular co-management system we are interested in. The logic is that we start from the 'bottom', in the activities themselves, and try to figure out how management is organized, if power is shared, if rights and duties are contracted out and if State authorities have a 'finger in the pie'. In network analysis one makes a distinction between loosely and tightly coupled systems, i.e. whether relations are intermittent and spontaneous or frequent and perhaps regulated by law (Scott, 1994; Weick, 1976). Tightness of coupling is also revealed if one tries to capture how different relations and agreement are related to the management of the resource(s) under focus.

(4) *Analyze linkages*. After the system has been mapped, it can be analyzed, for example, by regarding how and to what extent the identified relations connect central levels of decision making to those of the local level. We will also understand how past practices relate to the present and how one geographical area is connected to another. In fact, all the points that were listed in the previous section can serve as criteria for analyzing the co-management system that has been mapped. If the analyst chose to investigate a whole resource system, such as a river basin, the same methodology can be used while comparing co-management systems among different groups utilizing the resource. This kind of comparative approach would be an excellent method for testing and generating theory (Young, 2002).

(5) *Evaluate capacity-building needs*. In the fifth step, the goal is to identify features of the system that can be used for enhancing so-called capacity building. Capacity-building may be defined as the sum of efforts needed to nurture, enhance and utilize the skills and capabilities of people and institutions at all levels—nationally, regionally and internationally. It is based on a comprehensive view that emphasizes the importance of institutional arrangements,

appropriate government policies and legal frameworks, and stakeholder participation. Capacity-building does not seek to resolve specific problems but rather seeks to develop the capacity within communities, governments and other organizations to resolve their own problems (Berkes, 2002). Here the idea is that, once the system under focus has been mapped and its network structure has been analysed, one can evaluate the particular features that can be used to empower people and to reorganize relevant institutions.

(6) *Prescribe remedies*. Having identified features that might enhance capacity building, one can turn to the question of solutions. The goal of this step is to suggest what can be 'done better'. This does not mean, however, that the analyst should take on the role of solving particular problems for or on behalf of particular groups or political decision makers. It only means that the researcher should communicate his or her results to relevant groups in order to contribute knowledge for the general process of policy-making and problem solving. In fact, this idea fits very well with the old mission of policy analysis, as Harold Lasswell once defined the task (Lasswell, 1968).

5. Conclusion

Research about common-pool resources has demonstrated the existence of a very rich variety of ways by which humans organize themselves (Feeny et al., 1990; Burger et al., 2001; Ostrom et al., 2002; Dolšak and Ostrom, 2003). There exist a tremendous diversity of successful management systems, and institutional solutions for the solution of the same types of problems, such as access and utilization of a resource, might take very different forms in different settings (Ostrom, in press). Many of these institutions have evolved over long periods of time and as a result of extensive processes of problem solving. In essence, what these studies elucidate is an impressive amount of human inventiveness which has led to the creation of institutions that are tailored to fit local circumstances.

Hence, there are reasons to believe that this institutional resourcefulness applies to other social constructs as well, including the State itself. As has been demonstrated in this article, this insight has implications for our image of co-management but also for our understanding of natural resources management in general. Typically modern state is fragmented and separate entities might have a number of relations to different communities. To a significant extent, this heterogeneity also applies to communities of resource users, which are not always unitary entities. Consequently, we should also expect contemporary instances of co-management to follow the same logic. In this article we have argued that co-management can hardly ever be understood as a dualism, as something solely made up by homogenous actors such as 'a community' and 'a State'.

The ideal image of co-management as a power sharing arrangement between a coherent State and a single community implies the existence of an arena for joint decision-making. This might as well be the case, but the network image of co-management that has been discussed in this article challenges this view. The network approach to co-management evokes an old lesson from social research, namely, that decision-making and problem solving are not the same thing (Simon, 1989). Decision-making implies choices between different alternatives while problem-solving has to do with the process of generating these alternatives. Co-management evolves over time, very much as a result of deliberate problem-solving. Since management of the dynamics of nature requires experimentation and learning in an iterative process, it is quite logical that this would entail systems that contain different competence, and distributed decision-making. Thus, the evolution of co-management networks is the substantial result of ongoing processes of problem-solving. In these arrangements something called the State might have a minor or major role but is rarely the only co-player on the scene.

We have argued that co-management is the logical approach to solving resource management problems through partnerships. It is good for approaching a variety of tasks, from providing linkages to risk-sharing and conflict resolution. In order to better understand the problems to be addressed and how contemporary management systems are organized, investigations should start with the management tasks to be performed by partnership. Such a strategy will make it possible for research to unfold (but not necessary always find) rich webs of relations. The structure and content of these might explain the relative success of an existing management configuration out of which community-state relations might make up a minor part. By applying such an approach, power-sharing will typically be regarded as the end result of a collaborative problem-solving process rather than the starting point of a co-management decision-making process.

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