

## **Managing Environmental Processes Across Boundaries:**

A Review of the Literature on Institutions and Resource Management

---

Deborah Sick

International Development Research Centre

November 2002



## **Working Paper Series**

IDRC's mandate is to initiate, encourage, support, and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical, and other knowledge to the economic and social advancement of those regions.

The publications in this series are designed to fill gaps in current research and explore new directions within a wide range of natural resource management topics. Some are narrowly focused, analytical and detailed empirical studies; others are wide-ranging and synthetic overviews of general issues.

Working papers are published by IDRC staff, hired consultants and interns, and are not part of Partner-funded research activities. Each paper is peer reviewed by IDRC staff. They are published and distributed primarily in electronic format via [www.idrc.ca](http://www.idrc.ca), though hardcopies are available upon request. Working papers may be copied freely for research purposes and cited with due acknowledgment.



*Working Paper 10*

## **Managing Environmental Processes Across Boundaries:**

A Review of the Literature on Institutions and Resource  
Management

*Deborah Sick*

**International Development Research Centre**  
PO Box 8500, Ottawa, ON, Canada K1G 3H9



*About the author:*

Deborah Sick is an anthropologist who has studied issues of rural development and transboundary resource management in northern Chihuahua, Mexico, Costa Rica, and Panama. She is the author of *Farmers of the Golden Bean: Costa Rican Farmers and the Global Coffee Economy* and has publications in a number of collected volumes and journals including *Human Ecology*, *Ethnology*, and *Human Organization*. She currently consults on issues of rural sustainable development and is a research associate and occasional lecturer at McGill University, Montreal.

Sick, D. 2002. Managing Environmental Processes Across Boundaries: A Review of the Literature on Institutions and Resource Management. Working Paper 10, Rural Poverty and the Environment Working Paper Series. Ottawa: International Development Research Centre.

Copyright © 2005 IDRC

This publication may be downloaded, saved, printed and reproduced for education and research purposes. When used we would request inclusion of a note recognizing the authorship and the International Development Research Centre.

Please send enquiries and comments to [wmanchur@idrc.ca](mailto:wmanchur@idrc.ca)

Cover Image: Daniel Buckles, IDRC, 1999.  
Design & Layout: Richard Bruneau, IDRC, 2004.



---

## Abstract

The ability to adapt to environmental and social change is key to the sustainability of socioecological systems. Change is mediated largely through the institutions that people create, both formal and informal. Latin American and Caribbean societies are struggling with the challenge of maintaining, reforming, and creating institutions to sustainably manage their complex and diverse cultural landscapes and productive resources. Demographic, economic, and environmental changes have intensified connections between places, ecosystems, and hydrological systems. Managing scarce resources, such as water, over extensive territories and among multiple stakeholder groups presents a challenge which transcends administrative boundaries of local communities, cities, and even national governments and to which existing formal institutions may be inadequate to respond. These conditions call for a reconceptualization of natural resource management and a re-structuring of resource management institutions (RMIs) at local, sub-national, national and international levels.

This review of the published literature on natural resource management institutions was requested by the Minga program in order to identify and better understand key issues and factors crucial to the sustainable and equitable management of transboundary natural resources in Latin America and the Caribbean.

---

## Contents

|                                                                                                                       |     |
|-----------------------------------------------------------------------------------------------------------------------|-----|
| Abstract .....                                                                                                        | i   |
| Contents .....                                                                                                        | ii  |
| Executive Summary .....                                                                                               | iii |
| Introduction.....                                                                                                     | 1   |
| Socio-Ecological Systems as Common Pool Resources .....                                                               | 3   |
| Challenges of Managing Socio-Ecological Systems: Lessons from<br>Community-Based Resource Management Initiatives..... | 8   |
| Simplistic Notions of ‘Community’ and ‘Participation’ .....                                                           | 9   |
| Lack of Conflict, Negotiation, and Resolution Mechanisms.....                                                         | 12  |
| Perceptions of Inequities, Injustice, and Lack of Legitimacy .....                                                    | 14  |
| Prohibitive Transaction Costs.....                                                                                    | 15  |
| Lack of Clear and Secure Property Rights.....                                                                         | 17  |
| Building on Existing Institutions .....                                                                               | 18  |
| Context is Crucial .....                                                                                              | 19  |
| Unclear Social and Spatial Boundaries.....                                                                            | 21  |
| Flux, Flexibility, and Institutional Resiliency.....                                                                  | 24  |
| Coping with Change .....                                                                                              | 24  |
| Information & Communication.....                                                                                      | 26  |
| Conclusions & Future Directions.....                                                                                  | 29  |
| References Cited.....                                                                                                 | 32  |

---

## Executive Summary

In recent decades, widespread environmental degradation and increasing (and often violent) conflicts over resource use by multiple stakeholder groups are indications of institutional inadequacies in natural resource management at a number of levels. As demographic, economic, and environmental changes intensify the connections between peoples, places and ecosystems, many scholars are beginning to argue that environmental resources in LAC (and elsewhere) must be managed as parts of extensive socio-ecological systems in which environmental and human social processes are intricately related and characterized by flux and uncertainty (Aguilar 1999; Berkes and Folke 1998b; Costanza, Segura, and Martinez-Alier 1996; Gunderson, Holling, and Light 2002; Holling, Berkes, and Folke 1998; Low et al 1999; Mehta et al 1999).

The equitable and sustainable management of natural resources within such socio-ecological systems will require an understanding and integration of ecological and social factors at a level beyond that which exists at the moment. The purpose of this review is 1) to synthesize some of the key literature on NRMI, identifying those issues and factors which research has found to be critical to the sustainable and equitable management of natural resources, in particular those which might extend across social, political, and administrative boundaries, and 2) to explore ways to re-conceptualize institutional frameworks for natural resource management in Latin America and the Caribbean where processes of globalization, decentralization, market integration, technological change, and shifting demographic patterns are precipitating rapid social and ecological change.

This work draws on a variety of theoretical and case study research on Sustainable Development, Natural Resource Management Institutions (NRMIs), Common Property Resource Management, Community Based Resource Management, and Institutional Resiliency. Two key points emerge from the literature regarding resource management in extensive socio-ecological systems: 1) the need for a common-property approach with nested institutions which can incorporate the diverse needs of multiple stakeholder and fair mechanisms for dealing with conflict 2) the need for institutional flexibility.

This growing awareness of the inter-relatedness of human and environmental processes which extend beyond the boundaries of interest or control of individual users, single communities, and nation states has highlighted the need for institutional arrangements which can effectively deal with large-scale multi-stakeholder resources which extend across various political, social, economic and geographic boundaries (Adger and Luttrell 2000; Fernández-Giménez 2002). What we are, in effect, dealing with are common-pool resources – natural or man-made resources that are sufficiently large or fluid as to make it costly, though not impossible, to exclude potential users (Ostrom 1992: 295). These types of resources are difficult to bound and divide and pose particular problems for human institutions.

Research shows that various institutional arrangements are possible for dealing with the peculiarities of common-pool resources (Berkes 1989; Berkes 1992; Berkes et al 2001; Messerschmidt 1987; Netting 1981; Netting 1982; Netting 1993; Oakerson 1992; Ostrom 1990; Somma 1997; Vondal 1987), but some common elements appear crucial. In particular, user-groups, resource boundaries, and user rights and responsibilities should be clearly defined (Berkes 1989; Poole 1989)

The benefits of directly involving user groups in the management of resources upon which they depend for their livelihoods has led to an explosion of Community-Based Resource Management (CBRM), Integrated Conservation and Development Projects (ICDPs), which attempt to incorporate both conservation and development objectives. These have been an improvement over top-down exclusionary policies, but have not been without their problems – problems likely to be amplified for the next generation of RMIs attempting to deal with more extensive environmental processes and a larger number of more socially and culturally diverse user groups.

Under these conditions, managing environmental processes will require the coordination of nested local, regional, and state co-management institutions, which draw on the strengths of various stakeholders at various institutional levels, but it will also be vital to:

- *understand and integrate the intricacies of both environmental processes and human resource use and management. **Context is crucial.***

- *identify resource management boundaries, acknowledging that such boundaries are artificial constructs and not natural 'givens'; build upon existing institutions if possible, but with caution*
- *identify legitimate stakeholder groups.*
- *assess transaction costs, both in terms of human and economic resources, at individual, community, and organizational levels, accounting for class, ethnic, age, and gender differences*
- *ensure that costs and benefits are equitably shared, particularly rural-urban and local-global cost sharing*
- *establish secure property rights for user groups – appropriate to the type of resource and production system*
- *coordinate institutions with appropriate fit of group size to resources to be managed*
- *ensure that monitoring, enforcing, and sanctioning is perceived by all as legitimate and just*
- *establish conflict resolution and negotiation mechanisms that can effectively deal with spatially and socially diverse stakeholder groups and be coordinated across administrative levels*
- *integrate local, traditional, and scientific knowledge systems*
- *facilitate the timely exchange of social and ecological information among stakeholder groups*
- *foster adaptive management and institutional learning to encourage flexibility and resilience*
- *recognize that institution building is a long-term process, an on-going multi-level, interdisciplinary, inter-sectoral learning endeavour*

A new era of resource management is upon us, one which will require “a fundamental paradigm shift” in the way we approach the problems of sustaining both environmental resources and human livelihoods (Tyler 1999: 271). While the call for ready-made

solutions is strong, there are no blueprints for success. Now more than ever, there is a need for interdisciplinary research, inter-sectoral cooperation, and broad-based forums for the open exchanges of ideas. Understanding the social, political and economic context of resource management will be a crucial task. Perhaps the greater challenge will be in developing the global political will to tap the creative potential of individuals and grassroots organizations; to build on the strengths of existing institutions while addressing problems of inequities and uncertainties in innovative ways.

---

## Introduction

Over the course of the last few decades, widespread environmental degradation and (often violent) conflicts over resource use by multiple stakeholder groups have become potent indicators of the inadequacies of current natural resource management institutions (NRMIs) at a number of levels. Part of the problem plaguing resource management today is that the theoretical constructs which shape current policies and practices are all too frequently predicated on simplistic, equilibrium-based models which treat social and ecological systems as distinct and static entities (Scoones 1999). Though there is increasing inter-disciplinary dialogue, for the most part researchers and activists have tended to focus either on ecological processes *or* the human social aspects of resource use and management. As demographic, economic, and environmental changes intensify the connections between peoples, places and ecosystems, many scholars are beginning to argue that environmental resources in LAC (and elsewhere) must be managed as parts of extensive socio-ecological systems in which environmental and human social processes are intricately related and characterized by flux and uncertainty (Aguilar 1999; Berkes and Folke 1998b; Costanza, Segura, and Martinez-Alier 1996; Gunderson, Holling, and Light 2002; Holling, Berkes, and Folke 1998; Low et al 1999; Mehta et al 1999).

The equitable and sustainable management of natural resources within such socio-ecological systems will require a better understanding and integration of both ecological and social factors. The purpose of this review is 1) to synthesize some of the key literature on NRMIs, identifying those issues and factors which research has found to be critical to the sustainable and equitable management of natural resources, in particular those which might extend across social, political, and administrative boundaries, and 2) to explore ways to re-conceptualize institutional frameworks for natural resource management in Latin America and the Caribbean where processes of globalization, decentralization, market integration, technological change, and shifting demographic patterns are precipitating rapid social and ecological change.

This work draws on a variety of theoretical and case study research on Sustainable Development, Natural Resource Management Institutions (NRMIs), Common Property Resource Management, Community Based Resource Management, and Institutional Resiliency. Though the focus is on Latin America, research findings from elsewhere (including Asia, Africa, Europe, South Pacific, and North America) are incorporated in order to better define the wide array of experiences and social, cultural, political, and economic factors related to the use and management of environmental resources. These include: on **Asia** (Agarwal 2001; Agrawal 2000; Brodt 2002; Fernández-Giménez 2002; Li 2002; Martin and Lemon 2001; Messerschmidt 1987; Varughese 2000); on **Africa** (Banana and Gombya-Ssembajjwe 2000; Horowitz 1987; Kepe, Cousins, and Turner 2001; Kull 2002); on **Europe**, (Elliott 1998b; Esty and Mendelsohn 1998; Hønneland 1999; Löfstedt and Sjöstedt 2001; Ostrom 1990; Parks 2002); on the **South Pacific** (Mahanty and Russell 2002) (Buchy and Race 2001); and on **North America** (Elliott 1998b; Mikalsen and Jentoft 2001; Ostrom 1990; Parks 2002; Rivera 1998).

Two key points emerge from the literature regarding resource management in extensive, large scale, multi-stakeholder socio-ecological systems: 1) the need for a common-property approach with nested institutions which can incorporate the diverse needs of multiple stakeholder and fair mechanisms for dealing with conflict 2) the need for institutional flexibility.

---

## Socio-Ecological Systems as Common Pool Resources

This growing awareness of the inter-relatedness of human and environmental processes which extend beyond the boundaries of interest or control of individual users, single communities, and nation states has highlighted the need for institutional arrangements which can effectively deal with large-scale extensive resources which extend across various political, social, economic and geographic boundaries. In many situations, the problems of managing environmental processes involving multiple stakeholders have only recently come to light.

The management of extensive, unpredictable and/or fluid resources by multiple stakeholders (such as rangelands, fisheries, irrigation systems, waterways, and forests) is, in fact, not a new phenomenon. Common-pool resources – natural or man-made resources that are sufficiently large or fluid as to make it costly, though not impossible, to exclude potential users (Ostrom 1992: 295) – are difficult to bound and divide and pose particular types of problems for human institutions. How best to manage these types of resources has long been a source of debate which has often been reduced to private vs. state vs. common-property institutions. There are no blueprint institutions for managing common pool resources. Institutional arrangements vary considerably and are here only briefly summarized. But insights gained from the study of existing common property management regimes can be useful for understanding emerging institutional needs for managing extensive, multiple-stakeholder resources in contemporary Latin America and the Caribbean.

Political motivations and fears of the ‘tragedy of the commons’ have prompted governments to mount campaigns to either claim common-pool resources as state property or alternately to institute widespread privatization (as is currently the trend worldwide) (Hardin 1968), but there is a great deal of evidence that neither *alone* works well for common-pool resources. The extensive nature of these resources – especially fluid and fugitive resources, such as water and wildlife – makes monitoring difficult and costly, and access and use cannot be readily controlled. The transaction costs of

defending against free-riders and theft are prohibitively high (Somma 1997). In national parks and protected areas, for examples, boundaries are usually sufficiently porous that local dwellers are able to re-enter conservation territories they traditionally used to harvest and exploit resources found there (Brandon and Wells 1992; West and Brechin ; Young 1999).

Many state-owned and controlled resources, such as forests, fisheries, and hydrological systems suffer notably from overexploitation and degradation (Kalikoski, Vasconcellos, and Lavkulich 2002. See also Messerschmidt 1987). Private property institutions suffer from some of the same problems and in some cases have actually exacerbated ecological destruction. For example, throughout much of Latin America the 'rule of capture', whereby property rights are granted to individuals who can demonstrate presence or productive use (e.g. by the cutting of trees), has contributed to rapid deforestation (Collins 1995; Hecht 1981; Schmink and Wood 1987; Sheridan 1988). In many places ownership of land typically implies the right to water beneath that land and anyone who can afford to drill a well and pump water can do so. Governments cannot adequately monitor pumping, groundwater resources are vastly over-exploited, and aquifers are shrinking at alarming rates (Postel 1999; Sheridan 1988; Sick, in press ). In effect, groundwater, and other extensive resources become *res nullius* (no one's property); access is open to all and over-exploitation is common.

Research on common property regimes has shown that various durable institutional arrangements exist for dealing with the peculiarities of common-pool resources (Berkes 1989; Berkes 1992; Berkes et al 2001; Messerschmidt 1987; Netting 1981; Netting 1982; Netting 1993; Oakerson 1992; Ostrom 1990; Somma 1997; Vondal 1987). In common property regimes users typically hold clear and secure rights to resources (including formal private property rights), but overarching rights and management decisions are vested neither in individuals nor the state alone , but in a group of stakeholders. Many successful common property regimes are, in fact, mixtures of private-like and public-like institutions (Ostrom 1990: 14)

Scholars of common property regimes have identified several conditions which distinguish them from open access situations and which are considered necessary for successful CPR management institutions. These include :

- 1) well-defined user groups and spatial boundaries
- 2) clearly-defined rules specifying both the rights and responsibilities for joint use
- 3) effective monitoring with the ability of the group to apply fair and graduated sanctions

(Bromley 1992; Ostrom 1990; Runge 1992).

Clearly defined boundaries and a web of defined rights and responsibilities involve users directly in resource management and provide them with a stake in protecting resources upon which they depend for their livelihoods (Berkes 1989; Poole 1989). Though there is some evidence that managing common-pool resources is easier among small, homogenous groups (Olson 1965; Ahuja 1998), in some cases institutional nesting arrangements have proven to be effective in resolving problems arising from heterogeneity and large group collective action (Barrett et al 2001; Kalikoski, Vasconcellos, and Lavkulich 2002; Ostrom et al 1999; Ostrom and Wertime 2000; Oviedo 1999; Varughese 2000).

The benefits of user groups actively managing the common-pool resources on which they depend for their livelihoods have been widely noted in the literature on common property institutions (Bromley 1992; Bromley and Cernea 1989; Davis and Wali 1993; Messerschmidt 1987; Ostrom 1990; Ostrom et al 1999; Poole 1989; Radwan 1997; Runge 1992).

First, local users usually have an intimate **knowledge of the resources** upon which they depend; close proximity allows them more readily to note changes in resource conditions than distant technocrats and bureaucrats working for government agencies. Second, direct **stakeholders** are more likely to **encourage the protection of resources** on which they depend for their livelihoods. Third, **monitoring and enforcement** of rules

regarding use and maintenance are more effective and involve lower transaction costs if done by local user groups rather than by outside agencies.

The benefits of user involvement, as well as a growing understanding of the link between poverty and environmental degradation (Annis 1992; Stonich and DeWalt 1989; United Nations Development Programme 1994; World Bank. 1990), have not gone unnoticed by policy makers and planners. Natural resource management policies and practices vary across Latin American and the Caribbean, but in the past decade, policy trends advocating decentralization and participation of local peoples in resource management have resulted in an explosion of Community-Based Resource Management (CBRM), and Integrated Conservation and Development Projects (ICDPs), which attempt to incorporate both conservation and development objectives (Berger 1993; Gray, Prellada, and Newing 1998; Guzmán, Castillo, and Escalante 1998; Hønneland 1999; Pardeshi 1996; Pimbert et al 2000; Stevens 1997; Sunderlin and Gorospe 1997; Umaña and Brandon 1992).

Participatory arrangements vary considerably in their structure and the degree to which they take into account local interests and allow for local participation. They also have been established with a range of objectives: from a) the sustainable management of productive resources – for example **fisheries** (Berkas 1992; Hønneland 1999; Kalikoski, Vasconcellos, and Lavkulich 2002; Sunderlin and Gorospe 1997), **forests** (Agrawal 2000; Azhar 1993; Buchy and Race 2001; Davis and Wali 1993; Gibson and Becker 2000; Gibson, McKean, and Ostrom 2000; Gibson, Ostrom, and McKean 2000; Klooster 2000a; Klooster 2000b; Martin and Lemon 2001; Molnar 1989; Varughese 2000), and **rangelands** (Berger 1993; International Institute for Environment and Development (IIED). 1994; Kepe, Cousins, and Turner 2001; Kruse et al 1998), and **water resources** (Boelens and Doornbos 2001; Postel 1999; Rivera 1998; Scott and Silva-Ochoa 2001; Sick, in press ; Somma 1997; Whiteford and Bernal 1995; Whiteford and Melville, in press ; Wilshusen et al 2002) – to b) the explicit aim of conserving biological diversity in **protected areas** (Brandon and Wells 1992; Furze, De Lacy, and Birkhead 1996; Gillingham 2001; Gray, Prellada, and Newing 1998; Guzmán, Castillo, and Escalante 1998; Kaimowitz et al 1998; Kepe, Cousins, and Turner 2001; Kothari et al 1996; Marks

1991; McNeely 1995; Pardeshi 1996; Stevens 1997; Umaña and Brandon 1992; West and Brechin ).

Among the most well-known conservation-development initiatives are UNESCO's Man and the Biosphere Reserves, in which significant ecological zones which have been targeted for conservation are managed through a variety of multiple-use zones designed to meet both human development and conservation objectives (Kaiser 2001). In Latin America, these include the BOSAWAS reserve in Nicaragua; the Galapagos Biosphere Reserve, Ecuador; the Maya Biosphere and Vizcaino Biosphere Reserves in Mexico; the Sierra Nevada de Santa Marta in Colombia, and the Meso-American Biological Corridor spanning eight countries from Chiapas, Mexico to the Darien Gap in Panama.

---

## **Challenges of Managing Socio-Ecological Systems: Lessons from Community-Based Resource Management Initiatives**

As our understanding of ecological processes, human motivations, and population pressures increases, the need for large-scale management institutions which extend beyond the capacity of any one local community is clear (Adger and Luttrell 2000; Baker 1992; Fernández-Giménez 2002; Kalikoski, Vasconcellos, and Lavkulich 2002; Terborgh 1999). Thinking of socio-ecological systems as common-pool resources gives us a theoretical model with which we can re-structure our thinking about NRM in our seemingly shrinking world, but establishing well-defined boundaries and group membership, clearly defined rights and responsibilities, and effective monitoring for these complex and diverse systems is not going to be easy. Matching the scale of decision making and management with the scale of environmental processes will require careful thought (Kalikoski, Vasconcellos, and Lavkulich 2002; Low et al 1999)

The many failures of CBRM and ICDPs to adequately protect environmental resources – most notably in conservation areas – has led some to call for a return to centralized management (Oates 1999) but the necessity of active local-level participation in resource management is also demonstrably clear. The fact remains that throughout Latin America and the Caribbean, the social, environmental, and monetary costs of excluding local peoples from resource management are prohibitively high (Brecht et al 2002; Heltberg 2002; Wilshusen et al 2002).

Managing environmental processes across a range of existing social, administrative, economic, and political boundaries will require the co-ordination – and in many cases the creation – of nested hierarchies of local and regional institutions, drawing on the strengths of various stakeholders at various institutional levels. Co-management offers some interesting prospects for dealing with the dual problems of protecting individual and group rights as well as preserving the integrity of extensive, common pool resources. The exact nature of co-management schemes varies tremendously, but the basic

premise is that government and local user groups become partners in resource management, each drawing on its respective strengths: governments can provide administrative, regulatory and infra-structural capabilities that do not exist at the community level, while communities of resource users, in turn, can contribute their knowledge, their presence in the resource setting, and community-based mobilization in support of management efforts (Hønneland 1999; Kruse et al 1998; Pinkerton 1992; Sunderlin and Gorospe 1997). To date, though, most co-management schemes are, in fact, state initiated and state run, with local users having little real input. Co-management schemes have suffered many of the same problems of CBRM and ICDPs – problems likely to be amplified for the next generation of RMLs attempting to deal with more extensive environmental processes and a larger number of more socially and culturally diverse user groups. This section summarizes some of the key lessons of communitybased conservation efforts and their implications for nested institutional arrangements for managing extensive socio-ecological systems.

### **Simplistic Notions of ‘Community’ and ‘Participation’**

Many of the problems faced by CBRM and co-management programs stem from the fact that new institutional arrangements have been imposed or fostered by outside agencies and organizations, rather than developing ‘organically,’ and that these agencies rely on overly simplistic notions of two key concepts of CBRM: ‘community’ and ‘participation.’ All too often, planners envision communities as homogenous groups of ‘local peoples’, rather than social entities comprised of varied interest groups defined by social status, gender, age, occupation, ethnicity, and ideological orientation – groups which are often engaged in overt and covert struggles over power and resources (Agarwal 2001; Agrawal and Gibson 1999; Annis 1992; Gibson, McKean, and Ostrom 2000; Kutay 1991; Marks 1991; Olwig 1980). Some researchers even go so far as to argue that the concept of “community” is so elusive as to be of little use in analyzing RMLs (Kepe, Cousins, and Turner 2001).

As communities are indeed comprised of multiple interest groups, the question of representation arises when ‘community participation’ is invoked. In many CBRM

initiatives, marginal groups, including women, ethnic minorities, and the poor, are rarely included and local elites and vested interest groups monopolize access to resources and co-opt decision-making at the local level (Kepe, Cousins, and Turner 2001; Klooster 2000a; Klooster 2000b; Mahanty and Russell 2002; Martin and Lemon 2001).

Furthermore, despite official rhetoric, much research indicates that in reality most local 'participation' in conservation initiatives has been passive (Chatty 1999; Redclift 1992). Participation can range from being cooks and park guards, to full and effective control of management practices; but most often it is an outside government agency or NGO that is the effective decision-maker (Gray, Prellada, and Newing 1998). Simple inclusion on a joint management board does not necessarily imply effective decision-making power (Chatty 1999; Kruse et al 1998; Redclift 1992). Goetze, in her research on co-management in Canada and Belize, cautions that because many projects are heavily funded by external donors, the chief concerns of local peoples and NGOs are often lost as outsiders dominate decision-making or as locals attempt to meet externally-generated funding guidelines (Goetze 2002).

In some cases, 'local user groups' are actually defined by the state (Oakerson 1992). For example, in the devolution program in Mexico, the state created local water user groups based on geographic, rather than, social criteria – the latter referring to historically evolved communal landholders and private landowners. The result was intense conflict within the new water-user groups (Whiteford, Scott and Bernal, Francisco 95; Whiteford, Scott and Melville, Roberto, in press ).

Discussions of participation should perhaps make special note of the role of indigenous peoples in resource management and conservation. Because indigenous peoples typically reside in marginal, undeveloped regions – the same areas which are valued for their biodiversity as conservation areas – they are among the most affected by attempts to build new institutional arrangements for resource management (Chatty 1999; Colchester and Gray 1998; Davis and Wali 1993; Gray, Prellada, and Newing 1998; Kaimowitz et al 1998; Poole 1989; Stevens 1997).

In Latin America, indigenous peoples reside within 80% of the protected areas (Colchester and Gray 1998) and have legal, communal claims to areas estimated to be as much as ten times the size of all formal conservation units combined (Clay 1996). Lands claimed or controlled by indigenous peoples are often strategically located within or adjacent to protected areas and are considered vital by many biologists to enhancing ecosystem viability (Redford 1996). Many indigenous peoples do not have the human or financial resources to defend their rights and interests in wider national and international contexts, though some, like the Kayapo of Brazil (Hecht and Cockburn 1989) and the Kuna of Panama have been able to mobilize support through national and international networks and have been quite successful in legalizing territorial rights and administrative authority at the national level (Brandon 1996; Davis and Wali 1993; Ventocilla et al 1996; Wali 1993).

The physical and economic relationship of indigenous peoples to areas deemed valuable to the conservation of biodiversity has resulted in some collaboration between indigenous peoples and conservationists in the management of environmental resources, but in many cases finding overlapping interests has been difficult (Clay 1996) and conflict has been common (Kaimowitz, David. n.d. ; Stocks 1996; Young 1999). For one thing, biodiversity is not necessarily the primary objective of most indigenous groups (though it is frequently a cultural by-product). This clash of values and restrictions placed on the use of environmental resources often pits indigenous peoples against park officials and/or conservation groups (Stocks 1996; Ventocilla et al 1996).

The degree to which indigenous peoples participate in resource management decisions varies, as well. For example, in Colombia indigenous people had to contest the state's rights to manage natural resources in territories that they traditionally claimed (Forero, Tanimuca, and Laborde 1998); local rights to resource control were upheld and indigenous peoples are now actively creating local organizations to help better manage resources within these territories. Others, for example El Sira, in Peru, have chosen protected area status specifically as a strategy to defend their rights against other potential user groups such as miners and agricultural colonists (Guzmán, Castillo, and

Escalante 1998). How the integration of certain state-imposed rules has affected local institutions in this case is not yet clear.

### **Lack of Conflict, Negotiation, and Resolution Mechanisms**

The literature is rife with reports of conflict, resistance, sabotage, and continued degradation of environmental resources. Conflict within RMIs stems from the diversity of interests within user groups; among multiple user groups claiming rights to the same or overlapping resources; and among user groups, biologists and government administrators (Colchester and Gray 1998; Fernández-Giménez 2002; Gibson, Ostrom, and McKean 2000; Klooster 2000b; Kruse et al 1998; Turner and et al. 2000; Zbicz 1999).

The equitable distribution of power and resources is not easy to achieve; defining boundaries and eligibility for legitimate access, determining rules and sanctions, enforcing exclusion, monitoring resource use and distribution, etc. are intrinsically contentious functions (Ostrom 1990; Ostrom et al 1999). In many cases, conflict, such as that which plagues most protected areas, is the result of institutional failure to adequately deal with clashes in interests or values attributed to environmental resources (Agrawal and Gibson 1999; Gibson and Becker 2000; Gibson, Ostrom, and McKean 2000; Kepe, Cousins, and Turner 2001; King 1997; Neumann 1995; Vondal 1987). There is a particular need in these settings for “a pluralistic approach that recognizes the multiple perspectives of stakeholders” (Buckles and Rusnak 1999: 4).

Successful common property arrangements work not because there is an absence of diversity, conflict, and power struggles, but through established mechanisms for negotiation and resolution (Guzmán, Castillo, and Escalante 1998; Löfstedt and Sjöstedt 2001; Ostrom 1990; Vondal 1987). These mechanisms can range from informal negotiations, to the settlement of disputes by local leaders, to the use of regional commissions, or national laws. In order to be effective, sanctions should be decided upon by users themselves, or by entities *accountable* to user groups (Ostrom 1990).

Much work suggests that while conflict needs to be managed, it is also a normal feature of human societies which can act as a “catalyst for positive change . . . [especially] for marginal groups seeking to redress injustices or extreme inequities in resource distribution” (Buckles and Rusnak 1999). (See also Oviedo 1999; Weitzner and Fonseca Borrás 1999.) Nevertheless, some level of consensus is in order for management plans to be formulated and executed.

Given the increased potential for conflict in these multi-level resource management institutions, how well they operate will depend on well-articulated and co-ordinated negotiation and conflict resolution mechanisms (Daniels and Walker 2001). Conflict resolution and negotiation mechanisms need to deal with spatially and socially diverse stakeholder groups and to be coordinated across administrative levels. Existing local and regional negotiation and conflict resolution institutions should be incorporated wherever possible as dispute resolution mechanisms of the first and second resort; state legal institutions can provide legitimacy to these systems and act as conflict resolution mechanisms of last resort (Fernández-Giménez 2002; Ostrom 1990)

In small-scale RMIs, management often revolves not solely around resource use but is related to shared activity and social life (McCay and Jentoft 1998). Within large institutions which cut across spatially, socially and economic diverse interest groups, webs of established social relations are likely to be weak, if they exist at all. Negotiation and conflict resolution mechanisms on a broader scale may not exist. Incorporating the means for representatives of various groups to meet face-to-face in planning and negotiating meetings will be important to facilitate the exchange of ideas and concerns and to help to build trust. In some cases the idea of belonging to a common network can provide diverse stakeholders with a sense of shared identity (Carley and Christie 2000: 189).

Government officials will find themselves needing to play a more facilitative, mediating, role and become more active in monitoring (not control) “to ensure that public interests are protected from narrow parochial interests” (Tyler 1999: 278). NGOs or other non-partisan coalitions (Auer 2002; Gibson, Ostrom, and McKean 2000; Nygren 2000) .

Changing attitudes of government officials may be one of the more difficult tasks. In their study of the Laguna Merin watershed in Uruguay, Perez Arrate & Scarlato found that government agents and technical personnel proved “the least willing to modify their positions” (Pérez Arrate and Scarlato 1999: 110). Disagreements between local resource users and government bureaucrats are likely, in part because each is likely to have preconceived notions about the ‘other.’ Because of the power imbalance, changing bureaucratic cultures to accept a collaborative role in the management process may be difficult (Pimbert et al 2000). Attitudes about class, ethnicity, cultural differences, and entrenched notions of working *for* the government rather than *with* resource users are likely to prove difficult to change (Kalikoski, Vasconcellos, and Lavkulich 2002). Further research in this area would be useful.

### **Perceptions of Inequities, Injustice, and Lack of Legitimacy**

Conflict and disregard for resource-use rules are frequently the result of perceptions of inequities, injustice, and lack of legitimacy (Boelens and Doornbos 2001; Buchy and Race 2001; Klooster 2000a; Kull 2002; Oakerson 1992). When some individuals or groups perceive that their legitimate rights are being overlooked, they often resort to resistance and sabotage, which can lead to environmental degradation (Kepe, Cousins, and Turner 2001; Klooster 2000a).

The question of legitimacy is particularly crucial in cases where outside agencies or organizations have attempted to create new institutional arrangements, or devolved management responsibilities to local groups in new ways, as is the case in many community-based and co-management projects (Klooster 2000a; Klooster 2000b). Local peoples may have their own views on what constitutes the legitimate use of resources and these views may not correspond with those of conservationists and planners (Kepe, Cousins, and Turner 2001).

Related to the issue of injustice is the inefficient monitoring of resource use and/or unequal sanctioning of non-compliance. Unenforced, or selectively enforced, rules lead to a sense of injustice. As a result, a true tragedy of the commons may occur as

everyone races to get his/her share before others do (Hardin 1968; Kalikoski, Vasconcellos, and Lavkulich 2002). On the other hand, co-management institutions can enhance the legitimacy of monitoring and sanctioning undertaken by local user groups by providing financial and institutional support (Ostrom 1990; Ostrom et al 1999).

### **Prohibitive Transaction Costs**

Investment in collective action and institution building is costly in many ways, including time spent in meetings and heated debates, in monitoring resource use, and in resource improvements (Barrett et al 2001; Buchy and Race 2001; Esty and Mendelsohn 1998; Gibson and Becker 2000; Gibson, Ostrom, and McKean 2000; Thomson, Feeny, and Oakerson 1992). As decentralization policies are implemented, local users frequently must bear not just the financial costs of monitoring, upkeep and sanctioning, but other organizational costs, as well. For example, in Peru the creation of indigenous communal reserves has given the Sira state-legitimized rights over the resources on which they most depend, but, according to Guzmán, they do not have adequate human or financial resources to effectively monitor and control against in-coming migrants and commercial timber and gold extractors (Guzmán, Castillo, and Escalante 1998). (See also Klooster 2000b.)

Other types of transaction costs can also be prohibitive. For example, labour constraints limit the time individuals or households can spend on collective management activities and often keep the most marginal groups – and women in particular – from actively participating in management activities and decision-making (Scott and Silva-Ochoa 2001). In my own work in Panama, rural residents cited both time constraints and lack of transportation as impediments to participation. Almeida found that in Brazil, large distances and poor transportation systems were barriers to participation in the management of an extractive reserve (Almeida 1996).

In assessing transaction costs, it is again important that all users perceive that benefits and costs are fairly distributed (Ostrom 1990; Ostrom et al 1999). Various arrangements can be made to accommodate individual needs; for example some users might

contribute time and labour, while others make cash contributions (Varughese 2000). As Chevalier and Buckles note, transferring rights and responsibilities for natural resource management to local communities without providing financial resources, credit or marketing help, technical support, or protective legislation against local elites or multinational corporations amounts to nothing but “pure rhetoric” (Chevalier and Buckles 1999: 30).

The challenges of equitably distributing transaction costs and benefits among stakeholder groups will be even greater for broad-based, multi-level institutions charged with managing extensive socioecological systems. Conservation and monitoring efforts may involve greater transaction costs than for smaller regimes and may fall disproportionately on one or a few stakeholder groups. The distribution of human and financial costs needs to be carefully considered.

As our understanding of ecological processes deepens, geographically dispersed groups are exerting pressure on connected resources hundreds, or thousands of kilometres distant. Many local stakeholder groups (primarily rurally based subsistence groups in the developing world) are beginning to call for payment for their part in the conservation of environmental resources. They claim that they are being expected to disproportionately bear the costs of ecosystem conservation, while others (e.g. urban-based populations in the industrialized world) benefit from the environmental services provided by their conservation measures (Almeida 1996; Brannstrom 2001; Gibson and Becker 2000; Pastoral de la Tierra Y Medio Ambiente Diocesis de Trujillo. 2000).

Debt for nature swaps are an example of such payments on a national level, but ecological economists have been pondering this question of how to adequately and fairly value ecosystem functions and services (e.g. preserving biodiversity, carbon sequestering, and water cycling) and strong arguments are emerging as to the benefits of all beneficiaries paying more directly for ecological services (Collados and Duane 1999; Costanza et al. 1999). But the potential problems associated with such payments are many and include (but are not limited to): lack of consensus on the monetary value of such services; the question of how and to whom payments should be made (directly to

local peoples or distributed through governments); how to monitor compliance; and how to avoid divisive effects and other social costs of large environmental-service payments to communities (Fearnside 1997).

According to one study on watershed conservation in Latin America, the idea of all beneficiaries helping to pay for conservation services has been gaining ground (Echavarria and Lochman 2001). For example, the Costa Rican government began in the early 1990s to pay landholders for reforestation, sustainable management of forests and forest preservation in order to help preserve watershed services; around the same time in Brazil, the state of Parana began to financially compensate municipalities for the conservation of watershed resources; in Ecuador, a water-user fee system (differentiated according to use) has been initiated in which fees are invested in a fund used for watershed conservation projects and management. In the Costa Rican case, landowners themselves are directly compensated, though these tend to be larger, wealthier property owners, and funds for compensation are limited. In the other cases, the proportion of user fees that actually reach local user groups charged with management and preservation responsibilities is as yet unclear.

### **Lack of Clear and Secure Property Rights**

The importance of clear and secure rights to resources has also been widely asserted as a crucial component of successful resource management (Banana and Gombya-Ssembajjwe 2000; Brandon 1996; Esty and Mendelsohn 1998; Gibson, Ostrom, and McKean 2000; Guzmán, Castillo, and Escalante 1998; Heltberg 2002; Kepe, Cousins, and Turner 2001; Netting 1982; Stocks 1996). Property rights not only define who is allowed to use resources and where; secure rights are also one way of dealing with uncertainty. Without clear expectations for the future, resource users are more likely to discount the future value of resources (Adger and Luttrell 2000; Esty and Mendelsohn 1998; Gibson, Ostrom, and McKean 2000; Runge 1992). Those systems in which users do not have secure property rights are more prone to over-exploitation. Adger and Luttrell argue that past under-valuation and poorly clarified tenure regimes of Indonesian wetlands have led to conflict and resource degradation as expanding urban communities, who now covet cheap, 'unclaimed' coastal swamps for housing

developments, compete with traditional users for rights to these resources (Adger and Luttrell 2000).

This is not to say that private property rights are essential. Private property rights if nested within institutions of common property management are well-suited for some types of resources – particularly intensively worked agricultural lands (Adger and Luttrell 2000; Netting 1981; Netting 1982; Netting 1993; Thomson, Feeny, and Oakerson 1992). In other cases, where resources are dispersed and flows of benefits are unpredictable, as in unimproved rangelands, users may require secure rights of access to particular resources (e.g. dispersed pastures), rather than rights to clearly defined territories; rangelands that have been divided territorially among herding groups often become degraded (Agrawal 2001; Fernández-Giménez 2002; Galaty 1999).

Furthermore, titling processes involve costs which many people cannot afford. Wealthy elites are better able to take advantage at the expense of the less powerful. Titling should be carried out only after careful local analysis of existing economic differentiation (Heltberg 2002; Kepe, Cousins, and Turner 2001).

### **Building on Existing Institutions**

Research has shown that building on existing local institutions and initiatives will help ensure more efficient and enduring institutions (Chambers 1983; Korten and Klaus 1984), which can facilitate the monitoring of local resource conditions, the enforcement of rules, and the sanctioning of rule-breakers. Broader regional and national institutions can provide coordinating functions. These might include indigenous organizations, existing communal land-owning groups, resource-use associations, such as water-user or cattle-raising groups, syndicates, national and international NGOs, legal & religious institutions, and public and private organizations. Informal social networks such as family and extended kin groups, might also provide (with caution) foundations on which to build (Fernández-Giménez 2002; Turner et al. 2000).

In recent years, national governments throughout Latin America have begun devolving authority for resource management to municipal governments. As local institutions that

are in many cases already involved with the management of some local resources, municipal governments appear a logical starting place. For example, in the PROBIDES program in Uruguay, the local municipal government played a key role by lending legitimacy to the project and in helping with its execution (Pérez Arrarte and Scarlato 1999).

In Bolivia, Nicaragua, and Honduras the outcomes of devolving resource management to municipal governments have been less positive, for a number of reasons. First, municipal governments are not always considered legitimate by local populations; they are often perceived as political, corrupt and overly-interested in tax collecting; they are frequently unaware of the condition of their resource base; they may be overly influenced by urban interests and developers and may be tempted to see the resource base primarily in terms of its short-term income earning potential (Gibson, Ostrom, and McKean 2000; Gillingham 2001; Heltberg 2002)

These same problems might apply to other existing institutions such as co-operatives, religious institutions, development associations, etc. Thus, while existing institutions are likely to be more enduring than those created artificially by outside organizations, their inclusion does need careful thought and research. . Local institutions and organizations may be prone to co-optation by local elites, as Klooster found in community forestry programs in Mexico (Klooster 2000a; Klooster 2000b). (See also Mahanty and Russell 2002; Martin and Lemon 2001 for cases elsewhere.) Frequently, those people involved with the running of existing institutions will have their own underlying objectives that may or may not coincide with broader resource management objectives or the interests of other stakeholders.

## **Context is Crucial**

Understanding the social, cultural, political, historical, and economic contexts of natural resource management institutions is as crucial as understanding the biological and physical aspects of ecological systems (Agrawal and Gibson 1999; Boelens and Doornbos 2001; Brannstrom 2001; Bush and Opp 1999; Kaimowitz et al 1998; Kalikoski,

Vasconcellos, and Lavkulich 2002; Wilshusen et al 2002). New institutions for managing extensive environmental systems will evolve within complex existing social and historical frameworks, in which power imbalances and cultural differences might be extensive and deeply embedded (Heltberg 2002; Kepe, Cousins, and Turner 2001; Klooster 2000a; Klooster 2000b).

The importance of context is well-documented throughout the literature and cannot be understated. The lessons are clear: *failure to understand context is likely to result in institutional failure as well*. There is a need not only to understand existing property rights and systems of resources use, but the social, cultural, and historic context in which these operate (McCay and Jentoft 1998).

For example, Gillingham's work in Brazilian *Ribeirinho* (river) communities is particularly insightful in this respect. The creation of the Mamirauá sustainable development reserve was seemingly well thought out, with significant decision-making and problem-solving authority given to local residents, and rules established through a consultative process with local authorities and other stakeholder groups. Yet strongly embedded patron-client relationships between rural *Ribeirinhos* and urban merchants went unrecognized by planners. The result was an unconscious undermining of the agreed-upon rules of resource use (Gillingham 2001). (See also Gibson and Becker 2000 on Ecuador.)

Within the context of large-scale, nested institutional arrangements it will be essential to understand from the outset the perceptions of resource value, motivations, and types of relationships that exist or are likely to emerge as groups of stakeholders are linked with one another in new ways – as well as possible clashes of interests (Agrawal and Gibson 1999; Esty and Mendelsohn 1998; Gibson and Becker 2000; Kepe, Cousins, and Turner 2001; King 1997; Neumann 1995; Turner and et al. 2000; Vondal 1987). Initial and on-going research aimed at understanding local, regional, national, and international contexts within which RMIs operate will be time-consuming yet essential for anticipating problems and potential conflicts (Chenier, Sherwood, and Robertson 1999; Chevalier and Buckles 1999; Oviedo 1999; Ramírez 1999). Research should minimally focus on:

- *identifying all possible stakeholders and interest groups*
- *identifying and understanding social relationships*
- *understanding diverse perspectives on concepts of nature, resource use, and goals*
- *understanding individual, household and corporate motivations; how these might vary according to class, ethnicity, occupation, age, and gender etc, and their impact on institutional operations*
- *identifying existing local and regional institutions for resource management, negotiation, and conflict resolution*
- *identifying & understanding local systems of knowledge and networks of communication*
- *understanding local and regional economic and political systems*

Various methodologies – such as rapid rural appraisal techniques, participant observation and interviewing by trained outside professionals, and participatory action research (PAR), in which local participants are actively involved in the study design and data collection – have proven to be effective and useful tools for understanding institutional context and for serving to stimulate interest and a sense of ownership among participants (Chenier, Sherwood, and Robertson 1999; Chevalier and Buckles 1999; Oviedo 1999; Ramírez 1999). Cost-benefit, network, decision-making, and stakeholder analyses can help to shed light on motivations and to anticipate and mediate conflict.

### **Unclear Social and Spatial Boundaries**

One of the biggest challenges facing RMIs is the fact that there is no clear fit between environmental processes and human-defined institutional boundaries. Eco-system processes are not necessarily spatially confined. The inter-relationships among ‘ecosystem parts’ often are not immediately evident, are frequently invisible, constantly in flux, and still not fully understood – or agreed upon – by the scientific community,

(Chenier, Sherwood, and Robertson 1999; Turner and et al. 2000). Institutional arrangements will need to consider the range of ecological interactions in the system (Gómez, Martínez, and Reilly 2001; Holling, Berkes, and Folke 1998), though in many cases ecologically arbitrary decisions might need to be made concerning the delineation of resource boundaries for management purposes

This ‘boundary problem’ is perhaps most apparent with fluid and mobile resources such as water, fisheries, and wildlife, though it is becoming evident with other types of resources (e.g. forest-watershed systems) as our understanding of ecosystems improves. For example, artisan fishermen of Patos Lagoon, Brazil have been granted exclusive rights and management authority over estuary resources, but have no control over offshore industrial fishers and their impact on estuary resources {Kalikoski, Vasconcellos, et al. 2002 37 /id}. Associations of Maine lobster fishermen regulate for maximum catch size to maintain diversity and a healthy lobster population, but larger lobsters roam and outside fishermen wait along boundary lines to scoop them up as they cross territorial boundaries (Low et al 1999). Groundwater pumped from wells in the southern United States depletes farmers’ wells hundreds of kilometres across the border in northern Mexico (Ashley and Smith 1999; Elliott 1998a; Elliott 1998b; Sick, in press ).

The sheer number and range of interest groups and levels of administration alone poses one of the greatest challenges to institution building. The question of boundary definition and stakeholders is tricky: if too narrowly defined, then relevant factors, actors, and connections might be excluded; if too widely defined, the problem will seem too diffuse and incomprehensible (Carley and Christie 2000: 157).

Most scholars concur that sustainable management is most likely when key decisions and daily management are the responsibility of those stakeholders who depend on the resource for a substantial part of their livelihood and when their potential losses from degradation are large and apparent (Ostrom et al 1999). On a practical level, the spatial extent of the resource to be managed needs to be small enough – and the group size large enough – that with given transportation and communication, users can develop

accurate knowledge of the environment and its boundaries and monitor effectively (Gibson, Ostrom, and McKean 2000).

Mikalsen and Jentoft (2001) suggest a coalition model which includes among the decision-makers and managers primary resource users, as well as others with legitimate claims to participate, such as government administrators, technical professionals, and scientists. Concerns of other interested parties – environmental groups and current urban and future populations who will benefit from healthy ecosystems as sources of livelihood, climatic stabilizers, carbon sinks, recreational sites, or sources of clean water, etc – might be addressed through transparent institutional arrangements which include broader consultative processes (Mikalsen and Jentoft 2001). See also (Jønch-Clausen and Fugl 2001).

---

## Flux, Flexibility, and Institutional Resiliency

### Coping with Change

One of the biggest challenges facing NRMI is constant change in both human and ecological systems. Disturbances in ecological systems as well as changes in conditions of human livelihoods – such as expanding markets, changing values of resource products, changes in available technology (e.g. acquisition of chainsaws, guns, power boats), and government policies, and increased demographic pressures, through population growth or migration – can result in serious disruptions in RMIs (Almeida 1996; Brannstrom 2001; Horowitz 1987; King 1997; Li 2002; Thomson, Feeny, and Oakerson 1992).

For example, the tremendous impacts of rapid migration into areas where RMIS were unprepared to cope with their presence, are well documented.(Agrawal 2001; Collins 1995; Gibson, Ostrom, and McKean 2000; Guzmán, Castillo, and Escalante 1998; Hecht 1981; Hecht and Cockburn 1989; Heckadon Moreno 1985; Hiraoka and Yamamoto 1980; Schmink and Wood 1987; Stocks 1996). Migrants typically have different cultural backgrounds from local residents (usually indigenous groups), share “no common tradition or recognition of resource values and taboos . . . [and are ] not party to established mechanisms for arbitration, benefit sharing and managing common property” (Tyler 1999: 266). Still, unless forcibly evicted, the reality is that once in place, colonists are unlikely to simply go away. Their presence, claims on, and use of natural resources will at some level need to be incorporated into new or existing RMIs, a process that is likely to be a lengthy and contentious process (Heltberg 2002).

The fact that both human and environmental conditions are constantly in flux has many biological, social, and environmental scientists returning to lessons from the ‘development era’ of the 1960s -1980s and advocating the need to think of sustainable development not as a goal, but as a process (Holling, Berkes, and Folke 1998). In order to continue functioning in a world of constant change, RMIs must be resilient, i.e. able to

absorb fluctuations and disturbance within both the natural and human parts of the system (Berkes and Folke 1998b:6. See also Polacheck 2002; [www.resalliance.org](http://www.resalliance.org)).

The higher transaction costs characteristic of managing larger nested institutions mean that concerted effort will be needed to ensure that these institutions remain flexible and resilient. By nature they will be more complex, bureaucratic, and cumbersome; decision-making will typically be slower and run the risk of bogging down to the point of inaction.

Key to building resiliency is to remember that institution building is a long-term process. Rules of use, systems of monitoring, mechanisms for conflict resolution, and building trust among stakeholders all take time to develop. Unfortunately, past experience indicates that government agencies and NGOs are too often project- and deadline-driven and looking for easily-copied models (Heltberg 2002; Kepe, Cousins, and Turner 2001). This outcome-oriented approach – usually measured by outside standards of ‘success’ – usually allows for little innovation or flexibility, as approval for action, particularly at the local level, must come from afar (Gezon 1997).

Many scholars now suggest that in order to remain resilient, RMI must adopt a learning-process approach to management in order to cope with changing and uncertain conditions (Berkes and Folke 1998a; Carley and Christie 2000; Elmgren 2001; Gunderson and Holling 2002; Holling 2001). Rather than prescribing desired outcomes, an adaptive management approach allows people within institutions to learn from their actions (Oakerson 1992), creating reflective institutions which encourage learning and response to change (IUCN. n.d. ). Crisis and failure are seen as useful types of feedback and are used to help re-configure the system.<sup>1</sup>

---

<sup>1</sup> This adaptive-learning concept has also been employed as a research methodology, as in the case of AMESH (Adaptive Methodology for Ecosystem Sustainability and Health), a multi-stage, reflexive research methodology used in Ucayali, Peru to look at the interactions among competing health, environmental, and economic goals (Murray, Tamsyn P., Kay, James J., Waltner-Toews, David., and Rael-Luna, Ernesto.; Shore 2000).

## **Information & Communication.**

As Ostrom notes, “getting institutions right . . . is a process that requires reliable information about time and place variables, as well as a broad repertoire of culturally acceptable rules” (Ostrom 1990: 14). Key to the success and flexibility of the next generation of RMIs will be the timely collection and dissemination of information among all levels of management in a manner mutually understandable to all stakeholders. Though the scale and complexity of broad-based, nested institutional arrangements will likely encumber communication (Pérez Arrarte and Scarlato 1999), good communication is vital to ensure that 1) changing conditions of the resource base and/or users’ needs are related to decision-makers, and 2) rules, monitoring and enforcement are coordinated across administrative levels.

Sometimes, simple opportunities for the exchange of information have been instrumental in facilitating cooperation among interest groups. For example, in the community of Loma Alta, Ecuador a simple video demonstrating some of the ecosystem services that a nearby forest could provide the local community changed some local people’s perceptions about the value of the forest and might well lead to changes in currently destructive resource use (in Gibson and Becker 2000).

One of the potential benefits of managing environmental processes through coordinated, multi-level resource management institutions is the inclusion of a variety of information systems and knowledge bases. With extensive environmental resources, it is difficult for either the state or local user groups to have a complete understanding of the condition of the entire system. Local users have intensive knowledge and understanding about day to day local uses and conditions, while national governments and international NGOs have financial and administrative resources to tackle large-scale scientific research.

Monitoring and assessing the conditions of particular environmental resources over vast geographic areas might be facilitated by the use of sophisticated technology and scientific expertise. While there is a danger in overemphasizing technological solutions, scientific research efforts and state-of-the-art technologies can be important tools for

the management of extensive resources. For example, GIS systems can provide detailed information on environmental conditions on a vast scale (Berkes et al 2001). The *timely* exchange of environmental data among stakeholder groups – both vertically and horizontally – will be key to institutional success (Mahanty and Russell 2002; Turner et al. 2000). Sophisticated communications systems such as the Internet and wireless telephones can speed the exchange of information among groups, as they are doing among NGOS in Mexico (Ezcurra et al 1999). But as Gómez et al point out, the Internet and other communication technologies are tools, not solutions. They “can just as easily reinforce . . . inequalities as help develop strategies to cope with them” (Gómez, Martínez, and Reilly 2001: 113).

Sophisticated and expensive technologies may prove useful, but inexpensive, simple technologies are often the most effective. For example, the MANRECUR II project in the El Angel Watershed, Ecuador found that a simple float device could be used effectively by local people to monitor the volume of water in their irrigation tanks (Proaño and Poats 2000).

A growing awareness that environmental processes do not respect national boundaries has led to cooperative efforts among nations to reach a more complete understanding of shared resources. For example, in the Barents Sea Fisheries, Norway and the Soviet Union/the Russian Federation have established a joint commission of marine biologists who cooperate in the assessment fish stocks in the region (Hønneland 1999). Joint commissions created by Mexico and the U.S., such as the International Boundary and Water Commission have initiated a number of hydrological studies to collect data concerning the condition of transboundary water resources.

Despite these collaborations, to date there are few institutions designed specifically for the coordination and exchange of scientific, local, and indigenous knowledge that will be used by stakeholders in making resource management decisions (Brodt 2002). In most areas of the world, information *exchange* among local user groups and scientists has been minimal, but some interesting collaborations are emerging. In Maine, for example, lobster fishermen and scientists have been working together and exchanging

information on stock behavior (Corson 2002) – though the collaboration is not part of any formal management agreement.

In Latin America a number of formal and informal networks with a focus on resource management are emerging that may be able to play important roles in facilitating information exchange among those concerned with the management of socio-ecological systems. For example, the United Nations Sustainable Development Networking Program (SDNP) has helped to establish the *Red de Desarrollo Sostenible* (RDS) in Colombia, Honduras, and Mexico. These networks involve participants from various sectors: government, academic, socio-cultural organizations, media, international organizations, and NGOs ([www.rds.org](http://www.rds.org)). While the RDS in Honduras was developed as a disaster reconstruction program after Hurricane Mitch, it now acts as an information and contact center for natural resource stakeholders ([www.sdnf.undp.org](http://www.sdnf.undp.org)). How effective these networks have been, or might be, as a means of information sharing for resource management purposes is unclear. Further research on this topic would be useful.

---

## Conclusions & Future Directions

In the past two decades, a number of multi-stakeholder institutions have evolved which are attempting to manage extensive common pool resources through institutional arrangements which are broad-based, participatory, and nested in hierarchies which incorporate local, regional, national, and international agendas. These institutions are relatively new and as yet there has not been a great deal of systematic research on the types of operational problems they may be experiencing, how well they have managed to integrate ecological and social processes, whether there are mechanisms to facilitate responses to changes in the system, nor how effective these efforts have been in managing environmental processes in an equitable and sustainable manner. According to law professor Stephen Owen, “the effectiveness of shared decision-making in creating social justice and environmental integrity” depends on democratic climate (Owens, cited in Morrow 1997: 2), a condition that is better met in some places than others. While most institutions are still struggling in infancy, there are some innovative examples which might bear closer scrutiny.

In Latin America, the Corporación del Valle del Cauca (CVC) in Colombia has been instrumental in coordinating a holistic strategy to manage and protect watershed resources in the region ([www.cvc.gov.co](http://www.cvc.gov.co)). The CVC has done much on its own to coordinate public, private, and local and regional interests, but some of the initiatives on watershed protection were developed independently by grassroots associations of rice and sugarcane farmers who have worked with the CVC to protect water sources, identify community needs, and establish fee-payment systems to help support conservation activities (Echavarria and Lochman 2001).

In the department of Cajamarca, Peru, a strategy of *concertación* is being followed which attempts to bring together ideas and efforts at a variety of administrative levels. This program has relied heavily on local municipal governments, as well as bringing together NGOs, academics, technical professionals, and local business interests to negotiate

sustainable development plans. Cajamarca's *Mesa de Concertación* has put the environment at the top of the agenda and provided a space for collaboration, debate and discussion among stakeholders of various backgrounds and interests (Morrow 1997, Pérez Arrarte & Scarlato 1999, Soberon A. 1998).

The Pacific Northwest Salmon co-management arrangement is an interesting case. Salmon are perhaps a quintessential example of a transboundary resource. In this arrangement, the state of Washington and Northwest tribes work together to manage salmon resources. Their efforts are then coordinated by larger (albeit at times contentious) agreements with other states and Canada. One of the interesting aspects of the Washington State-Northwest tribal arrangement is that there is a great deal of emphasis on collecting a wide variety of fisheries and habitat-related information produced at different scales: fine-grained local information, as well as coast-wide trends, which come from a variety of sources from tribal fishermen to biologists (Ebbin 2002: 255-56). The approach, then is one that attempts to manage salmon at different spatial and social scales, with policies communicated and coordinated among all levels (ibid).

Elsewhere in the U.S., the city of Chattanooga, Tennessee has evolved from being one of the most polluted in the country to an example of sustainable development, while in Virginia, the Virginia Coast Biosphere Reserve is actively working with local communities to improve economic prospects (Bernard and Young 1997). In both cases, crisis conditions sparked change in which broad-based, non-political non-profit organizations have been instrumental in drawing together a diversity of interests groups in consultative processes. In Chattanooga's Revision 2000, "the demographics of the 2,600 participants were within one percentage point of the city's age class and cultural structure" (ibid: 69), a remarkable achievement and likely a major factor in the success that its programs have enjoyed.

There is much to be learned from the study of existing institutions and resource management, but a new era of resource management is upon us, one which will require "a fundamental paradigm shift" in the way we approach the problems of sustaining both

environmental resources and human livelihoods (Tyler 1999: 271). Broad, multi-level institutions which involve local users as active decision-makers and which employ an adaptive management approach may prove resilient and sustainable in the management of socio-ecological systems. But they may not be enough. As Smil cautions, we need measures to “restrain the growth of affluent consumption and enable the poor world’s populations to raise the quality of their living to dignified levels with the least degree of environmental degradation (Smil 1993: 109).

There are no blueprints for success. Now more than ever, there is a need for interdisciplinary research, inter-sectoral cooperation, and forums for open exchanges of ideas. Understanding the specific ecological and social contexts of which RMIs will be a part, will be a tremendous, but crucial, task in itself. Perhaps the greater challenge will be in developing the global political will to tap the creative potential of individuals and grassroots organizations; utilize human capital and technologies creatively, and to build on the strengths of existing institutions while addressing inequities and uncertainties in innovative ways.

---

## References Cited

- Adger, Neil W. and Luttrell, Cecilia. 2000. Property rights and the utilisation of wetlands. *Ecological Economics* 35 : 75-89.
- Agarwal, Bina. 2001. Participatory Exclusions, Community Forestry, and Gender: An Analysis for South Asia and a Conceptual Framework. *World Development* 29 (10): 1623-1648.
- Agrawal, Arun. 2000. Small Is Beautiful, but Is Larger Better? Forest-Management Institutions in the Kumaon Himalaya, India. In *People and Forests: Communities, Institutions, and Governance*. Clark. Gibson, Margaret A. McKean, and Elinor. Ostrom, eds. Pp. 57-86. Cambridge, Massachusettes: MIT Press.
- Agrawal, Arun. 2001. Common Property Institutions and Sustainable Governance of Resources. *World Development* 29 (10): 1649-1672.
- Agrawal, Arun. and Gibson, Clark. 1999. Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation. *World Development* 27 (4): 629-649.
- Aguilar, Bernardo J. 1999. Applications of Ecosystem Health for the Sustainability of Managed Systems in Costa Rica. *Ecosystem Health* 5 (1): 36-48.
- Almeida, Mauro W. B. 1996. The Management of Conservation Areas by Traditional Populations: The Case of the Upper Juruá Extractive Reserve. In *Traditional Peoples and Biodiversity Conservation in Large Tropical Landscapes*. Kent H. Redford and Jane A. Mansour, eds. Pp. 137-157. Arlington, Virginia: The Nature Conservancy.
- Annis, Sheldon. 1992. Forward. In *Poverty, Natural Resources, and Public Policy in Central America*. Sheldon. Annis, ed. New Brunswick: Transaction Press.
- Ashley, Jeffrey S. and Zachary Smith. 1999. *Groundwater Management in the West*. Lincoln and London: University of Nebraska Press.
- Auer, M. R. 2002. Who Participates in Global Environmental Governance? Partial Answers from International Relations Theory. *Policy Sciences* 33 : 155-180.
- Azhar, Rauf A. 1993. Commons, Regulation, and Rent-seeking Behavior: The Dilemma of Pakistan's *Guzara* Forests. *Economic Development and Cultural Change* 42 (1): 115-129.

- Baker, W. L. 1992. The Landscape Ecology of Large Disturbances in the Design and Management of Nature Reserves. *Landscape Ecology* 7 (3): 181-194.
- Banana, Abwoli Y. and William. Gombya-Ssembajje. 2000. Successful Forest Management: The Importance of Security of Tenure and Rule Enforcement in Ugandan Forests. In *People and Forests: Communities, Institutions, and Governance*. Clark. Gibson, Margaret A. McKean, and Elinor. Ostrom, eds. Pp. 87-98. Cambridge, Massachusettes: MIT Press.
- Barrett, Christopher B., Brandon, Katrina., Gibson, Clark., and Gjertsen, Heidi. 2001. Conserving Tropical Biodiversity Amid Weak Institutions. *Bioscience* 51 (6): 497-503.
- Berger, Dhyani. 1993. *Wildlife Extension: Participatory Conservation by the Maasai of Kenya*. Nairobi: ACTS Press.
- Berkes, Fikret. 1989. Common Property Resources: Ecology and Community-Based Sustainable Development. *World Development* 20 (4): 557-570.
- Berkes, Fikret. 1992. Success and Failure in Marine Coastal Fisheries of Turkey. In *Making the Commons Work: Theory, Practice, and Policy*. Daniel. Bromely, ed. Pp. 161-182. San Francisco: Institute for Contemporary Studies Press.
- Berkes, Fikret and Carl Folke. 1998a. Linking Social and Ecological Systems for Resilience and Sustainability. In *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Fikret Berkes and Carl Folke, eds. Pp. 1-25. Cambridge: Cambridge University Press.
- Berkes, Fikret and Carl Folke. 1998b. *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Cambridge: Cambridge University Press.
- Berkes, Fikret, et al. 2001. *Managing Small-scale Fisheries: Alternative Directions and Methods*. Ottawa: IDRC.
- Bernard, Ted and Jora Young. 1997. *The Ecology of Hope: communities Collaborate for Sustainability*. Gabriola Island B.C and East Haven, CT: New Society Publishers.
- Boelens, Rutgerd. and Doornbos, Bernita. 2001. The Battlefield of Water Rights: Rule Making Amidst Conflicting Normative Frameworks in the Ecuadorian Highlands. *Human Organization* 60 (4): 343-355.

- Brandon, Katrina. 1996. Traditional Peoples, NonTraditional Times: Social Changes and the Implications for Biodiversity Conservation. In *Traditional Peoples and Biodiversity Conservation in Large Tropical Landscapes*. Kent H. Redford and Jane A. Mansour, eds. Pp. 219-236. Arlington, Virginia: The Nature Conservancy.
- Brandon, Katrina. and Wells, Michael. 1992. Planning for People and Parks: Design Dilemmas. *World Development* 20 (4): 557-570.
- Brannstrom, Christian. 2001. Conservation-with-Development Models in Brazil's Agro-Pastoral Landscapes. *World Development* 29 (8): 1345-1359.
- Brechin, Steven R., Wilshusen, Peter R., Fortwangler, Crystal L., and West, Patrick C. 2002. Beyond the Square Wheel: Toward a More Comprehensive Understanding of Biodiversity Conservation as Social and Political Process. *Society and Natural Resources* 15 : 41-64.
- Brodth, Sonja. 2002. Learning About Tree Management in Rural Central India: A Local-Global Continuum. *Human Organization* 61 (1): 58-67.
- Bromley, Daniel. 1992. The Commons, Property, and Common-Property Regimes. In *Making the Commons Work: Theory, Practice, and Policy*. Daniel. Bromely, ed. Pp. 3-15. San Francisco: Institute for Contemporary Studies Press.
- Bromley, Daniel. and Cernea, Michael. 1989. *The Management of Common Property Natural Resources: Some Conceptual and Operational Fallacies*. Unpublished report. Washington, D.C.: World Bank.
- Buchy, Marlène. and Race, Digby. 2001. The Twists and Turns of Community Participation in Natural Resource Management in Australia: What is Missing? *Journal of Environmental Planning and Management* 44 (3): 293-308.
- Buckles, Daniel. and Gerett. Rusnak. 1999. Conflict and Collaboration in Natural Resource Management. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 1-10. Ottawa: IDRC.
- Bush, Kenneth D. and Robert J. Opp. 1999. Peace and Conflict Impact Assessment. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 185-202. Ottawa: International Development Research Council.
- Carley, Michael. and Ian. Christie. 2000. *Managing Sustainable Development*. London: Earthscan.

- Chambers, Robert. 1983. *Rural Development: Putting the Last First*. New York: Longman Scientific & Technical.
- Chatty, Dawn. Conservation and Indigenous Populations: Displacement, Forced Settlement or Sustainable Development. Paper presented at the University of Oxford, Conference on Displacement, Forced Settlement, and Conservation 9-9-1999.
- Chenier, Jacqueline, Stephen Sherwood, and Tahnee Robertson. 1999. Copán, Honduras: Collaboration for Identity, Equity, and Sustainability. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 221-236. Ottawa: International Development Research Centre.
- Chevalier, Jacques M. and Daniel. Buckles. 1999. Introduction. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 13-41. Ottawa: International Development Research Centre and the World Bank.
- Clay, Jason. 1996. Foreword. In *Traditional Peoples and Biodiversity Conservation in Large Tropical Landscapes*. Kent H. Redford and Jane A. Mansour, eds. Pp. vii-viii. Arlington, Virginia: The Nature Conservancy.
- Colchester, Marcus. and Andrew. Gray. 1998. Forward. In *From Principles to Practice; Indigenous Peoples and Biodiversity Conservation in Latin America*. Andrew. Gray, Alejandro. Parellada, and Hellen. Newing, eds. Pp. 10-17. Copenhagen: IWGIA.
- Collados, Cecilia. and Duane, Timothy P. 1999. Natural Capital and Quality of Life: A Model for Evaluating the Sustainability of Alternative Regional Development Paths. *Ecological Economics* 30 : 441-460.
- Collins, Jane L. 1995. Smallholder Settlement of Tropical South America: The Social Causes of Ecological Destruction. In *Developing Areas: A Book of Readings*. V. K. Pillai and L. W. Shannon, eds. Pp. 453-467. Oxford: Berg.
- Corson, Trevor. Stalking the American Lobster. 20-2-2002 *The Atlantic* (April) : 61-81
- Costanza, Robert et al. 1999. The Value of the World's Ecosystem Services and Natural Capital. *Nature* (387) : 253-260
- Costanza, Robert., Olman. Segura, and Juan. Martinez-Alier. 1996. *Getting Down to Earth: Practical Applications of Ecological Economics*. Washington, D.C.: Island Press.

- Daniels, Steven E. and Gregg B. Walker. 2001. *Working Through Environmental Conflict: The Collaborative Learning Approach*. Westport, Connecticut and London: Praeger.
- Davis, Shelton H and Wali, Alaka. 1993. *Indigenous Territories and Tropical Forest Management in Latin America*. Unpublished report. Washington, D.C.: World Bank.
- Ebbin, Syma A. 2002. Enhanced Fit through Institutional Interplay in the Pacific Northwest Salmon Co-management Regime. *Marine Policy* 26 (4): 253-259.
- Echavarria, M. and Lochman, L. 2001. *Mechanisms for Watershed Conservation: Case Studies*. Unpublished report. Washington, D.C.: The Nature Conservancy: Latin American and Caribbean Region.
- Elliott, Lorraine. 1998a. *The Global Politics of the Environment*. New York: New York University Press.
- Elliott, Lorraine. 1998b. The Transboundary Agenda: Conservation and Pollution. In *The Global Politics of the Environment*. Pp. 27-51. New York: New York University Press.
- Elmgren, Ragnar. 2001. Understanding Human Impact on the Baltic Ecosystem: Changing Views in Recent Decades. *Ambio* 30 (4-5): 222-230.
- Esty, Daniel. and Mendelsohn, Robert. 1998. Moving from National to International Environmental Policy. *Policy Sciences* 31 : 225-235.
- Ezcurra, Exequiel., Marisa. Mazari-Hiriart, Irene Pisanty, and Adrian G. Aguilar. 1999. *The Basin of Mexico: Critical Environmental Issues and Sustainability*. New York, Tokyo, Paris: United Nations University Press.
- Fearnside, Philip M. 1997. Environmental Services as a Strategy for Sustainable Development in Rural Amazonia. *Ecological Economics* 20 : 53-70.
- Fernández-Giménez, María. 2002. Spatial and Social Boundaries and the Paradox of Pastoral Land Tenure: A Case Study From Post-socialist Mongolia. *Human Ecology* 30 (1): 49-78.
- Forero, Oscar A., Jaime. Tanimuca, and Ramón. Laborde. 1998. Colombia: Yaigoje Indigenous Resguardo Natural Reserve. In *From Principles to Practice: Indigenous Peoples and Biodiversity Conservation in Latin America*. Andrew. Gray, Alejandro. Parellada, and Hellen. Newing, eds. Pp. 108-125. Copenhagen: IWGIA.

- Furze, Brian., Terry. De Lacy, and Tim. Birkhead. 1996. *Culture, Conservation and Biodiversity: The Social Dimension of Linking Local Level Development and Conservation through Protected Areas*. Chichester, New York: Wiley.
- Galaty, John. Unsettling Realities: Pastoral Land Rights and Conservation in East Africa. 1999. *Conference Proceeding*. University of Oxford, Conference on Displacement, Forced Settlement, and Conservation, 9-9-1999.
- Gezon, Lisa. 1997. Institutional Structure and the Effectiveness of Integrated Conservation and Development Projects: Case Study from Madagascar. *Human Organization* 56 (4): 462-470.
- Gibson, Clark. and C. D. Becker. 2000. A Lack of Institutional Demand: Why a Strong Local Community in Western Ecuador Fails to Protect Its Forest. In *People and Forests: Communities, Institutions, and Governance*. Clark. Gibson, Margaret A. McKean, and Elinor. Ostrom, eds. Pp. 135-162. Cambridge, Massachusettes: MIT Press.
- Gibson, Clark., Margaret A. McKean, and Elinor. Ostrom. Gibson, Clark., McKean, Margaret A., and Ostrom, Elinor. 2000. *People and Forests: Communities, Institutions, and Governance*. Cambridge, Massachusettes: MIT Press.
- Gibson, Clark., Elinor. Ostrom, and Margaret A. McKean. 2000. Forests, People, and Governance: Some Initial Theoretical Lessons. In *People and Forests: Communities, Institutions, and Governance*. Clark. Gibson, Margaret A. McKean, and Elinor. Ostrom, eds. Pp. 227-242. Cambridge, Massachusettes: MIT Press.
- Gillingham, Sarah. 2001. Social Organization and Participatory Resource Management in Brazilian Ribeirinho Communities: A Case Study of the Mamirauá Sustainable Development Reserve, Amazonia. *Society and Natural Resources* 14 : 803-814.
- Goetze, Tara C. 2002. *The Canadian Experience with Co-Management: Ideas, Examples, and Lessons*. Unpublished report. Ottawa: International Development Research Centre.
- Gómez, Ricardo., Juliana. Martínez, and Katherine. Reilly. 2001. Paths Beyond Connectivity: Experience From Latin America and the Caribbean. *Cooperation South* 1: 110-122.
- Gray, Andrew., Alejandro. Prellada, and Hellen. Newing. 1998. *From Principles to Practice: Indigenous Peoples and Biodiversity Conservation in Latin America*. Copenhagen: IWGIA.

- Gunderson, Lance H. and C. S. Holling. Costanza, Robert., Segura, Olman., and Martinez-Alier, Juan. 2002. *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, D.C.: Island Press.
- Gunderson, Lance H., C. S. Holling, and Stephen S. Light. Gunderson, Lance H., Holling, C. S., and Light, Stephen S. 2002. *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. New York: Colombia University Press.
- Guzmán, Sergio Arbaiz, Castillo, Beatriz Huertas, and Escalante, Casiano Aguirre. El Sira Communal Reserve. 1998. *Conference Proceeding*.
- Hardin, Garrett. 1968. The Tragedy of the Commons. *Science* 162 : 1243-1248.
- Hecht, Susan. 1981. Deforestation in the Amazon Basin: Magnitude, Dynamics and Soil Resource Effects. *Studies in Third World Societies* 13 (61): 100
- Hecht, Susan. and A. Cockburn. 1989. *The Fate of the Forest: Developers, Destroyers and Defenders of the Amazon*. London: Verson.
- Heckadon Moreno, Stanley. 1985. La colonización campesina de bosques tropicales en Panamá. In *La Botánica e Historia Natural de Panamá*.
- Heltberg, Rasmus. 2002. Property Rights and Natural Resource Management in Developing Countries. *Journal of Economic Surveys* 16 (2): 189-214.
- Hiraoka, M. and Yamamoto, S. 1980. Agricultural Development in the Upper Amazon of Ecuador. *Geographical Review* 70 (423): 445
- Holling, C. S. 2001. Understanding the Complexity of Economic, Ecological, and Social Systems. *Ecosystems* 4 : 390-405.
- Holling, C. S., Fikret Berkes, and Carl Folke. 1998. Science, Sustainability and Resource Management. In *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Fikret Berkes and Carle Folke, eds. Pp. 342-362. Cambridge: Cambridge University Press.
- Hønneland, Geir. 1999. Co-Management and Communities in the Barents Sea Fisheries. *Human Organization* 58 (4): 397-404.
- Horowitz, Michael M. 1987. The Political Economy of Desertification in White Nile Province, Sudan. In *Lands At Risk in the Third World: Local-level Perspectives*. Peter D. Little and Micahel M. Horowitz, eds. Pp. 95-114. Boulder and London: Westview Press.

- International Institute for Environment and Development (IIED). 1994. *Whose Eden?: An Overview of Community Approaches to Wildlife Management*. Unpublished report. Nottingham, UK: Russell.
- IUCN. n.d. *Why Reflective Institutions?* Gland, Switzerland. Unpublished paper.
- Jønch-Clausen, Torkil and Fugl, Jens. 2001. Firming up the Conceptual Basis of Integrated Water Resources Management. *Water Resources Development* 17 (4): 501-510.
- Kaimowitz, David. n.d. *Armed Conflict and the Bosawas Biosphere Reserve in Nicaragua*. Unpublished paper.
- Kaimowitz, David., Vallejos, Cristian., Pacheco, Pablo B., and Lopez, Raul. 1998. Municipal Governments and Forest Management in Lowland Bolivia. *Journal of Environment & Development* 7 (3): 45-59.
- Kaiser, Jocelyn. Bold Corridor Project Confronts Political Reality. 2001 *Science* 293 (5538) : 2196- 2199
- Kalikoski, Daniela Coswig., Vasconcellos, Marcelo., and Lavkulich, Les. 2002. Fitting Institutions to Ecosystems: The Case of Artisanal Fisheries Management in the Estuary of Patos Lagoon. *Marine Policy* 26 (3): 179-196.
- Kepe, Thembele., Cousins, Ben., and Turner, Stephen. 2001. Resource Tenure and Power Relations in Community Wildlife: The Case of Mkambati Area, South Africa. *Society* 14 : 911- 925.
- King, Thomas D. 1997. Folk Management among Belizean Lobster Fishermen: Success and Resilience or Decline and Depletion? *Human Organization* 56 (4): 418-426.
- Klooster, Dan. 2000a. Community Forestry and Tree Theft in Mexico: Resistance or Complicity in Conservation? *Development and Change* 31 : 281-305.
- Klooster, Dan. 2000b. Institutional Choice, Community, and Struggle: A Case Study of Forest Co-Management in Mexico. *World Development* 28 (1): 1-20.
- Korten, David and Rudi Klauss. 1984. *People-Centered Development*. West Hartford, CT: Kumarian Press.
- Kothari, Ashish., Neena. Singh, Saloni. Suri, and (eds). 1996. *Peoples & Protected Areas: Towards Participatory Conservation in India*. London: Sage Publications.

- Kruse, Jack., Klein, Dave., Braund, Steve., Moorehead, Lisa., and Simeone, Bill. 1998. Co-Management of Natural Resources: A Comparison of Two Caribou Management Systems. *Human Organization* 57 (4): 447-458.
- Kull, Christian A. 2002. Empowering Pyromaniacs in Madagascar: Ideology and Legitimacy in Community-Based Natural Resource Management. *Development and Change* 33 : 57-78.
- Kutay, Kurt. 1991. Cahuita National Park, Costa Rica: A Case Study in Living Cultures and National Park Management. In *Resident Peoples and National Parks: Social Dilemmas and Strategies in International Conservation*. Patrick C. West and Steven R. Brechin, eds. Tucson: University of Arizona Press.
- Li, Tanya Murray. 2002. Engaging Simplifications: Community-Based Resource Management, Market Processes and State Agendas in Upland Southeast Asia. *World Development* 30 (2): 265-283.
- Löfstedt, Ragnar E. and Gunnar. Sjöstedt. 2001. Transboundary Environmental Risk Management in the New Millennium: Lessons for Theory and Practice. In *Transboundary Risk Management*.
- Joanne. Linnerooth-Bayer, Ragnar E. Löfstedt, and Gunnar. Sjöstedt, eds. Pp. 305-323. London and Sterling, VA: Earthscan.
- Low, Bobbi., Costanza, Robert., Ostrom, Elinor., Wilson, James., and Simon, Carl P. 1999. Human-Ecosystem Interactions: A Dynamic Integrated Model. *Ecological Economics* 31 : 227- 242.
- Mahanty, Sango. and Russell, Diane. 2002. High Stakes: Lessons from Stakeholder Groups in the Biodiversity Conservation Network. *Society and Natural Resources* 15 : 179-188.
- Marks, Stuart A. 1991. Some Reflections on Participation and Co-management from Zambia's Central Luangwa Valley. In *Resident Peoples and National Parks: Social Dilemmas and Strategies in International Conservation*. Patrick C. West and Steven R. Brechin, eds. Tucson: University of Arizona Press.
- Martin, Adrian. and Lemon, Mark. 2001. Challenges for Participatory Institutions: The Case of Village Forest Committees in Karnataka, South India. *Society and Natural Resources* 14 : 585-597.

- McCay, Bonnie J. and Jentoft, Svein. 1998. Market of Community Failure? Critical Perspectives on Common Property Research. *Human Organization* 57 (1): 21-29.
- McNeely, Jeffrey. 1995. *Expanding Partnerships in Conservation*. Washington, D.C.: Island Press.
- Mehta, Lyla., Leach, Melissa., Newell, Peter., Scoones, I., Sivaramakrishnan, K., and Way, Sally- Ann. 1999. *Exploring Understandings of Institutions and Uncertainty: New Direction in Natural Resource Management*. Unpublished report. Brighton: University of Sussex.
- Messerschmidt, Donald A. 1987. Conservation and Society in Nepal: Traditional Forest Management and Innovative Development. In *Lands At Risk in the Third World: Local-Level Perspectives*. Peter D. Little and Micahel M. Horowitz, eds. Pp. 373-397. Boulder and London: Westview Press.
- Mikalsen, Knut H. and Jentoft, Svein. 2001. From User-Groups to Stakeholders? The Public Interest in Fisheries Management. *Marine Policy* 25 : 281-292.
- Molnar, Augusta. 1989. Forest Conservation in Nepal: Encouraging Women's Participation. In *Seeds: Supporting Women's Work in the Third World*. Ann. Leonard, ed. New York: City University of New York, The Feminist Press.
- Murray, Tamsyn P., Kay, James J., Waltner-Toews, David., and Raez-Luna, Ernesto. Adaptive Methodology for Ecosystem Sustainability and Health (AMESH). White Oak Conservation Center, Florida. Conservation Medicine Conference. 2-5-1999.
- Netting, Robert M. 1981. *Balancing on an Alp*. Cambridge: Cambridge University Press.
- Netting, Robert M. 1982. Territory, Property, and Tenure. In *Behavioral and Social Science Research: A National Resource*. R. M. Adams, N. J. Smelser, and D. J. Treiman, eds. Washington, D.D.: National Academy Press.
- Netting, Robert M. 1993. *Smallholders, Householders: Farm Families and the Ecology of Intensive, Sustainable Agriculture*. Stanford: Stanford University Press.
- Neumann, Roderick. 1995. Local Challenges to Global Agendas: Conservation, Economic Liberalization and the Patoralists' Rights Movement in Tanzania. *Antipode* 27 (4): 363-382.
- Nygren, Anja. 2000. Environmental Narratives on Protection and Production: Nature-Based Conflicts in Rio San Juan, Nicaragua. *Development and Change* 31 (4): 807-831.

- Oakerson, Ronald J. 1992. Analyzing the Commons. In *Making the Commons Work*. Daniel. Bromely, ed. Pp. 41-59. San Francisco: Institute for Contemporary Studies Press.
- Oates, J. F. 1999. *Myth and Reality in the Rain Forest: How Conservation Strategies are Failing in West Africa*. Berkeley: University of California Press.
- Olwig, K. F. 1980. National Parks, Tourism, and Local Development: A West Indian Case. *Human Organization* 39 (1): 22-31.
- Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, New York and Melbourne: Cambridge University Press.
- Ostrom, Elinor. 1992. The Rudiments of a Theory of the Origins, Survival, and Performance of Common-Property Institutions. In *Making the Commons Work: Theory, Practice, and Policy*. Daniel. Bromely, ed. Pp. 293-318. San Francisco: Institute for Contemporary Studies Press.
- Ostrom, Elinor., Burger, Joanna., Field, Christopher., Norgaard, Richard., and Policansky, D. 1999. Revisiting the Commons: Local Lessons, Global Challenges. *Science* 284 (April) : 278-282
- Ostrom, Elinor. and Mary B. Wertime. 2000. International Forestry Resources and Institutions Research Strategy. In *People and Forests: Communities, Institutions, and Governance*. Clark. Gibson, Margaret A. McKean, and Elinor. Ostrom, eds. Pp. 243-268. Cambridge, Massachusettes: MIT Press.
- Oviedo, Paola. 1999. The Galapagos Islands: Conflict Management in Conservation and Sustainable Resource Management. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 163-182. Ottawa: International Development Research Centre.
- Pardeshi, Praveensingh. 1996. Conserving Maharashtra's Biodiversity through Ecodevelopment. In *Peoples & Protected Areas; Towards Participatory Conservation in India*. Ashish. Kothari, Neena. Singh, and Saloni. Suri, eds. Pp. 114-126. London: Sage Publications.
- Parks, Noreen. 2002. A Lingua Franca for Marine Habitat Classification --an Idea Whose Time Has Come. *Bioscience* 52 (4): 324-324.

- Pastoral de la Tierra Y Medio Ambiente Diocesis de Trujillo. 2000. *Experiencias de Pago por Servicios Ambientales en el Departamento de Colón, Honduras*. Unpublished report. Colón, Honduras: Diocesis de Trujillo.
- Pérez Arrarte, Carlos. and Guillermo. Scarlato. 1999. The Laguna Merin Basin of Uruguay: From Protecting the Natural Heritage to Managing Sustainable Development. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 237-250. Ottawa: International Development Research Centre.
- Pimbert, Michel., Bainbridge, Vanessa., Foerster, Stephanie., Pratt, Garrett., and Arroyo, Iliana Y. 2000. *Transforming Bureaucracies: Institutionalising Participation and People Centred Processes in Natural Resource Management - An Annotated Bibliography*. Unpublished report. London: International Institute for Environment and Development.
- Pinkerton, Evelyn. 1992. Translating Legal Rights into Management Practice: Overcoming Barriers to the Exercise of Co-Management. *Human Organization* 51 (4): 330-341.
- Polacheck, Tom. 2002. Will 'Small Core' Fisheries Solve the Fishery Management Dilemma? *Marine Policy* 26 (4): 369-371.
- Poole, Peter. 1989. *Developing a Partnership of Indigenous Peoples, Conservationists, and Land Use Planners in Latin America*. Unpublished report. Washington, D.C.: World Bank.
- Postel, Sandra. 1999. *Pillars of Sand: Can the Irrigation Miracle Last?* New York & London: W.W. Norton & Company.
- Proaño, Mauricio and Poats, Susan. 27-11-2000. *Abundancia o Escasez? Concesiones, Conflictos, Poderes y Políticas en el Manejo del Agua en la Cuenca del Río El Angel, Carchi-Ecuador*. Unpublished report. El Proyecto MANRECURI-FUNDAGRO-CIID. IDRC: Ottawa.
- Radwan, L. S. 1997. Farmer Responses to Inefficiencies in the Supply and Distribution of Irrigation Requirements in Delta Egypt. *The Geographical Journal* 163 : 78-92.
- Ramírez, Ricardo. 1999. Stakeholder Analysis and Conflict Management. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 101-126. Ottawa: International Development Research Centre.

- Redclift, Michael. 1992. Sustainable Development and Popular Participation: A Framework for Analysis. In *Grassroots Environmental Action: People's Participation in Sustainable Development*. D. Ghai and J. M. Vivian, eds. Pp. 23-49. London: Routledge.
- Redford, Kent H. 1996. Preface. In *Traditional Peoples and Biodiversity Conservation in Large Tropical Landscapes*. Kent H. Redford and Jane A. Mansour, eds. Pp. ix-x. Arlington, Virginia: The Nature Conservancy.
- Rivera, José A. 1998. *Acequia Culture: Water, Land, and Community in the Southwest*. Albuquerque: University of New Mexico Press.
- Runge, C. F. 1992. Common Property and Collective Action in Economic Development. In *Making the Commons Work: Theory, Practice, and Policy*. Daniel. Bromely, ed. Pp. 17-40. San Francisco: Institute for Contemporary Studies Press.
- Schmink, Marianne. and Charles H. Wood. 1987. The 'Political Ecology' of Amazonia. In *Lands at Risk in the Third World: Local-Level Perspectives*. Peter D. Little and Micahel M. Horowitz, eds. Pp. 38-57. Boulder & London: Westview Press.
- Scoones, I. 1999. New Ecology and the Social Sciences: What Prospects for a Fruitful Engagement? *Annual Review of Anthropology* 28 : 479-507.
- Scott, Christopher A. and Silva-Ochoa, Paula. 2001. *Collective Action for Water Harvesting Irrigation in the Lerma-Chapala Basin, Mexico*. Unpublished report. Washington, D.C.: International Food Policy Research Institute: CGIAR Systemwide Program on Collective Action and Property Rights.
- Sheridan, Thomas E. 1988. *Where the Dove Calls: The Political Ecology of a Peasant Corporate Community in Northwestern Mexico*. Tucson: University of Arizona Press.
- Shore, Keane. AMESH: A New Approach to Environmental Health. 3-3-2000/*IDRC Reports: Science from the Developing World*
- Sick, Deborah. *in press*. Water Management Regimes and Crisis in the Mexican-U.S. Borderlands. *The Cultural Politics of Water*. New Delhi, India: Oxford University Press.
- Smil, Vaclav. 1993. *Global Ecology: Environmental Change and Social Flexibility*. London & New York: Routledge.
- Somma, Mark. 1997. Institutions, Ideology, and the Tragedy of the Commons: West Texas Groundwater Policy. *Publius: The Journal of Federalism* 27 (1): 1-13.

- Stevens, Stan. 1997. *Conservation through Cultural Survival: Indigenous Peoples and Protected Areas*. Washington, D.C.: Island Press.
- Stocks, Anthony. 1996. The Bosawas Natural Reserve and the Mayangna of Nicaragua. In *Traditional Peoples and Biodiversity Conservation in Large Tropical Landscapes*. Kent H. Redford and Jane A. Mansour, eds. Pp. 1-32. Arlington, Virginia: The Nature Conservancy.
- Stonich, Susan. and DeWalt, Billie R. Development, Rural Impoverishment, and Environmental Degradation in Honduras. Washington, D.C. 88th Annual Meeting of the American Anthropological Association. 15-11-1989.
- Sunderlin, William D. and Gorospe, Maharlina Luz G. 1997. Fishers' Organizations and Modes of Co-Management: The Case of San Miguel Bay, Philippines. *Human Organization* 56 (3): 333- 343.
- Terborgh, J. 1999. *Requiem for Nature*. Washington D.C.: Island Press.
- Thomson, James T., David. Feeny, and Ronald J. Oakerson. 1992. Institutional Dynamics: The Evolution and Dissolution of Common-Property Resource Management. In *Making the Commons Work: Theory, Practice, and Policy*. Daniel. Bromley, ed. Pp. 129-155. San Francisco: ICS Press.
- Turner, R. Kerry. and et al. 2000. Ecological-economic Analysis of Wetlands: Scientific Integration for Management and Policy. *Ecological Economics* 35 : 7-23.
- Tyler, Stephen R. 1999. Policy Implications of Natural Resource Conflict Management. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 263-280. Ottawa: International Development Research Centre.
- Umaña, Alvaro. and Katrina. Brandon. 1992. Inventing Institutions for Conservation. In *Poverty, Natural Resources and Public Policy in Central America*. New Brunswick: Transaction.
- United Nations Development Programme. 1994. *Human Development Report*. Unpublished report. New York and Oxford: Oxford University Press.
- Varughese, George. 2000. Population and Forest Dynamics in the Hills of Nepal: Institutional Remedies by Rural Communities. In *People and Forests: Communities, Institutions, and Governance*. Clark. Gibson, Margaret A. McKean, and Elinor. Ostrom, eds. Pp. 193-226. Cambridge, Massachusettes: MIT Press.

- Ventocilla, Jorge., et al. 1996. The Kuna Indians and Conservation. In *Traditional Peoples and Biodiversity Conservation in Large Tropical Landscapes*. Kent H. Redford and Jane A. Mansour, eds. Pp. 33-56. Arlington, Virginia: The Nature Conservancy.
- Vondal, Patricia. 1987. The Common Swamplands of Southeastern Borneo: Multiple Use, Management, and Conflict. In *The Question of the Commons: The Culture and Ecology of Communal Resources*. Bonnie J. McCay and James M. Acheson, eds. Pp. 231-249. Tucson: University of Arizona Press.
- Wali, Alaka. 1993. The Transformation of a Frontier: State and Regional Relationships in Panama, 1972-1990. *Human Organization* 52 (2): 115-129.
- Weitzner, Viviane. and Marvin. Fonseca Borrás. 1999. Cahuita, Limón, Costa Rica: From Conflict to Collaboration. In *Cultivating Peace: Conflict and Collaboration in Natural Resource Management*. Daniel. Buckles, ed. Pp. 129-150. Ottawa: International Development Research Centre.
- West, Patrick C. and Brechin, Steven R. Resident Peoples and National Parks: Social Dilemmas and Strategies in International Conservation. Tucson, University of Arizona Press.
- Whiteford, Scott and Bernal, Francisco. Campesinos, Water and the State: Different Views of La Transferencia. Paper presented at Columbia University's 'The Reform of Mexican Agrarian Reform Conference.' 4-4-1995.
- Whiteford, Scott and Melville, Roberto. *in press*. Water and Social Change in Mexico. *Protecting a Sacred Gift: Changes in Water Management in Mexico*. Whiteford, Scott. and Melville, Roberto. San Diego: University of San Diego, Center for U.S./Mexican Studies.
- Wilshusen, Peter R., Brechin, Steven R., Fortwangler, Crystal L., and West, Patrick C. 2002. Reinventing a Square Wheel: Critique of a Resurgent "Protection Paradigm" in International Biodiversity Conservation. *Society and Natural Resources* 15 : 17-40.
- World Bank. 1990. *Guatemala: Environmental Issues Paper*. Unpublished report. Washington, D.C.: World Bank.
- Young, Emily. 1999. Local People and Conservation in Mexico's El Vizcaino Biosphere Reserve. *Geographical Review* 89 (3): 364-391.
- Zbicz, Dorothy C. 1999. The 'Nature' of Transboundary Cooperation. *Environment* 41 (3): 15-16.

## The Rural Poverty and Environment Working Paper Series

1. Rusnak, G. 1997. *Co-Management of Natural Resources in Canada: A Review of Concepts and Case Studies*.
2. McAllister, K. 1999. *Understanding Participation: Monitoring and evaluating process, outputs and outcomes*.
3. McAllister, K. and Vernoooy, R. 1999. *Action and reflection: A guide for monitoring and evaluating participatory research*.
4. Harrison, K. 2000. *Community Biodiversity Registers as a Mechanism the Protection of Indigenous and Local Knowledge*.
5. Poats, S. 2000. *Gender and natural resource management with reference to IDRC's Minga program*.
6. Lindayati, R. 2000. *Community Forestry Policies in Selected Southeast Asian Countries*.
7. Meltzer, J. 2001. *Assessment of the Political, Economic, and Institutional Contexts for Participatory Rural Development in Post-Mitch Honduras*.
8. Brooks, D.B., Wolfe, S. and Shames, T. 2001. *Local Water Supply and Management: A Compendium of 30 Years of IDRC-Funded Research*.
9. Lee, M.D.P. 2002. *Community-Based Natural Resource Management: A Bird's Eye View*.
10. Sick, D. 2002. *Managing Environmental Processes Across Boundaries: A Review of the Literature on Institutions and Resource Management*.
11. Mujica, M. 2002. *Assessing the Contribution of Small Grants Programs to Natural Resource Management*.
12. Frias, G. 2003. *Invasión Forestal: Khla Nagnegei Taiñ weichangepan*.
13. Ghose, J.R. 2003. *The Right To Save Seed*.
14. Wiens, P. 2003. *The Gendered Nature of Local Institutional Arrangements for Natural Resource Management: A Critical Knowledge Gap for Promoting Equitable and Sustainable NRM in Latin America*.
15. Goetze, T.C. 2004. *Sharing the Canadian Experience with Co-Management: Ideas, Examples and Lessons for Communities in Developing Areas*.
16. Currie-Alder, B. 2004. *Sharing Environmental Responsibility in Southeast Mexico: Participatory Processes for Natural Resource Management*.
17. Suzuki, R. 2005. *The Intersection of Decentralization and Conflict in Natural Resource Management: Cases from Southeast Asia*.
18. Bruneau, R. 2004. *Watershed Management Research: A Review of IDRC Projects in Asia and Latin America*.

*List Updated May, 2005*

**Postal Address:**

PO Box 8500  
Ottawa, ON, Canada  
K1G 3H9

**Street Address:**

250 Albert Street  
Ottawa, ON, Canada  
K1P 6M1

**Tel:**

(+1-613) 236-6163

**Fax:**

(+1-613) 238-7230

**E-mail:**

wmanchur@idrc.ca

**Website:**

[www.idrc.ca](http://www.idrc.ca)

