

IASCP 2000 Conference, Indiana University, June 2000

**Cross-Scale Institutional Linkages: Perspectives from the Bottom Up**

Fikret Berkes

Natural Resources Institute  
University of Manitoba  
Winnipeg, Manitoba R3T 2N2  
Canada

phone (204) 474-6731  
fax (204) 261-0038  
berkes@cc.umanitoba.ca

Prepared for the

NAS/NRC Panel on Institutions for Managing the Commons

Draft, April 2000

## Abstract

How do national and international-level institutions affect the capabilities of local users to govern and manage local resources? The question reflects the practical reality that local commons institutions are embedded in and affected by regional, national and global influences. There seem to be two broad categories of influences. First, decisions and developments in the outside world affect the local use of resources. Second, national governments and other national-level organizations are making commitments to manage international and global commons that obligate them to influence the actions of local resource users. This paper is mainly about the first category of influences, (1) understanding how higher-level institutions affect local institutions, and (2) identifying promising institutional forms for cross-scale linkages.

The commons literature is full of examples of destructive state intervention, such as excessive centralization, as found in many parts of Africa, which has stifled existing local institutions and prevented self-organization. However, the literature also contains many examples in which the state has created enabling legislation or has otherwise facilitated the development of local-level institutions. A literature has developed also on forms of institutions with potential for cross-scale linkages. One of these forms is co-management, linking local-level institutions with the government level. A second is multistakeholder bodies. A third is institutions oriented for development, empowerment and co-management (examples: CANARI in St. Lucia, West Indies; number of NGOs in Bangladesh). A fourth is the class of institutions for linking local users with regional agencies (example: epistemic communities leading to the Mediterranean Action Plan). A fifth concern research and management approaches that enable cross-scale linkages (examples: adaptive management and participatory rural appraisal). Finally, a sixth is the emerging class of institutions for "citizen science" (examples: watershed associations in Minnesota, USA; People's Biodiversity Registers, India).

## INTRODUCTION

Many cases of resource management are neither small-scale nor large-scale but *cross-scale* in both space and time. As such, management problems have to be tackled simultaneously at several levels. Yet, resource management in many parts of the world has tended towards centralization and the adoption of monolithic resource management science and practice, sweeping away a rich diversity of local practice. The contrast is important: historical practice involved locally adapted resource management practices and institutions; modernist resource management assumes away these practices and adaptations, declaring that Western science is the only key to resource management (Berkes and Folke 1998). The replacement of folk science with Western science requires the concentration of management powers in centralized government agencies. However, in building centralized bureaucracies, we have assumed that resource management can be scaled up. But there is little evidence to support the idea that the propositions or models of micro-scale systems can be applied to macro-scale ones.

The argument cuts both ways. It is not safe to say that resource management can be scaled down, either. There are good reasons to believe that local or community-level institutions alone cannot carry out the functions of regional or national institutions. As Young (1995) pointed out, "macro-scale systems are not merely small-scale systems writ large. Nor are micro-scale systems mere microcosms of large-scale systems".

There are trade-offs in the question of centralization vs. decentralization. Cases in the book, *Linking Social and Ecological Systems*, show that local-level institutions learn and develop the capability to respond to environmental feedbacks faster than do centralized agencies (Berkes and Folke 1998). Thus, if management is too centralized, valuable information from the resource, in the form of feedbacks, may be delayed or lost because of the mismatch in scale (Holling et al. 1998; Pritchard et al. 1998). If management is too decentralized, then the feedback between the user-groups of different resources, or between adjacent areas, may be lost. The reason for this is the connectedness of components, and the interrelations among processes, within an ecosystem. Environmental disturbances in one area (e.g. mountain erosion) may generate feedbacks somewhere else within the same ecosystem (e.g. the lower watershed), hence

the need for cross-scale management.

In the globalized world, the need for cross-scale institutions and linkages is greater than ever before. For example, fisheries may be controlled at the local-level through communal property rights and social sanctions, with emphasis on "how" people should fish rather than "how much" (Wilson et al. 1994). The problem is that these types of restrictions are usually not enough in most modern commercial fisheries in which the fishing units are subject to international market pressures and tend to become too large and too efficient for the fish stock they are exploiting. Thus, different kinds of controls at the national and international levels, including quota management to regulate the quantity of harvest, also become necessary (Hilborn and Gunderson 1996). But that does not mean that national-level controls can necessarily replace local-level management. Rather, there is a need to design and support management institutions at more than one level and to pay attention to interactions across scale from the local level up.

Given the significance of cross-scale institutional linkages, it is surprising that so little research has been carried out in this area. There is a large literature on common property institutions, and a growing base of mostly empirical literature on co-management but relatively little on cross-scale institutions *per se*. There is a need for theoretical and empirical studies that focus on institutional needs for the management of cross-scale problems. More systematic information is needed about co-management, its reasons for success and failure, institution-building, capacity-building, use of adaptive management, and the design of supportive policies.

Related to these needs, the larger research agenda includes more work on the resilience of social systems for the avoidance of ecological surprises, social and institutional learning, and the study of renewal cycles in social systems. As Holling (1986) observed, institutions, like ecosystems, can become "brittle" over time. Resource crises can play a useful role by triggering breakdown (release) and reorganization, in both ecosystems and institutions, building resilience (Gunderson et al. 1995). These observations can lead to new empirical and theoretical work on linkages between social and ecological systems, and to the question of just what produces adaptive capacity leading to resilience in linked social-ecological systems. The issue is the need to design institutions that safeguard the dynamic capacity of ecosystems that sustain human activities. Some of these issues are currently under study by a working group (Folke and Berkes

1998).

The focus of the present paper, however, is the investigation of various approaches to cross-scale linkages, including co-management systems and decentralization. How do national and international-level institutions affect the capabilities of local users to govern and manage local resources? Within this larger goal, the particular objectives of this paper are (1) understanding the ways in which higher-level institutions have negative and positive effects on local institutions, and (2) identifying promising institutional forms for linking across levels of institutions.

The paper is organized in four parts, starting with a review of the negative impacts of higher level institutions (national and international) on local-level institutions, and a review of the positive impacts. It then proceeds to identify, without trying to produce a full typology or inventory, some institutional forms that seem to facilitate cross-scale resource and environmental management, followed by a conclusions section.

## NEGATIVE EFFECTS OF HIGHER-LEVEL INSTITUTIONS ON LOCAL INSTITUTIONS

The commons literature is full of examples of destructive state intervention which eliminates or stifles existing local institutions and prevents self-organization. As summarized in **Table 1**, some of the mechanisms by which higher-level institutions have negative impacts on local institutions include: centralization of decision-making; shifts in systems of knowledge; colonization; nationalization of resources; increased participation in national and international markets, and national-level development projects. It should be noted that the designation of “negative” or “positive” is a value judgment. These “negative impacts” on local institutions, especially those with respect to modernization and economic development, may be seen by some as “positive impacts.”

Excessive centralization of resource management is not confined to countries with centrally planned economies such as the former Soviet Union (see example in Table 1). It is found in almost all governments in which resource management functions have been taken over by a managerial elite. However, such centralization has not occurred uniformly across resource

types and geographic areas. For example, in the adjacent Canadian provinces of Ontario and Quebec, the development of provincial resource management agencies took different paths. In Ontario, the provincial agencies were already powerful by the end of the 1940s and managed wildlife with a strong hand even in the northern parts of the province which are occupied by aboriginal groups. By contrast, in Quebec, the government management agency was only weakly present in the north, even as late as the 1970s. As a result, local institutions for wildlife management, almost non-existent in the Cree areas of Northern Ontario, were strongly present and effectively managing wildlife in the Cree areas of Northern Quebec (Berkes et al. 1991).

The replacement of local institutions by centralized ones often involves a change in the way knowledge is used for management. Local institutions tend to use their own folk knowledge, often referred to as local knowledge, indigenous knowledge or traditional ecological knowledge, whereas centralized management agencies tend to use internationally accepted scientific practice and often assume away the validity of local knowledge and practice (Williams and Baines 1993; Warren et al. 1995; Berkes 1999). The shift of knowledge systems is one of the major effects of government-level institutions on local institutions because it is often accompanied by a change in control over a resource. The differences between the two systems of knowledge can be substantial in the way resources are viewed and new government regulations brought down to control a local population (Freeman 1989).

A case in point is caribou management in the Canadian North. A number of studies indicate that aboriginal hunters from the Arctic and the Subarctic monitor caribou distributions, migration patterns and their change, predator presence, individual behavior, sex and age composition of herd, and fat deposits in caribou. The Western science of caribou management also monitors much the same things, but there is a fundamental difference: decision-making in scientific management is based primarily on the prediction of quantitative population models. The aboriginal system, by contrast, is based on local observations and ethics, assumes that caribou are not predictable or controllable, and does not try to use harvest or population size estimates. Rather, it pays relatively high attention to fat content (an excellent integrative indicator of caribou health) and uses a qualitative mental model which provides hunters with an indication of *trends* over time. This qualitative model reveals the *direction* (increasing or

decreasing) in which the population is headed, without requiring the estimation of the population size itself (Berkes 1999).

In Canada and elsewhere, centralization of decision-making and shift in systems of knowledge were often accompanied by colonization. Under local-level controls, resources served local economies and interests. Colonial governments fought long and hard against local institutions because generating revenues for the central governments required the suppression of local controls, a point made by Gadgil and Guha (1992) for the case of colonial India. In another example, Johannes (1978) describes in some detail how colonial governments in various parts of Oceania dismantled local marine tenure systems and exposed marine resources to open-access exploitation. Local controls were considered too conservative by colonial governments; the creation of trade opportunities and hence revenues depended upon opening up the resources to entrepreneurs. Similarly, the development of the canned salmon industry in the Pacific Northwest in the late 1800s required the dismantling of marine tenure systems and the creation of open-access conditions in salmon rivers. This move was initially met with considerable opposition. For example, cannery labor recruited from one tribal area often refused to fish in the area of another tribe, as the different tribal groups traditionally controlled various river and watershed areas, and this river tenure system was known and respected by all (Rogers 1979).

Through much of the Third World, de-colonization of the mid-twentieth century was often accompanied by the nationalization of resources. Post-colonial governments, and especially those in which tribal powers were seen as a threat to national governments, continued the centralization policies of the colonists by making state-property out of common property. A number of African cases are explained this way with respect to marine resources (Durand et al. 1991), pastoral commons (Baxter and Hogg 1990) and wildlife (Gibson 1999). In some cases, nationalization and centralization is seen purely as a resource grab by those in power, as in the case of the lucrative elephant ivory trade in Zaire in the 1960s and 1970s. At the time of independence in 1960, there were an estimated 150,000 elephants in Zaire. By 1976, they had almost disappeared, by the hand of the "politically and economically powerful groups using the state apparatus" (Kisengani 1986). In other cases, scholars have traced the evolution of centralized institutions as a complex interplay of individual desires, party politics, and

international pressures. Gibson (1999) argues that wildlife conservation, and hence policies dealing with centralization/decentralization, in three African countries reflect, more than any other factor, political competition among influential individuals and groups. Gibson takes a "new institutionalist" view, placing individuals, their preferences and institutions at the center of the analysis, and focusing on the distributive nature of institutions:

The shared colonial origins of Zambia, Kenya and Zimbabwe's conservation policies created remarkably similar trajectories for their wildlife policies in their colonial and early independence periods. As in Zambia, independence leaders in Kenya and Zimbabwe used colonial wildlife policy to foment antigovernment sentiment and promised change once their parties came to power. And, as in Zambia, these promises were unfulfilled: Both Kenya and Zimbabwe kept and eventually extended the centralized and exclusionary wildlife policies established under white rule (Gibson 1999, p. 40).

Even though a number of programs exist in these countries for community-based wildlife management (e.g. CAMPFIRE in Zimbabwe), Gibson does not think they represent a serious degree of control by local institutions:

Ultimate ownership of wildlife remains in the hands of the state, whose agencies control access to the animals using paramilitary scouts. Nearly all of the important decisions about revenues and quotas continue to be made by government personnel. Locals remain disenfranchised from wildlife resources (Gibson 1999, p. 148).

Elsewhere, however, there are cases in which the nationalization of resources has been reversed. The Government of Nepal nationalized forests in 1957, converting what often were communal forests into state property. This resulted in the rapid decline of the remaining forest cover because villagers whose control of village forests had been removed, now viewed the state forest as an ownerless resource open to all. The government was forced to reverse its policy and began in 1976 to re-create communal-property rights (Messerschmidt 1993).

Another mechanism by which higher-level institutions have negative impacts on local institutions concerns increased participation in markets or the development of national and international markets for a resource which had previously been used only locally. In simplest form, the commercialization of a subsistence resource can lead to the demise of the local institutions (as well as the resource itself). Examples include the commercialization of salmon in

the Pacific Northwest (Rogers 1979), a variety of marine shellfish in Micronesia (Johannes 1978), and the turtle fisheries of the Miskito people of Nicaragua (Nietschmann 1972). Prior to commercialization, the Miskito hunted turtles according to their subsistence needs, well within the productive capacity of the resource. This balance was disturbed in 1969 with the establishment of a turtle meat packing plant. Initially, the local people complained about the development, and considered commercialization as a threat to communal distribution networks and social obligations. But more and more turtle hunters began selling their catch to the packing plant instead of sharing it with relatives and neighbors, and local rules, norms and networks declined. By 1971, the green turtle (*Chelonia mydas*) catch had sharply increased, even though the amounts locally consumed had actually declined (Nietschmann 1972).

In other cases, the development of international markets can impact local institutions and use patterns in resources already used commercially for local and regional markets. A case in point is the development of trawler fisheries in Kerala, South India, in a area previously dominated by small-scale, non-mechanized boats. "The introduction of trawlers into Kerala coincides with the rise in demand for prawns in the international market," says Kurien (1992: 227). In 1961-62, the "beach price" (landing price) of prawns was Rs 240/tonne. By 1971-72, it had jumped to Rs 1,800/tonne, with another seven-fold increase by 1984-85. The case is instructive in that it shows not only the impact on local institutions of a higher-level economic institution (international markets), but also of higher-level government institution. The entry of trawlers into the area was facilitated by the government policy of "modernization path" in which 1,200 mechanized boats were subsidized by the state between 1961-62 and 1977-78 (Kurien 1982).

The impact of national-level development policies on local-level institutions is one of the most extensively documented class of negative impacts. Development policies are often accompanied by the centralization of decisions, increased participation in market economies (as in the Kerala case), and the application of inappropriate pricing, subsidies, legislation and other governmental incentives (Goodland et al. 1989). Examples include state policies for the opening up of the Brazilian Amazon for cattle ranching, and other state-sanctioned changes in land tenure as done in Indonesia, Thailand and parts of Africa. In Tanzania, the Basotu Plains were

developed for state wheat in the 1970s and the 1980s under the Tanzania-Canada Wheat Program. The area had been used by Barabig pastoralists. However, the government considered it "idle land" and slated it for agricultural development, replacing a sophisticated land tenure system involving the rotation of grazing areas, with an agricultural system of questionable economics and sustainability (Lane 1992).

As summarized in Table 1, there are a number of classes of impacts of higher-level institutions that results in the elimination or degradation of local-level institutions. These classes can no doubt be subdivided further, for example, by differentiating between the effects of national markets, and integration into globalized markets. Creating a more complex typology may not be warranted, given the inherent difficulties in sorting out the effects of multiple factors.

#### POSITIVE EFFECTS OF HIGHER-LEVEL INSTITUTIONS ON LOCAL INSTITUTIONS

The literature includes, not only negative effects, but also examples of positive effects of higher-level institutions, which may strengthen or rejuvenate local-level institutions. As with negative effects, a number of classes of positive impacts may be recognized, including state recognition of local institutions; development of enabling legislation; decolonization and revitalization; capacity-building and local institution-building (**Table 2**).

One possible positive impact of higher-level institutions is the legitimization of local-level institutions. Among the design principles illustrated by long-enduring common property institutions analyzed by Ostrom (1990: 90) is "the right of appropriators to devise their own institutions" without being challenged by external authorities. This, as Ostrom puts it, is the "minimal recognition of rights to organize." If government can recognize locally developed rules, community institutions may be able to enforce these rules themselves. In some cases, the state may go further and legally recognize local rules. However, it should be mentioned in passing that there are inherent risks in codifying local rules, such as those of marine tenure systems; writing them down may "freeze" them in space and time and reduce their flexibility (Baines 1989). Some of the aboriginal land claims settlements in Canada, New Zealand and

Australia provide examples of state recognition of local institutions. For example, Canada's 1975 *James Bay and Northern Quebec Agreement* explicitly and legally recognizes the hunter-trapper organizations of the Cree and their jurisdiction over certain types of wildlife resource management (Berkes et al. 1991).

Why would governments recognize and legitimize local institutions? The reasons may be diverse and complex. For example, *kuhl* irrigation in Himachal Pradesh, NW India, is and has been a locally managed network (Coward 1990). This indigenous system was recognized by the British colonial administration in the mid-1800s through a process to define existing rights, called the "settlement." Two related tasks were carried out through the settlement: the assessment of the revenue to be collected and the creation of a record of rights. There is a debate on the question of whether settlement legalized local rights as then existed, or whether it transferred the ownership, or at least control, from the Rajas to the group of users as "rights-holders." Either way, "once recorded, these rights were legitimized and protected by the colonial authorities. And since independence the Indian government has tended to continue to validate these rights" (Coward 1990).

The importance of enabling legislation was recognized early on by commons specialists, as reflected in the consensus of participants in the closing comments of the 1985 Conference on Common Property Resource Management (Peters 1986). In the common property literature, enabling legislation often refers to legislation which makes it possible, or creates the legal preconditions, for effective local-level institutions. For example, the fishery cooperative in Alanya, Turkey, studied by Berkes (1992), developed its own rules for a complex system of fishing spots which were used in rotation by the fishers. The system drew its legitimacy from a broad (local) interpretation of the *Aquatic Resources Act* which states that cooperatives have jurisdiction over "local arrangements," even though there really is no provision within the *Act* to make local rules that limit the right of individual fishers regarding where they may fish.

Another example of enabling legislation comes from Tanzania. In 1962, the post-independence government of Tanzania made rural development (*ujamaa* villages) the cornerstone of its development strategy, and a series of legislation was passed in the 1970s and the 1980s in support of decentralization as a government policy. Although it is generally thought

that the Tanzanian experiment in *ujamaa* self-reliance and local democracy did not live up to its potential (Chambers 1985), this legislation nevertheless enabled districts and villages to manage their own affairs, and later served as enabling legislation, among others, for locally managed marine parks (Anderson and Ngazi 1995).

Just as colonization often results in the weakening of local institutions, decolonization has the potential to lead to the strengthening of local institutions, except where centralization and nationalization basically extend colonial policies (Gadgil and Guha 1992). There are a number of cases in which local resource tenure systems have been restored, strengthened and legally recognized by post-colonial governments, as in several of the island states in Melanesia (Baines 1989; Ruddle 1994). Some scholars use the term, decolonization, to refer to a broader social and political action in which the colonization is overthrown, not only in form but also in ideology (Smith 1999). For example, Smith (1999) argues that social science research has been inextricably linked with colonialism because it may involve the mining of information about a people by outsiders. Consequently, decolonization would require the control of research, and the control of knowledge, by the people themselves.

As a political movement, decolonization often goes together with revitalization. In Northern Canada, the Berger Inquiry in the 1970s helped articulate aboriginal views and lent credibility to local knowledge and institutions; it was partly responsible for the development of a revitalization movement in the area (Zachariah 1984). Revitalization movements are not merely about the revival of local institutions but also about cultural rediscovery and the assertion of rights. Such a process of empowerment may result in the “re-invention of tradition” to suit political needs, as alleged in the case of indigenous Hawaiians (Keesing 1989).

In some of the cases of restoration of local institutions, it was necessary to engage in capacity-building, providing an outside impetus before community organizations could build on the vestiges of traditional institutions. 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 (NRTEE 1998). 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.

The development of village-based marine conservation of the valuable topshell, *Trochus*, in the Pacific island nation state of Vanuatu may be considered an example of capacity-building. When a resource conservation problem emerged in Vanuatu, the Fishery Department decided not to declare a closed season from the top down but rather initiate village-based *Trochus* conservation, actively including the villagers in the design and conduct of the program. The villagers were instructed on the basic principles of *Trochus* management -- that stocks should be harvested about once every three years and the fishery closed in between. The villages accepted the Department's advice and found that the proposed management actually worked. The word of their success soon spread to other villages that had not been a part of the program. Within a period of four years, many additional villages were managing their *Trochus* stocks, and similar conservation methods were being applied to some other species as well. One of the key factors contributing to the success of community-based conservation was the revival of traditional reef and lagoon management rituals and ceremonies (Johannes 1998).

Institutions are not static but tend to appear and disappear and change in form and function. Ostrom (1990) has pointed out that one may refer to a "capital" of institutions in an area or a group of people. Such institutional capital is a form of social capital -- "shared knowledge, understanding and patterns of interaction that a group of individuals brings to any productive activity " (Ostrom 1994:20). The relatively new fishery management institutions in the Alanya fishery may have evolved out of institutions for managing grazing areas because both types of institutions use drawing lots as a way of allocating rights, and grazing traditions in the area are much older than fishing traditions (Berkes 1992).

Where local institutions did not historically exist for a particular resource, new institutions may evolve over time, especially if higher-level institutions provide a social and political environment conducive to such development. There is insufficient material on which to make conclusions about the speed of evolution of local institutions under various degrees of support from higher institutions. However, there is some experience with deliberate institution-building regarding the time required to build local institutions. With NGO support, local

institution-building appears to require on the order of a decade, based on the experience in St. Lucia with charcoal-producers (Smith and Berkes 1993), community-fishery organizations in Bangladesh (Ahmed et al. 1997), and community-based coastal resource management projects in the Philippines. **Table 3** provides a summary of the stages of capacity-building and institution-building in one of these projects in the Philippines (Van Mulekom 1999). We turn next to interventions towards building local institutions and institutional forms for cross-scale management.

### A DIVERSITY OF INSTITUTIONS FOR CROSS-SCALE LINKAGES

In recent years a literature has developed on forms of local and higher-level institutions, some of them with potential for cross-scale linkages. One of these forms is co-management, linking local-level institutions with the government level. A second is multistakeholder bodies. A third is a diverse set of institutions that are oriented for development, empowerment and co-management; some of these link regional and national NGOs to local users. A fourth is the class of institutions for linking local users with regional agencies. A fifth concern research and management approaches that enable cross-scale linkages. Finally, a sixth is the emerging class of institutions for "citizen science."

#### Co-Management Arrangements between Communities and Governments

The simplest kind of cross-scale institutional linkage is the one that connects local-level management with government-level management. Literature contains many examples of co-management arrangements between groups of users and the government, in a diversity of regions in a number of resource sectors. Many co-management initiatives are in progress in the areas of fisheries, wildlife, protected areas, forests and other resources in various parts of the world, from Joint Forest Management in India (Poffenberger and McGean 1996) to the implementation of aboriginal resource rights in USA, Canada, New Zealand and Australia. Often there are legal reasons for co-management, as in aboriginal land claims. But another reason for growing interest

is that effective resource management often requires partnerships to combine the strengths of government-level and local-level resource management and to mitigate the weaknesses of each (Berkes and Pomeroy 1997). In some cases, as in the Philippines coastal fisheries, co-management is related to enforcement problems (Pomeroy 1995).

Figure 1 shows the linkages in two co-management arrangements. The first is the Beverly-Qaminurjuaq Caribou Co-Management Board in northern Canada. Although this is not a co-management arrangement under land claims and not legally binding, it is a long-standing body (since the 1980s) and considered successful in enabling effective local input into what used to be a centrally managed resource (Kendrick, 2000). The second example in Figure 1 is a formally legislated aboriginal land claims settlement, the *James Bay and Northern Quebec Agreement* (Berkes 1989). Co-management applies, not only to one species as in the first case, but to an area with all the resources in it.

### Multistakeholder Bodies

A second and related form of cross-scale linkage is multistakeholder bodies. Characteristically, multistakeholder bodies link multiple user-groups and interests, local and regional, with the government, and provide a forum for conflict resolution and negotiation among users. **Table 4** provides a number of examples of stakeholder bodies. Some are established formally by law, as in the case of Barbados, Norway and USA examples in Table 4. But note that the Barbados and USA bodies in the table are advisory, whereas the Norwegian one has delegated powers (Jentoft 1989). Some authors see stakeholder bodies, as compared to co-management arrangements with specific communities of resource users, as diffusing the powers to be shared. According to Murphree (1994), they "can easily transform interest into a conceptual collective by a vast and amorphous circle of stakeholders." But in our experience, multistakeholder bodies intergrade into co-management; they are not always easy to distinguish.

## Development, Empowerment, Co-Management Arrangements

This form of linkages seems distinct from the first two sets in terms of their emphasis on community development and empowerment (with co-management arising as an incidental effect), the involvement of NGOs or other capacity-building bodies, and the presence of lateral as well as cross-scale linkages. **Figure 2** illustrates four different arrangements of communities, government agencies and NGOs in a pilot project designed to empower fishing communities in Bangladesh to take over their own fishing licenses from the government, rather than working for license-holding middlemen (Ahmed et al. 1997).

There are at least three strategies possible. In the government agency-led strategy, development assistance is channeled directly through the government body (Fig. 2A). Given that development work need long-term work in the communities, the project changed after a few years in favor of an NGO-led strategy. In some of the communities in the pilot project, the NGO played a go-between role, whereas in others, the NGO provided support to the community, with the potential of phasing itself out when the community became self-sufficient to conduct its own affairs (Fig. 2B). In the government agency - NGO strategy, one field officer each from the government and the NGO worked jointly with the community, to give a three-way relationship for development and resource management until the NGO was ready to phase itself out.

These various strategies result in a rich variety of cross-scale linkages. **Table 5** summarizes these linkages for two sets of examples of development-empowerment-comanagement bodies. The first is the Bangladesh cases illustrated in Figure 2, and the second comes from St. Lucia, West Indies. The NGO in the latter case is the Caribbean Natural Resources Institute (CANARI), a regional NGO which specializes in coastal resources and rural development and carries out a number of projects in the Eastern Caribbean region (Renard 1994). The two lists of linkages (the Bangladesh cases and the St. Lucia cases) show a great deal of similarity despite differences in geographic area and in the nature of resource and development issues in the two sets of cases.

### Institutions for Linking Local Users with Regional Agencies

A number of institutions provide cross-scale linkages by connecting local issues with regional and international agencies. A relatively well known set of institutions of this kind is what Haas (1992) has termed epistemic communities. An example is the group of scientists, government experts and NGO people, from often conflicting countries, who enabled the Mediterranean Action Plan. Members of such communities share principled beliefs, notions of validity, and policy goals that cut across political boundaries. Some consider epistemic communities to be a subset of policy communities (Coleman and Perl 1999).

Institutional Dimensions of Global Environmental Change report (Young 1999) discusses these kinds of institutions in two regions of the world, Southeast Asia and the Arctic. The Arctic Region includes such cross-scale institutions as the Arctic Council and the Inuit Circumpolar Conference (ICC) which links the Inuit people of several countries. These institutions tend to focus on the higher-scale, and it is not clear how well local issues are transmitted cross-scale.

There is another class of institutions that play a similar kind of role, and may fit into this group. These are the funding agencies with an international development mandate, such as the Ford Foundation, which bring the local-scale into the international arena and help regions exchange experiences.

#### Research and Management Approaches that Enable Cross-Scale Linkages

Research and researchers may have an impact on local and higher-level institutions that they study, especially if the research approach they use involves attention to scale. **Table 6** lists four such approaches. Ecosystem-based management and adaptive management explicitly pay attention to ecological scale issues but not so much to institutions. Participatory Rural Appraisal (PRA) and Participatory Action Research (PAR) both focus on researchers empowering local communities (Chambers 1994), and provide some linkages between the local-level and the regional. Other approaches, such as bioregionalism, may possibly be included in this group.

#### Citizen Science

Finally, a sixth class for cross-scale linkages is the emerging institutions for "citizen

science." Examples include watershed associations in Minnesota, USA, and People's Biodiversity Registers in India. "People's science movements" has a history in India that goes back to the 1960s in the southern state of Kerala. In the 1970s, they took the form of alternative resource and environmental assessments with inputs from university scientists. Out of this emerged in the 1980s an activity called village level resource mapping programme. People's Biodiversity Registers (PBR) is a programme that developed in the mid-1990s in a number of states in India, involving hundreds of communities. It aims to document the understanding of mainly rural and forest-dwelling peoples, of living organisms, their ecological setting, ongoing ecological changes, their own development aspirations, and how they would like to see the resources managed. The PBR program, using PRA-type methodologies and linking the local to the regional (and potentially to the national and the international) is probably the largest people's science movement. However, there are other people's science movements in various parts of the world, including the USA, Canada and Sweden (Gadgil et al. 2000).

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Figure 1. Cross-scale linkages in co-management arrangements: (a) Beverly-Quaminurjuak Caribou Co-Management Board, and (b) James Bay and Northern Quebec Agreement, Canada.

Figure 2. Different strategies in development, empowerment, co-management arrangements from a project in Bangladesh (adapted from Ahmed et al. 1997).

F = fishing community; DOF = Department of Fisheries;

NGO = BRAC, Proshika, Caritas, Grameen

Table 1. Classes of negative impacts of higher-level institutions on local institutions

Classes of impacts	Examples
Centralization of decision-making	The former Soviet Union centralized decision-making for rational resource management and for setting production targets, sweeping away in the process, local management systems and institutions such as the <i>artels</i> of the Ural Cossacks for managing fisheries of the Caspian Sea region (Kropotkin 1914)
Shifts in systems of knowledge	From the 1950s onward, caribou management in the Canadian Arctic came to be based primarily on quantitative population models. Science replaced aboriginal management systems based on accumulated local observations and ethical rules (Berkes 1999)
Colonization	To create revenues form timber extraction, the colonial regime in India dismantled local institutions for forest and grazing land management, moving the locus of control to the center (Gadgil and Guha 1992)
Nationalization of resources	Government of Nepal nationalized forests in 1957 (to curb deforestation) but the result was the creation of <i>de facto</i> open-access because the government measure disempowered local institutions which had functioned in forest resource sharing (Messerschmidt 1993)
Increased participation in markets	To take advantage of the demand for prawns in the international market, the government subsidized trawlers in the 1960sa and the 1970s in Kerala, India, in an area previously dominated by small-scale, non-mechanized boats, touching off a social crisis and a resource crisis (Kurien 1992)
Development policies	State policies for the development of wheat agriculture in lands occupied and used by Barabig pastoralists, Tanzania, supported by international development agencies, resulted in the destruction of local institutions for sustainable land use (Lane 1992)

Table 2. Classes of positive impacts of higher-level institutions on local institutions

State legitimization of local institutions	If resource users have the right to devise their own institutions without being challenged by external authorities, they can enforce the rules themselves. The principle of “minimal recognition of rights to organize” (Ostrom 1990)
Enabling legislation	Legislation which makes it possible, or creates the legal preconditions, in this case, for the effective functioning of local-level institutions. Enabling legislation may be used to provide legitimacy for locally devised rules, or it may in other ways empower local institutions
Decolonization and revitalization	Getting rid of colonization; sometimes used to refer to broader social and political action in which the colonization is overthrown, not only in form but also in ideology (Smith 1999). Decolonization often goes together with revitalization movements which are about empowerment and cultural rediscovery, as well as revival of local institutions
Capacity-building	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 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 (NRTEE 1998)
Institution-building	Local institutions for commons management may arise spontaneously but this often takes time. Local institutions may be helped along by creating a favorable environment that speeds up their development. There are NGOs that engage in such institution-building.

Table 3. Phases in the development of community-based coastal resource management in Orion, Bataan Province, Philippines.

**1. Community organizing (1989-94)**

Advocacy; political action; education; learning-by-doing for project implementation; data gathering; formation of peoples organizations and bay-wide federation of POs

**2. Coastal resource management planning and organizational capacity-building (1992-99)**

Building links with government agencies; training; organizational and institutional capacity-building; preparation and presentation of management plan; start monitoring; committees

**3. Establishing community-based management system (1994-99)**

Dialogue with municipal government; lobbying for municipal ordinances; fund accessing; establishing fisherfolk patrol (for enforcement); formalization of co-management arrangements

**4. Implementing community-based management system (1994-04)**

Document tangible results of plan; artificial reefs; mangrove reforestation; fish sanctuary and fisheries reserve; expand rehabilitation and patrol area; negotiate and later phase-out of trawling

**5. Non-fishing livelihood development (1996-??)**

Diversifying livelihoods to increase income and reduce fishing pressure; community stores; savings and credit schemes; income-generating projects at the household level.

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Source: Adapted from Van Mulekom (1999).

Table 4. Examples of multistakeholder bodies

**Committee on Resources and the Environment (CORE), British Columbia, Canada.** CORE established several roundtables in the mid-1990s to act as advisory bodies to the Minister in the planning for a diversity of forest uses, reflecting "full range of public values." Each roundtable had representation from about 20 user-groups.

**Manitoba Model Forest, Canada.** One of ten model forests across Canada (and similar to others in an international network), set up as a demonstration project for the sustainable use of a forested ecosystem; includes a multistakeholder group consisting of the various users and communities who live in the area.

**Lofoten cod fishery, Norway.** A co-management arrangement of long standing (*Lofoten Act*, 1895) in which the Norwegian government has devolved the fishery to the users (Jentoft 1989). District committees of fishermen make yearly regulations and deal with user-group conflicts. Organized on gear-group representation and predominantly union-based (Jentoft 2000).

**Barbados Fisheries Advisory Committee.** A seven-member body set up by the *Fisheries Act* to advise the Minister; it includes the various sectors of the fishing industry -- fishermen, fish processors, boat owners and fish vendors (McConney and Mahon 1998).

**US Regional Fishery Management Councils.** One of several regional bodies consisting of government officials and members of the public who reflect various fishery and coastal environmental interests. Charged with developing management plans for fisheries of the EEZ (McCay and Jentoft 1996).

**Great Barrier Reef Management Authority, Australia.** The *Great Barrier Reef Marine Park Act* of 1975 has established an Authority which has the responsibility to seek out regional stakeholders to discuss management plans. Bodies representing the various uses of the reef, with priority going to those most dependent on the Park's resources, assist with ecosystem-based management of the larger reef area (Kelleher 1996).

Table 5. Cross-scale linkages in two examples of development, empowerment, co-management arrangements

**A. Bangladesh cases (Figure 2):**

1. Both NGOs and DOF transmit experiences within the country, national -- district -- subdistrict
2. NGO (Grameen Bank) transmits experiences internationally
3. NGOs, DFO transmit experiences from one group of users to another
4. Resulting co-management arrangements link the local level to the government level

**B. St. Lucia cases:**

1. CANARI transmits experiences from one group of users to another
2. CANARI transmits experiences from one area in the region to another (e.g. from St. Lucia to Dominica)
3. CANARI transmits experiences from one resource sector to another (fisheries, forests, protected areas)
4. Resulting co-management arrangements link the local-level to the government level

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Sources: Ahmed et al. (1997); Renard (1994)

Table 6. Research and management approaches that enable cross-scale linkages

**Ecosystem-based management** or ecosystem management has come to include human uses of resources. The US Forest Service adopted ecosystem management in 1992 as its official policy for managing national forests, and some other agencies followed suit. The policy came about mainly in response to increased spatial scales of management which require interagency and local landowner cooperation (Grumbine 1994). However, how well ecosystem management may serve as an institution of cross-scale linkages is an open question.

**Adaptive management** is the scientific version of learning-by-doing. It uses the tools of systems modelling and iterative hypothesis testing, "adapting" management prescriptions by treating policies as hypotheses. Adaptive management typically focuses at the level of a local ecosystem. However, since different ecological interactions and resource use patterns occur at different scales, adaptive management, at least in the more recent applications, takes an explicitly cross-scale approach (Walters 1986; Holling et al. 1998).

**Participatory Rural Appraisal** derives from Rapid Rural Appraisal (RRA) and Agroecosystem Analysis (AEA), both in the area of development, first appeared in the late 1970s (Chambers 1994). All three methodologies help link up the scale of individual farms and villages with the regional scale of development. PRA is distinguished by its insistence on a grass-roots, "farmer-first" approach, empowering decision-making and application at the local level.

**Participatory Action Research**, similar to "action anthropology," shares with PRA the emphasis on the empowerment of users at the local scale. PAR places research and researchers at the service of the community; researchers facilitate the community to carry out its own research agenda, in accordance to its own priorities and values (Chambers 1994).

