



SUI TECHNICAL SERIES VOL. 3

ADAPTIVE MANAGEMENT

FROM THEORY
TO PRACTICE



JAMES OGLETHORPE, EDITOR

IUCN
The World Conservation Union

SUI Technical Series Vol. 3

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WAGENINGEN UNIVERSITY
ENVIRONMENTAL SCIENCES



JAMES OGLETHORPE, EDITOR

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Table of Contents

FOREWORD Stephen R. Edwards	v
TROPENBOS' EXPERIENCE WITH ADAPTIVE MANAGEMENT IN CAMEROON Guillaume Lescuyer <i>Summaries</i>	1 14
GIS-ASSISTED JOINT LEARNING: A STRATEGY IN ADAPTIVE MANAGEMENT OF NATURAL RESOURCES Rhodora M. Gonzalez <i>Summaries</i>	15 39
CULTURE AND COSMOVISION: ROOTS OF FARMERS' NATURAL RESOURCE MANAGEMENT Irene Dankelman <i>Summaries</i>	41 52
DECISION-MAKING IN LOCAL FOREST MANAGEMENT: PLURALISM, EQUITY, AND CONSENSUS Jon Anderson <i>Summaries</i>	53 65
PLURAL PERSPECTIVES AND INSTITUTIONAL DYNAMICS: CHALLENGES FOR COMMUNITY FORESTRY Melissa Leach <i>Summaries</i>	67 82
PARTICIPATORY PROCESSES AND CONFLICT MANGEMENT IN COMMUNITY FORESTRY Katherine Warner <i>Summaries</i>	83 91
ADAPTIVE MANAGEMENT: POTENTIAL AND LIMITATIONS FOR ECOLOGICAL GOVERNANCE OF FORESTS IN A CONTEXT OF NORMATIVE PLURIFORMITY Janice Jiggins and Niels Röling <i>Summaries</i>	93 104

ADAPTIVE MANAGEMENT: A LEARNING-APPROACH TO DECISION-MAKING IN FORESTRY	105
K. F. Wiersum and R.J. de Hoogh	
<i>Summaries</i>	110
ROLE OF COMMUNITIES IN ADAPTIVE MANAGEMENT: A CASE FROM NORTH AMERICA	111
Cecilia Danks	
<i>Summaries</i>	123
RUTA CONDOR: AN INDIGENOUS-LED COOPERATIVE MODEL FOR CONSERVING CULTURE, NATURE AND AGROBIODIVERSITY IN THE SOUTH AMERICAN ANDES	125
Alejandro Argumedo and Katy Mamen	
<i>Summaries</i>	130
APPROPRIATE SOCIAL UNITS OF ANALYSIS IN THE CAMPFIRE PROGRAMME IN ZIMBABWE	131
Bev Sithole and P.G.H. Frost	
<i>Summaries</i>	141
TRANSBOUNDARY PROTECTED AREAS AND ADAPTIVE MANAGEMENT	143
Arun Agrawal	
<i>Summaries</i>	151
ECOREGION SCALE CONSERVATION - PLANNING, JOINT LEARNING AND ACTION	153
Gordon H. Orians	
<i>Summaries</i>	160
THE LANDSCAPE KALEIDOSCOPE: THE CONUNDRUM OF PROTECTED AREAS AND ADAPTIVE MANAGEMENT IN THE CONTEXT OF CLIMATE CHANGE	161
Peter Bridgewater	
<i>Summaries</i>	166

Foreword

Today we recognize that sustainable use is not a fixed state, which can be achieved "if we get the conditions correct". There is no "correct" set of conditions that can be applied universally. The conditions that will promote sustainability of wild resource uses derive from the context in which the use is being made. Furthermore, we know that conditions change over time in any context - something we experience in the governance of whatever town or city we live in every day of our lives. Just as there is no universal prescription for good governance of a town or city one should not presume to impose such conditions on managers of renewable natural resources.

Above all, good management (as well as good governance) is a dynamic process that is dependent on an array of factors including the quality of leadership and the means to manage risk by monitoring and adjusting actions based on information acquired. Adaptive management as a means to manage risk in use of wild resources has been gaining popularity over the past decade. At the 2nd World Conservation Congress in Amman, Jordan in October 2000, IUCN's members adopted a policy statement covering sustainable use that states:

- a. Use of wild living resources, if sustainable, is an important conservation tool because the social and economic benefits derived from such use provide incentives for people to conserve them;
- b. When using wild living resources, people should seek to minimize losses of biological diversity;
- c. Enhancing the sustainability of uses of wild living resources involves an ongoing process of improved management of those resources; and
- d. Such management should be adaptive, incorporating monitoring and the ability to modify management to take account of risk and uncertainty.

As sustainable use has gained credibility as a legitimate approach to conserve wild resources, the importance of "adaptive management", which can be described as a series of actions each of which is characterized by feedback loops and a willingness to adjust goals, hypotheses, objectives, outputs and management actions, has also taken on greater meaning. The most important element of adaptive management is a capacity to initiate and maintain long-term monitoring programs. As a result adaptive management provides a means to manage for dynamism and unpredictable change, which is a fundamentally different paradigm than managing for a desired state - the objective of prescriptive management.

In this volume we present 14 papers on the subject of adaptive management which were presented at two workshops held in 1999. The first was a contribution to a biodiversity forum preceding the 4th meeting of the Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA) to the Convention on Biological Diversity (Montreal, June 21 - 25, 1999). The second, held at the International Agricultural Centre (IAC) at Wageningen, the Netherlands (22 - 24 September, 1999), was attended by a variety of scholars and professionals and preceded IAC's 3-months course on community forestry.

Adaptive management: From Theory to Practice - the third volume in SUI's Technical Series - comprises papers that examine adaptive management from a number of perspectives, ranging from discussions of the theory behind adaptive management to case studies illustrating how the concept is applied in local management regimes. Melissa Leach (University of Sussex, UK) provides an excellent overview of practical applications of adaptive management in community-based management of forests. Guillaume Lescuyer (Tropenbos Cameroon Programme, Econ2 Project) and Rhodora M. Gonzalez, in separate papers, look at the role of GIS and other modern technologies in facilitating decision-making in community-based management of natural resources. Peter Bridgewater (Director, Division of Ecological Sciences, UNESCO), Gordon H. Orians (Department of Zoology, University of Washington), and Arun Agrawal (Department of Political Science, Yale University) examine the role of adaptive management in relation to applied natural resource management at scales ranging from global to local.

Papers by Bev Sithole (Centre for Applied Social Sciences at the University of Zimbabwe) and Peter Frost (Institute of Environmental Studies, University of Zimbabwe), Alejandro Argumedo (Indigenous Peoples' Biodiversity Network) and Katy Mamen

STEPHEN R. EDWARDS

(Asociación Andes), and Irene Dankleman (Nijmegen University, University Centre for Environmental Sciences) review the role of adaptive management in specific community-based management systems in such diverse environments as the grasslands and forests of Zimbabwe, to the Andean South America, to the coniferous forests of the western United States.

Taken together, this collection of papers provides the student, policy maker, and practitioner with new insights into the role of adaptive management in sustainable use of renewable natural resources.

I wish to thank all of the people who contributed to the workshops and this volume. I am especially grateful to Louise Fortmann, Harry van der Linde, Hans de Iongh, and Reinout de Hoogh.

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Tropenbos' Experience with Adaptive Management in Cameroon

Guillaume Lescuyer¹

The requirement to manage the environment emerged in the late 1960s. Since then, however, this concern has evolved, and so has Hollings's concept of 'adaptive management' of the environment. Nowadays, the use of natural resources is the result of both bio-physical and social dynamics. Thus, adaptive and sustainable management of the environment aims at co-ordinating these two dynamics. In the southern part of Cameroon, adaptive management of tropical forest resources is the goal. While designing a Forest Master Plan for the Tropenbos Cameroon Programme area, a four-step approach has been elaborated to achieve this general objective. This approach stresses the importance that Geographic Information Systems and Environmental Impact Assessments may take in the decision-making process on tropical forest management: They both facilitate the understanding of the Forest Master Plan and are powerful tools in helping stakeholders reach a consensus.

MANAGEMENT OF THE ENVIRONMENT: AN EVOLVING CONCEPT

The concern for environmental quality was communicated widely at the end of the 1960s with publications such as Boulding's *The Economics of the Coming Spaceship Earth* (1966), Rachel Carson's *Silent Spring* (1962) and Meadows' report *Limits to Growth* (1972). The major conclusion drawn by these authors is the incompatibility between, on the one hand, the exponential growth of the human population and material production, and, on the other hand, the long-term use of natural resources of the Earth.

In the beginning of the 1970s, management of the environment was considered a new topic. It soon came to be studied by disciplines other than ecological sciences. The conservation of the environment and its contribution to the development of human societies were discussed in international forums, for instance in 1972 at the UN-sponsored Stockholm Conference. New concepts and methods appeared during the seventies, such as the concept of adaptive management pro-

posed by Holling (1978) which still influences the way environmental problems are tackled today.

THE BASIS OF THE CONCEPT OF ADAPTIVE MANAGEMENT

With the growing awareness of the importance of a good-quality environment, several important theoretical works attempted to define ways in which to integrate environmental concerns into the decision-making process. In the field of environmental economics Krutilla and Fisher (1975), and Page (1977) led the field, while in ecological sciences Munn (1979), Holling (1978), and Clark (1976) contributed. Finally, Sachs (1980) and Passet (1979) were prominent in the political/social sciences. The main characteristic of these

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first works discussing environmental management was that they were based on mono-disciplinary research; the environment was studied with the sole purpose of achieving a single, specific objective. For instance, the fundamental question in economics was whether or not to integrate natural resources into market mechanisms in order to increase collective welfare. Similarly, in ecology, the emphasis was on the means to preserve natural resources, notably by creating protected areas (UICN 1980; McNeely *et al.* 1990). These first attempts to organise the use of natural resources had two consequences:

1. There was no integrated management of the environment; and
2. Environmental management was in the hands of specialists and experts who, on the basis of convenient data, were able to determine solutions optimal for them, but not necessarily for local populations.

The concept of adaptive management of the environment was initially proposed by Holling (1978). Adaptive Environmental Assessment and Management (AEAM) was presented as a simulation-based approach to assess the potential impacts of a specific development project on its natural environment. AEAM was designed to use small workshops comprising scientists, decision-makers, and computer modelling experts to establish the scope of an appraisal, to identify the key components of environmental systems, and to construct a simulation model of the systems likely to be affected by a development. Computer simulations were used to determine the likely outcome of the proposals based upon certain assumptions. Periodic workshops allowed the model to be refined, but not necessarily made more complex, as additional data became available.

The main advantage of this approach is that assumptions can be varied and the simulation can be re-run repeatedly to show the implications of a range of decisions. The chief drawback is that the plan for environmental management rests with a couple of specialists whose assumptions and assessments are frequently disconnected from the actual decision-making process on the ground. The uncertainty of the environmental dynamics is reduced to probabilities and other stakeholders have no voice in the choice of impacts and assessments.

However, contrary to many other environmental management approaches developed in the 1970s, adaptive management is still evolving. Adaptive management was a precursor to present approaches in that it was the first to account for the dynamic of the natural environment. This crucial concern for environmental variability may explain why more modern works on environmental management still use the term 'adaptive management.'

NEW TRENDS FOR ENVIRONMENTAL MANAGEMENT

Recognition of the dynamics of the natural environment is one of the basic assumptions of 'new ecology' (Botkin 1990; Frontier and Pichod-Viale 1993). According to recent surveys, most natural systems prove to be variable, non-linear, complex, rarely predictable, and have the potential for irreversible change. The old concepts of climax, equilibrium and optimality are no longer convenient in helping us understand how ecosystems function and evolve.

With the emergence of this new ecology, many researchers have begun studying the interactions between natural and social systems in order to conceive a new type of environmental management. Because of this new type of management, two scientific trends are particularly dominant.

The first approach was developed by people working on common property resources (Ostrom 1990; McCay and Acheson 1990). Their main assumption is that most natural resources are used (and often in a sustainable way) by various types of users. This has two consequences:

1. State regulation and privatisation of natural resources should not be considered the only two solutions to managing resources; and
2. Plurality of stakeholders should be integrated into any attempt at environmental management.

In every case, the ecological, social, and economic characteristics of using resources should be considered so that positive interactions among stakeholders constitute the basis of a multiple use management strategy for the environment. No solution based on mono-disciplinary criteria will adequately address an environmental issue. Rather, environmental disputes may only be tackled with satisfactory and consensual solutions developed by all stakeholders.

Ecological economics, which first appeared in the early 1990s (Costanza 1991; Jansson *et al.* 1994), also contributes to the definition of a new type of environmental management. One of the key concepts of this approach is co-evolution. This stresses that change in the natural environment has an influence on the way people use resources (Norgaard 1981). Any environmental management plan should include these various and complex feedback loops between social and natural systems.

As a result, a new type of environmental management has been emerging with the main purpose of organising interactions between social and natural dynamics. This type of environmental management is more than ever 'adaptive' as it seeks to add to the study of environmental dynamics and the likely evolution of social systems in resource use (Gunderson *et al.* 1995). Thus, the aim is to think about

new ways and processes to address natural and socio-economic variables. The experience of the Tropenbos Programme in Cameroon may be considered an example of a new adaptive management strategy in the Central African tropical forest.

TROPENBOS CAMEROON PROGRAMME: RESEARCH ACTIVITIES AND DESCRIPTION OF THE AREA

AN OVERVIEW OF TROPENBOS CAMEROON PROGRAMME

The Tropenbos Cameroon Programme (TCP) was founded on an agreement drawn-up between Tropenbos Foundation/Wageningen University in the Netherlands and the Ministries of Environment and Research in Cameroon. There are also stakeholders in national research institutes (IRAD: Institut de Recherche Agronomique pour le Développement, Yaounde, Cameroon; ONADEF: Office National de Développement des Forêts, Yaounde, Cameroon). The project is mainly funded by the European Union (EU) and the International Timber Trade Organisation (ITTO), Yokohama, Japan. The overall objective of the TCP is to develop methods and strategies for natural forest management directed at sustainable production of timber and other products and services. These methods have to be ecologically sound, socially acceptable, and economically viable. A programme of fourteen interrelated research projects was developed to meet this objective (Foahom and Jonkers 1992). These research projects are pursued in four disciplines: Forestry, ecology, sociology, and economics.

Field surveys started in 1994 will run until 2001. Substantial data have already been collected highlighting interesting prospects for an adaptive management programme of forest resources in the area.

DESCRIPTION OF THE NATURAL ENVIRONMENT OF THE TCP RESEARCH AREA

The TCP research zone is located in Southern Cameroon (2° 48' - 3° 13' E and 10° 24' - 10° 51' N). It is situated 80km east of Kribi, and includes three main villages: Bipindi, Akom II, and Lolodorf. The research area is 1,670km² (see Fig. 1.).

The climate of the TCP area is humid and tropical and is

typical of southern Cameroon. Four seasons are clearly distinguished: Two rainy seasons from September to November and from April to May, and two drier seasons from December to March and from June to August. The temperature varies little over the year, between 23°C in August and 27°C in March.

According to Letouzey (1968), the TCP research area belongs to the Guineo-Congolian domain of the humid evergreen forests. This domain is subdivided into two zones namely low/medium altitude and sub-mountain zones. Detailed vegetation surveys were carried out by van Gernerden and Hazeu (1999) and a total of 490 species belonging to 76 families have been identified. Among these families, *Euphorbiaceae* (47 species), *Caesalpiniaceae* (43 species), *Rubiaceae* (29 species), and *Annonaceae* (18 species) were the most important. As a whole, vegetation is classified into seven distinct plant communities.

Four altitudinal zones, seven different land forms, four main soil types, and seven defined plant communities form the basis of the landscape ecological map of the TCP research area. A total of fourteen main landscape units have been distinguished.

LOCAL POPULATION AND MAIN ACTIVITIES

One part of the TCP area is in the Division of the Ocean whilst the other is in the Mvila division, all being located in the South Province of Cameroon. There are four sub-divisions and 66 villages, including nine pygmy camps, that are settled within the TCP area:

- 23 villages in the subdivision of Akom II.
- 15 villages in the subdivision of Bipindi.
- 6 villages in the subdivision of Lolodorf; and
- 22 villages in the subdivision of Ebolowa.

The total population is composed of 14,370 people in 2,954 households (Lescuyer *et al.* 1999). The population density for the whole area is 8.6 inhabitants per km². The size of the family unit is small, averaging five persons per family; 327 families (11.1%) have only one member and 1,870 families (63.3%) have from two to six members. Twenty-two percent of the household leaders are women. The mean age of the household leader is 52 years.

The biggest villages are Akom II (944 persons) and Bidjouka (912 persons) and the smallest ones are pygmy settlements with less than 20 people each. The majority of the villages are old, having been settled at the beginning of the century.

Two different population groups have been identified:

1. The sedentary villagers, mainly represented by the

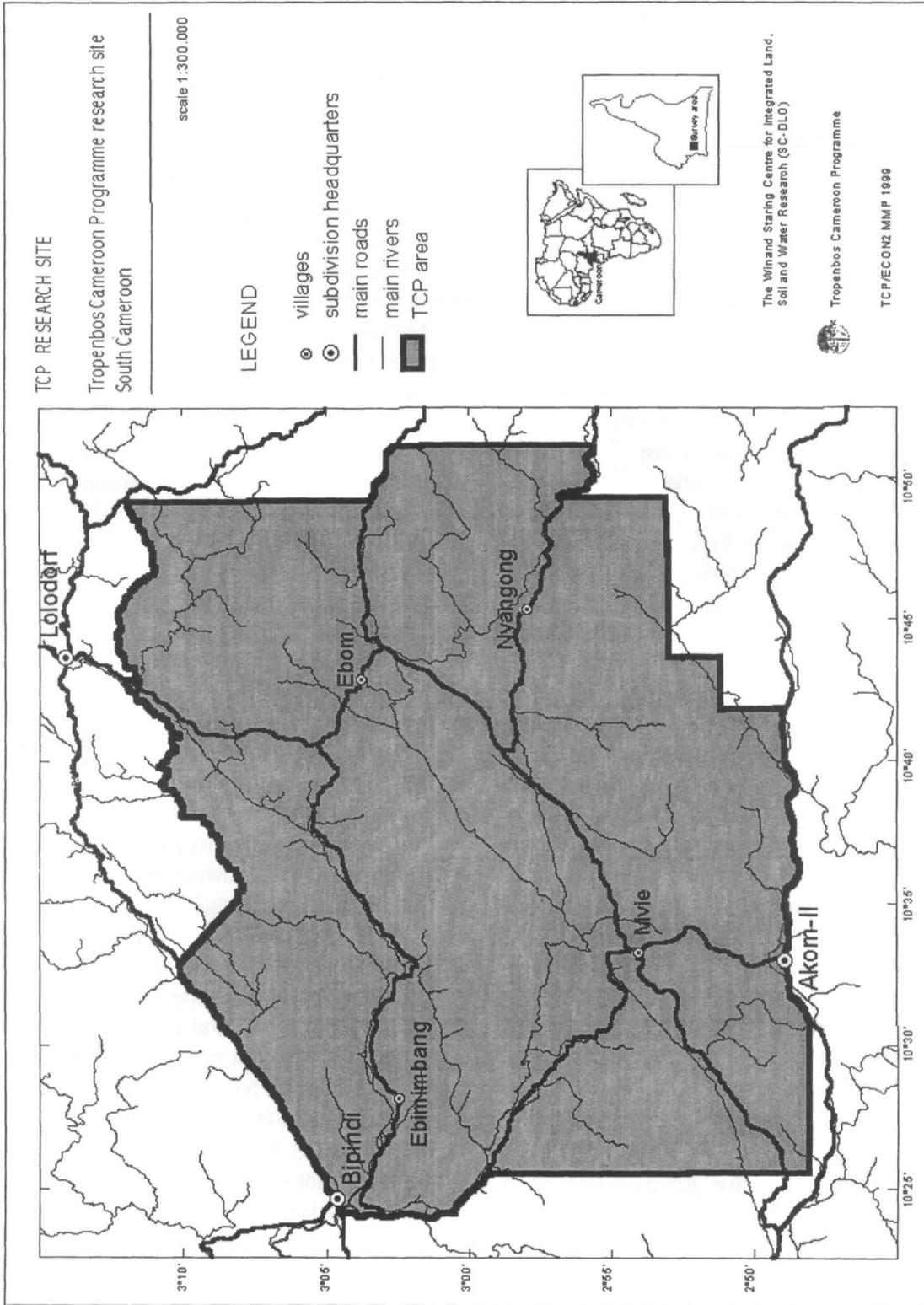


Figure 1: The TCP Research Area.

Bantu, including Bulu, Ngoumba, and Fang ethnic groups. They mainly live along the roads and their main activity is agriculture: Shifting cultivation and cacao plantations.

2. The Bagyeli pygmies who live in the forest and practice mainly hunting and gathering activities. Some may practice shifting cultivation on a very small scale. They represent only 2% of the total population.

The foremost activity in the management area is food crop cultivation. The second most important activity is cacao farming. At the same time, most villagers use forest resources through hunting, fishing, and gathering. Except for the Bagyeli, these practices are not essential for the inhabitants. Agricultural commodities provide most of their living needs, although many construction materials, medicines, and utensils are extracted from surrounding forests.

Income is derived from three main sources: Resource exploitation activities (agriculture, hunting, fishing, gathering), paid activities (salaries, pensions), and other incomes (gifts, small dealings, miscellaneous incomes). The annual mean income per household is estimated at CFA 470 000 (approx. USD710 [February 2000]).

The forest area contains many precious tropical timber species. As a result, it has been logged several times. The Dutch company Wijma was the main logging company operating in the zone during the past ten years. According to available information, Wijma company cuts an average of 0.8tree/ha (approximately $8m^3$)². The main species exploited are: *Azobé Lopbira alata* (60% of the extracted volume), *Padouk Pterocarpus soyauxii*, *Tali Erythroleum ivorense*, *Bibolo Lovoia trichilioides*, *Kossipo Entandrophragma candollei*, and *Bongo H Fagara heitzii*.

THE MASTER PLAN AS A FRAMEWORK FOR ADAPTIVE MANAGEMENT

One of the purposes of the TCP is to design sustainable and efficient management plans for tropical forests. One particular sub-project (Econ2) is working more precisely on this topic and is studying how an adaptive management programme in this environment could be designed and implemented in Central Africa. The task is to use both national guidelines for forest management in Cameroon and new participatory management tools to achieve this objective.

RATIONALE OF FOREST MANAGEMENT IN CAMEROON

New forest and environmental laws were published in 1994 and 1996 respectively. These laws aim to achieve efficient and sustainable management of the forest resources. The Cameroon Forest Law of 1994 defines several main steps for forest management. These steps represent three different planning scales:

1. An official Forest Zoning Plan that was first drawn in 1993 for the whole forest area; this macro-planning is supposed to be followed by the achievement of;
2. Master Plans at the sub-regional level which are divided into;
3. Several Forest Management Plans, which define the boundaries and the authorised uses in the permanent forests.

The first step of forest management in Cameroon consists of the design of an Official Zoning Plan that has been completed by the Ministry of the Environment and of Forests (MINEF 1993) for the entire southern part of the country. This zoning map is drawn from a macro-planning procedure with four aims:

1. Identify the forest areas in Cameroon and roughly assess the quantity/quality of forest resources.
2. Determine priority land use for forest areas.
3. Indicate prospective boundaries to these specialised forest lands (note: This initial zoning of forest is still indicative and can be changed in later steps of forest management); and
4. Ensure that at least 30% of the national territory of Cameroon will remain forested in the long-term.

The official macro-zoning process is just a first step towards the achievement of sustainable management of forests. The outcomes are only indicative and must be refined at a later stage.

The second phase in the management process is the Forest Master Plan (MINEF 1998a). On the basis of what has been proposed by the Official Zoning Plan, the Master Plan's aims are:

- To design priority allocation of forest lands.
- To propose meso-zoning of forest lands; and
- To provide a classification of permanent forests.

The concept of the Forest Management Plan plays a ma-

² 0.8tree/ha is not an annual figure. It signifies that when the Wijma company obtains a forest concession, its productivity is approximately $8m^3/ha$.

major role in the new forestry law. The desired result is decentralised and condition-specific management of forest resources by the stakeholders involved. The aim of the Forest Management Plan design is to recognise and integrate the pluralism of viewpoints about managing forest resources in order to conceive adaptive, effective, and sustainable forest management (MINEF 1998b). This includes:

- Designing concrete modes for using the forest in association with the priority use identified in the Master Plan, and
- Defining the micro-zoning of forest lands.

WHICH APPLICATION IS RELEVANT TO THE TCP AREA?

The Econ2 project is just over one year old and the research team has concentrated primarily on the design of a preliminary Master Plan for the TCP area. What is the nature of the data needed to furnish a draft of the Forest Master Plan? Four main sources of guidance were used:

1. Cameroonian laws regarding nature which address three main concepts: Conservation of nature (law 96/12, art. 62); sustained production (law 94/01, art. 23); and development of village communities (law 94/01, art. 68 & 71).
2. Zoning Plan (see Fig. 2): The entire TCP research area is included in the Zoning Plan and the following allocations were defined within it:
 - On one side: Permanent forest estate (to be classified), production forest (124km², 7.4% of the area), protection forests (377km², 22.5%), and council forests (169km²; 10.1%), and
 - On the other side: Non-permanent forest estates (including habitation, shifting cultivation, industrial cultivation, agroforestry, community forests, non permanent forests, *etc.*, 1,003km²) which constitute 60% of the TCP research area.
3. Biophysical data (landform, vegetation, land use, *etc.*) available from other TCP sub-projects.
4. Socio-economic data which were updated at the beginning of 1999.

On the basis of available data and taking into account local requirements, four basic scenarios were prepared for the TCP Master Plan (Fines *et al.* 1999):

1. Agroforestry scenario: This places the emphasis on the agroforestry zone in which shifting cultivation, plantations, and community forests can expand. The width of the agroforestry strip could extend to 5km along all roads. This scenario also proposes a produc-

tion forest in the middle of the zone. In comparison to the Zoning Plan (see Fig. 3) and to the landscape ecological map, the integral ecological reserve remains and the critical erosion areas are protected against intensive exploitation.

2. Timber production scenario: The emphasis here is on the forests dedicated to timber exploitation. Three areas of production forest are located in the centre of the site along a southeast - northwest transverse. Another area is proposed to the north of the site. The minimum cultivable area, the integral ecological zone, the protected areas, and the research zones will remain the same.
3. Nature conservation scenario: Here the emphasis is given to the conservation of the natural habitat. The minimum cultivable area is respected, while one production forest remains and the rest of the zone is protected against all intensive exploitation.
4. Business as usual scenario: This scenario considers the evolution of the TCP area without forest management. It is presented as a reference base when the other scenarios are analysed and compared to the actual situation.

These four scenarios are the result of much work. Their validity rests mainly on existing data. Still, the question remains: Which is the best scenario of the four, or better yet, is there a median scenario that would represent a compromise between the four discrete Master Plan proposals? Two management tools have been identified to facilitate this decision-making process:

1. Geographic Information Systems (GIS): This allows for a quick and easy understanding of what the Master Plan scenarios really are. An application of this tool is shown on the preceding map.
2. Environmental Impact Assessment (EIA): An EIA provides decision-makers with a means to compare, on a scientific basis, the impacts of each Master Plan alternative (Smith 1993). For this purpose, an impact matrix has been built, representing the four Master Plan scenarios in columns and the environmental variables in rows. This simulation-based tool allows us to predict and to assess (with the help of specialists) the expected dynamics of the natural environment (See Fig. 4).

However, GIS and EIA are not being used exclusively to design the optimal alternative of TCP forest management, but must be considered tools in a participatory approach in which stakeholders found their judgement on cartographic and environmental impact simulations.

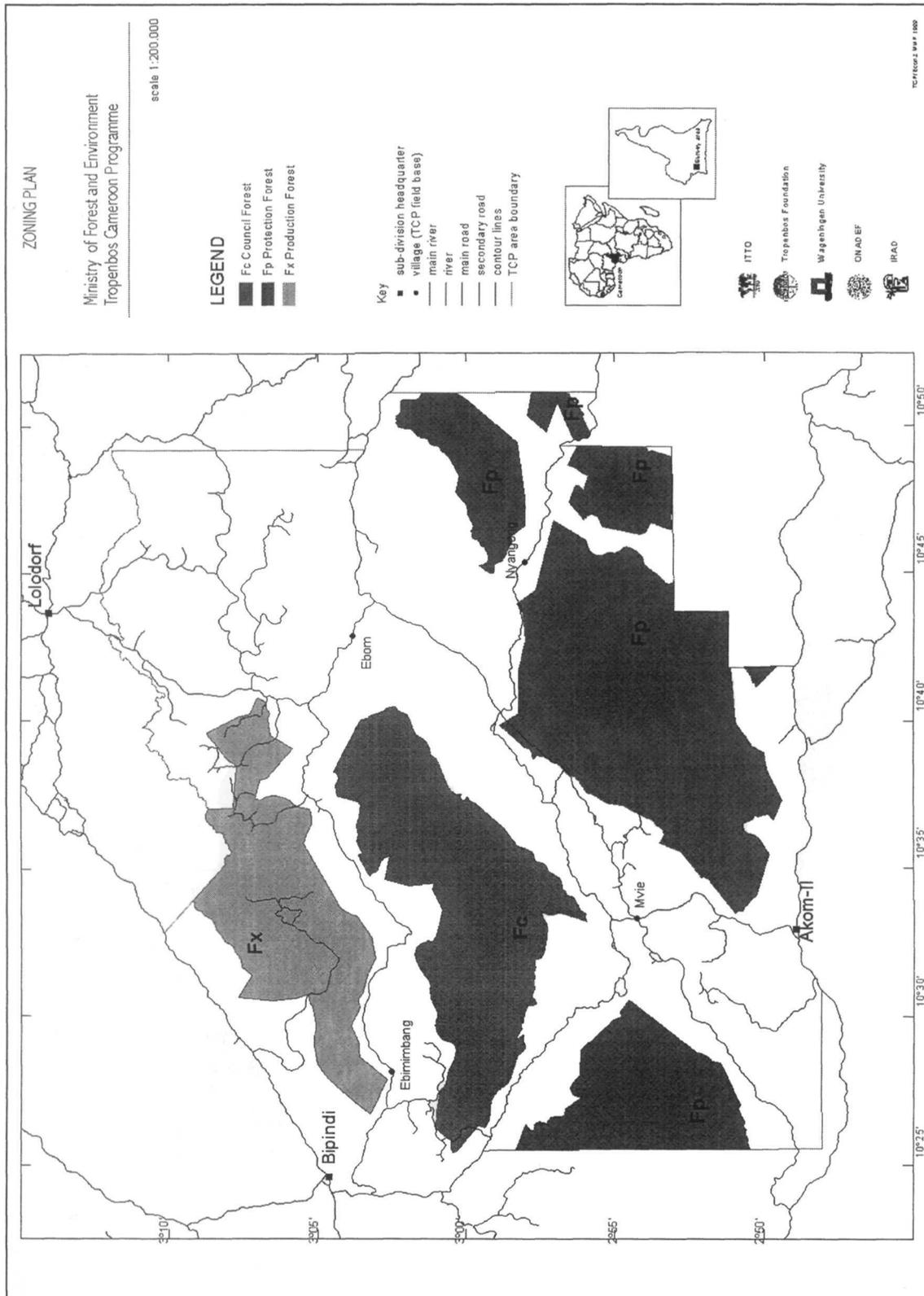


Figure 2: Zoning Plan.

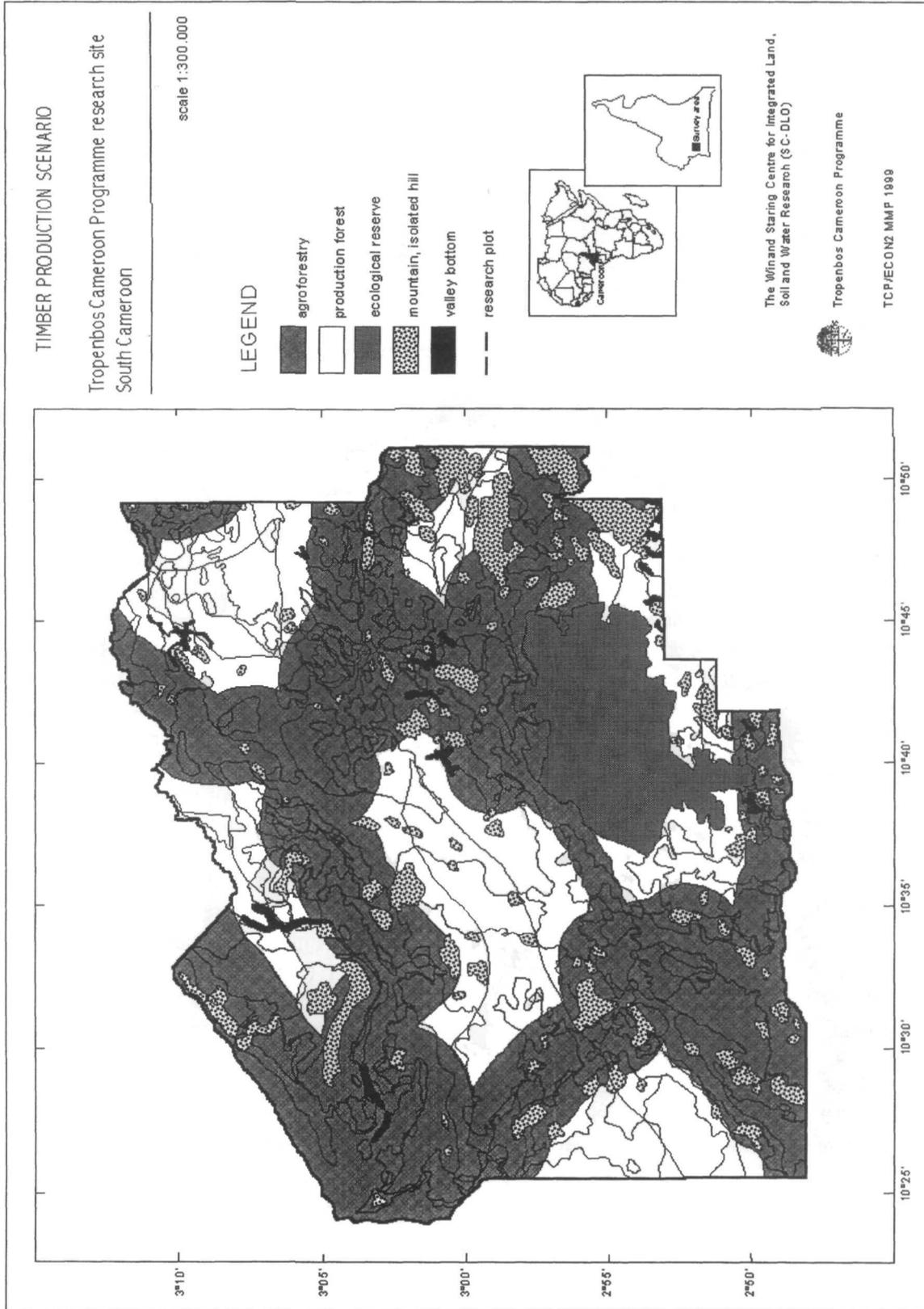


Figure 3: The Timber Production Scenario.

AN INTERMEDIARY PARTICIPATORY APPROACH

Local stakeholder participation is a very fashionable topic in literature dedicated to natural resource management and conservation (Nguinguiri 1999; FAO 1989). In managing national forest resources, the participation or, at least, the consultation of concerned stakeholders is a duty prescribed by the Cameroonian legislation. The law 96/12 (art. 9) refers to a participation principle that implies that:

"Every citizen must have access to information related to the environment...decisions on the environment must be taken after consulting the concerned sectors or groups, or after public discussion when they have a general scope."

Beyond the legal obligation, stakeholder involvement in the decision-making process is also an empirical requirement. From a practical point of view, forest management

cannot be defined without integrating conceptions and interests of local stakeholders, who are the *de facto* users of the resources. The aim of Econ2 work is therefore to recognise and integrate the pluralism of viewpoints about managing forest resources in order to conceive an adapted, effective, and sustainable Master Plan.

People's participation may take on a variety of forms, but they commonly share the objective of mobilising populations around the implementation of a project whose objectives have already been defined by political or economic decision-makers. Such a process can easily occur while elaborating the Master Plan. For instance, participatory management may suggest that the Master Plan is worked out by experts with the support of authorities and, once achieved, is finally submitted to villagers for acceptance or marginal change of the classified forest's boundaries.

Another participatory approach may be taken and its pro-

Types of Impact	Master Management Alternatives			
	Production	Protection	Agroforestry	Unchanged
Economic Impacts				
Employment				
Net Local Incomes				
Net Public Incomes				
Net National Benefits				
Environmental Impacts				
Water Regulation and Supply				
Erosion Control				
Climate and Air Quality				
Food and Raw Materials Production				
Fauna & Flora Diversity				
Fauna & Flora Quality				
Social Impacts				
Village Basic Equipment				
Road/Transport System				
Traditional Tenure System				
Intra-village Relationships				
Valorization of Local Human Resources				

Figure 4: Impact Matrix.

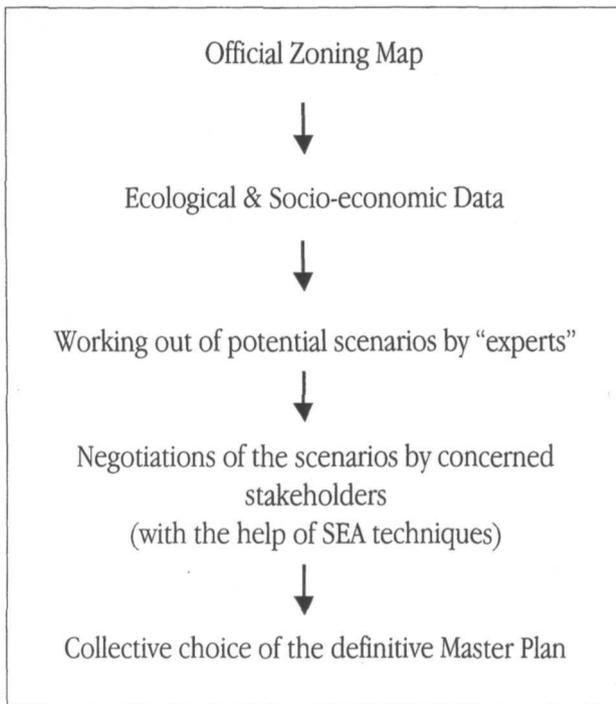


Figure 5: *An Intermediary Participation Process.*

posed implementation in the TCP area is outlined in Figure 5.

Mostly, the Master Plan that results from experts' surveys and simulations is applied without undue questioning. In our view, however, the task of planning specialists is not to follow the experts too closely, but to clarify the conceivable options with the view of initiating and supporting stakeholders' negotiations concerning the actual definition of sustainable management of forest resources.

The purpose of this Master Plan design process is not just to adapt the Master Plan to local conditions, but to help stakeholders define and appropriate an effective and actual set of actions for the sustainable management of forests. This is done through an iterative and multi-level negotiation procedure which aims to build, step by step, a compromise that satisfactorily fulfils each of the stakeholder's aspirations.

In this new approach, the link between management design and EIA implementation should not be linear, but interactive. It is a permanent exchange of information and feedback. Quantified results aim to support stakeholder negotiations and strengthen the consensus they reach. Therefore, the EIA methodology contributes to solving disputes and to facilitating their coming to an agreement on one sustainable and efficient Master Plan.

This new concept of a participatory approach breaks with conventional top-down processes, since forest management possibilities are now discussed and worked out by local stakeholders. However, this is not a typical bottom-up approach either. The first drafts of the Master Plan, to be submitted to stakeholder negotiation, are conceived according

to the forest policy prescriptions. Thus, this kind of forest co-management seems to be a balanced approach which integrates national concerns about forest strategy while taking into account the local (professional and village) interests and opportunities of managing forest resources (Wiersum 1998).

USING EIA AND GIS TO BUILD CONSENSUS FOR FOREST MANAGEMENT

The first question to be answered when considering stakeholder negotiations is who should be involved? According to Borrini-Feyerabend (1997), stakeholders generally share three characteristics:

1. They are aware of their interest in the sustainable use of the natural resources.
2. They have specific skills and methods (technical, cultural, scientific, *etc*) to manage these resources; and
3. They are willing to invest time and effort in this purpose.

In the TCP area, seven groups of stakeholders can be identified:

1. The local Bantu population: Because of the great number of villages and inhabitants in the TCP area, the participation of the Bantu population can be ensured through the appointment in every village of representatives who shall express the populations' views during meetings with other stakeholders.
2. The Bagyeli groups: Due to the historical predominance of Bantu people over the Bagyeli/Bakpla, it seems important to separate voices of the semi-nomad groups from the ones of the Bantu. However, the difficulty of identifying representatives for the Bagyeli is a major one, as any social hierarchy is almost non-existent in this ethnic group. To express the viewpoint of those groups, Biesbrouck (1997:17), among others, suggests calling for the co-operation of specialised associations which have been working with the Bagyeli for many years and which could serve as a channel to motivate Bagyeli participation. It is likely that these associations would provide the Bagyeli with a more convenient means to express their concerns regarding forest management.
3. Decentralised authorities: These include sub-prefects, mayors, and *chefs de groupement*. Their place in the negotiations is crucial as they represent an intermediate level whose function is both to organise the

application of the national policy at the local level and to integrate villagers' claims in this application.

4. Specialised authorities: These include two public institutions. The Ministry of the Environment and Forests (MINEF) is in charge of forest policy and represents the national interest concerning forests. This public body is present in the field through its forestry agents who represent the actual and direct interface between local-level management and external policies (Wiersum and Lekanne 1995). The National Office of Forest Development (ONADEF), specialises in the technical aspects and follow-up of forestry operations.
5. Private economic actors: Essentially these are logging companies whose aims are profitable resource exploitation while contributing to the economic development of isolated villages through the many secondary benefits of exploitation, such as road maintenance, employment, trade, *etc.* Logging companies also provide communes with a substantial amount of tax revenue.
6. National and international non-governmental organisations (NGOs) related to nature conservation or rural development: The legitimacy of NGO participation in the TCP Master Plan discussion may be questioned, but they are rather good representatives of the international community's concerns about ecosystems and the people of Central Africa.
7. Tropenbos Cameroon Programme: Many surveys are carried out in this forest area by the Tropenbos Programme. As a research programme, it may have a voice in the negotiation, not as a mediator, but as an actual stakeholder with concerns and interests of its own.

Negotiation regarding the Master Plan for the TCP area is still in its infancy. Many aspects still need to be changed and refined. But despite the heterogeneous status of the stakeholders, two particular aspects might favour debate and help local actors reach a consensus on the management of the forest resources. First, the Master Plan is a long-term objective. Rather than endlessly discussing present and past responsibilities for environmental degradation, stakeholders have to agree on a common vision of the future. Preliminary agreement on the state of the forest in 25 years may allow stakeholders to move beyond their current contentions and to involve themselves in a more sustainable way of using their resources (Weber 1996). Second, this Master Plan negotiation is supported by two management tools: The GIS and the EIA. These facilitate the participation of the various stakeholders by showing them the social and natural consequences of their choices. Thus, in the four steps of the Master Plan negotiation, GIS and EIA act as the follow-

ing major mediation tools:

1. Presentation of the Master Plan draft maps to the local authorities is a necessary requirement to obtaining an explicit official authorisation to carry out Master Plan surveys in the field.
2. Introduction of the first drafts of the Master Plan to each separate group of stakeholders (Bantu villages, Bagyeli settlements, logging companies, local public authorities, NGOs, *etc.*) so they can become familiar with the Master Plan scenarios and be in a position to offer comments and improvements. This should be considered as a preparatory step towards the following multi-stakeholder negotiation. It seems particularly important in each village to clarify the approach, to be precise about the objectives of the survey, and to encourage villagers to consider the Master Plan as a real opportunity to assert their views on how forest resources should be utilised. It should be stressed that the Master Plan constitutes an agreement between local forms of forest management and application of the forest law. To achieve this, the TCP team will show large-size Master Plan draft maps, which are supposed to be the main factors for stimulating discussion among villagers. To deepen the debate among inhabitants, a set of Master Plan maps (A3 format) should be left in each village, so that villagers have time to reach a common position about their acceptance, claims, and recommendations.
3. A meeting at the sub-division (*arrondissement*) level, which aims at communicating with all concerned stakeholders. Whereas previous discussions were conducted within a series of relatively homogeneous groups, the district level mediation process encourages different stakeholders to meet and confront each other's viewpoints on the forest management strategy. The result should be the expression of a common agreement, or at least common concerns, on the most satisfying Master Plan alternative.
4. An overall meeting should gather all the stakeholders together to discuss the feasibility of the Master Plan scenarios. The objective is to establish, with the help of EIA techniques, a final proposal for the Master Plan that is accepted by all the stakeholders. This document is to be authorised by regional authorities and sent to the MINEF for ratification.

This participatory approach to preparing and implementing the Master Plan for the TCP area shares many characteristics with the definition of adaptive management. Indeed, both natural and social dynamics are taken into account, one as a result of EIA, and the other through stakeholder par-

ticipation in designing the Master Plan. The above mentioned steps of application (including Impact Matrix Fulfilment and Master Plan Negotiation) were scheduled for 2000 and will provide us with new insights on the ways to implement sustainable management of natural environments.

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Summaries

La nécessité de gérer l'environnement est apparue à la fin des années 1960. Cependant, cette préoccupation a depuis évolué, de même que le concept de Hollings sur la « gestion adaptative » de l'environnement. À l'époque actuelle, l'utilisation des ressources naturelles est le résultat de la dynamique tant biophysique que sociale. La gestion adaptative et durable de l'environnement vise donc à coordonner ces deux dynamiques. Dans la région sud du Cameroun, la gestion adaptative des ressources forestières tropicales est le but cherché. Tout en concevant un Plan directeur forestier pour la région du Programme Tropenbos au Cameroun, une stratégie en quatre étapes a été élaborée pour atteindre cet objectif général. Cette stratégie souligne l'importance que les systèmes d'information géographique et des études d'impact sur l'environnement peuvent revêtir dans le processus décisionnel sur la gestion des forêts tropicales : ils facilitent tous deux la compréhension du Plan directeur forestier et sont d'excellents outils pour aider les intéressés à atteindre un consensus.

La necesidad de manejar el medio ambiente surgió a finales de los años 60. Sin embargo, esta preocupación ha evolucionado desde ese momento, así como lo ha hecho el concepto de manejo adaptativo del medio ambiente de Hollings. Hoy en día, el uso de los recursos naturales es el resultado de la dinámica biofísica así como social. Por lo tanto, el manejo adaptativo y sostenible del medio ambiente tiene como objetivo coordinar estas dos dinámicas. En la parte sur del Camerún, la meta es el manejo adaptativo de los recursos forestales tropicales. Se desarrolló un enfoque en cuatro etapas para lograr esta meta en el área del programa Tropenbos de Camerún. Este enfoque destaca la importancia que pueden tener los Sistemas de Información Geográfica y las Evaluaciones de Impacto Ambiental sobre el proceso de toma de decisiones en lo que se refiere al manejo de bosques tropicales: ambos facilitan el entendimiento del Plan Maestro Forestal y son herramientas poderosas para ayudar a que los interesados lleguen a un consenso.

GIS-assisted Joint Learning: A Strategy in Adaptive Management of Natural Resources

Rhoda M. Gonzalez¹

The Ifugaos of the Northern Philippine uplands have successfully managed their terraced ecosystem for more than 2,000 years. Knowledge of traditional natural resource management practices was passed on from one generation to the next through myths and chants during the performance of rituals praising their rice God. The terraces are now deteriorating after the incursion of modern socio-political influences. Different agencies are trying to halt the deterioration especially since their inclusion in the UNESCO World Heritage List. Adaptive management is a new approach that resembles traditional resource management in its emphasis on 'learning by doing.' However, adaptive management has the option to utilize newly available technologies. Geographic Information Systems (GIS) technology is a promising tool and its use is explored in a participatory manner. A GIS-assisted 'joint learning' approach is proposed as an adaptive management strategy to facilitate the visualising of different perspectives and as a tool for learning about the environment that is to be jointly managed.

THE STUDY AREA

Ifugao province comprises an area of 2517 km² of mostly steep, mountainous terrain. It lies approximately 320 km north of Manila and can be reached by a torturous 10-hour bus ride across much of Luzon Island - the largest island of the 7,100 Philippine islands (see Figure 1). The study area covers approximately 70 km² and is located at the northern sub-watershed of the town of Banaue. The people who inhabit Ifugao are called Ifugaos translated as the people of the earth or people of the hills. For centuries, and with only the simplest of hand tools, they have farmed the hillsides following the contours of the mountains. The handcrafted terraces they maintained for rice production are "one of the soundest soil and water conservation structures ever built by humans" (Conklin 1980:27). In 1995, the terraces were included in the UNESCO World Heritage List of cultural and natural properties considered to be of outstanding universal value.

Seventy percent of Ifugao's major river systems supply water to the Magat Dam and hydro-electric plant which

generates electricity for Luzon Island. The dam also provides water for irrigation. It was originally designed to last 100 years but is now projected to last only 43 years due to accelerated erosion of soil from both around the dam and upstream. There is growing awareness that the fate of the dam depends to a large extent on the status of Ifugao's watershed (PPDO 1996).

The ability of the Ifugaos to transform this hostile mountain environment into a productive habitat remains the resource of greatest potential. Their ancient or traditional skills in adaptive management have to be reinforced in light of the currently rapidly changing situation.

THE PROBLEM

Ifugao life has always been austere. Today however growing demands for cash, goods, and services - demands which

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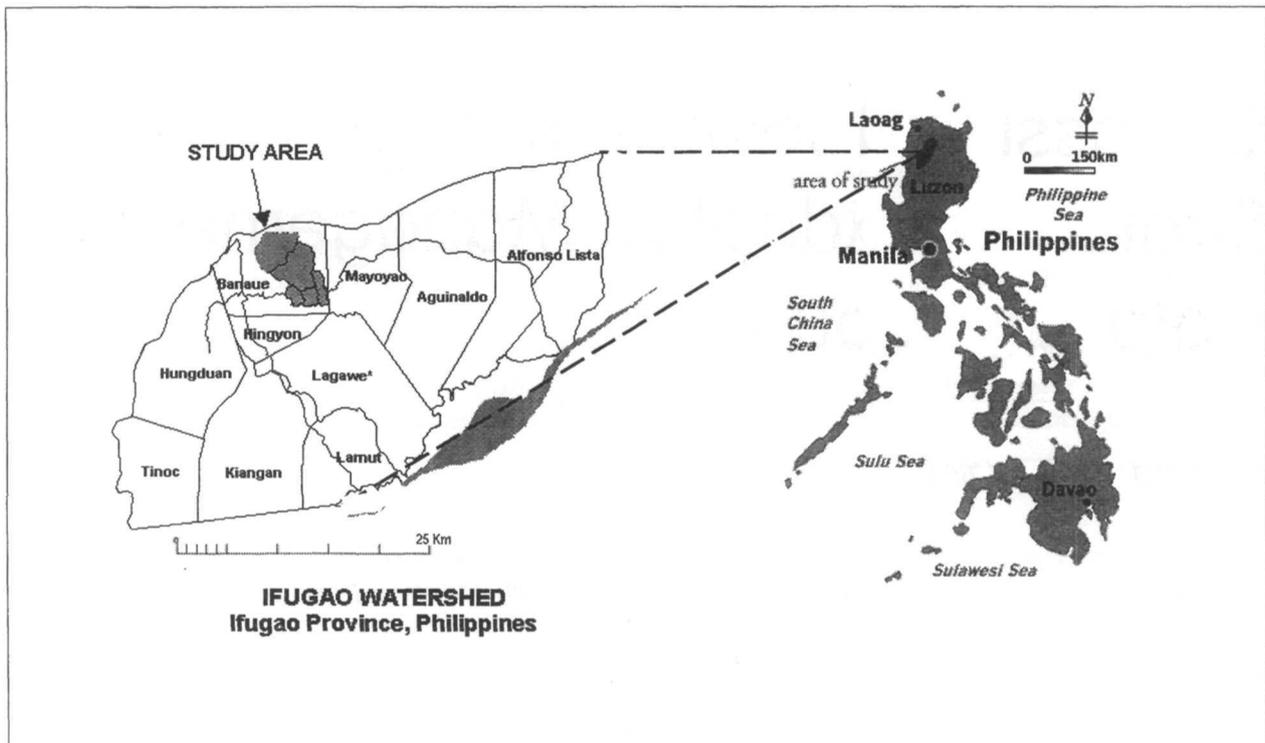


Figure 1: Location of the Study Area

subsistence farming cannot easily meet - exist. Ifugao's incidence of poverty² hovers around 75% of its population and is considered the worst in the region (PPDO 1996). Such poverty results in increasing pressure placed on the dwindling natural resources of the area.

In terms of actual land cover, the bulk of this mountainous province is composed of open grasslands (64% of the total land area) and forests (26%), while only 8% of the total land area is devoted to agriculture (PPDO 1996). About 55% of its forestlands are either open, denuded, logged, or have become brushlands. As a result, soil erosion threatens the very foundation of the Ifugao landscape with 1,417km² (56% of the total land area) affected by moderate to severe erosion. Closer inspection reveals abandoned and crumbling terrace walls, thinning forests, and landslides.

Research findings indicate that the crumbling terraces of Ifugao are manifestations of a much larger societal problem. Traditional farmers who have mastered the art and skill of tilling and maintaining the terraces are being lost to more lucrative enterprises and higher wage-earning jobs in the lowlands. The young, educated population is likewise drawn to the cities for economic reasons. Irresponsible tourism is spreading fast. A decline in the number of traditional com-

munity workgroups (*ubbu* and *baddang*), which are crucial for terrace labour, also contributes to the deterioration of the terraces. There is an increasing dependence on government and project hand-outs as different agencies of varying persuasions and levels of authority focus their efforts on saving the terraces. The inclusion of the terraces in the UNESCO World Heritage List has helped to further concentrate efforts many of which are directed towards propping-up the terrace structure.

It should be remembered that rice terraces are a creation of the unique Ifugao culture. Thus, the disintegration of the social organisation that maintained the structure for generations represents the basic threat to terrace sustainability. This paper focuses on the organisation of the Ifugao society in order to gain insight into their previously successful natural resource management, and to understand the dynamics of the present situation.

Since being subjected to external political and economic influences, that began with the arrival of American colonisers at the turn of the last century, Ifugao's natural resource management became more and more influenced by the interactions among different agencies. Such agencies have different and/or conflicting interests and perspectives. More of

² Poverty is defined as income below USD 1,288.35 per annum per family based on a 1991 survey (PPDO 1996).

ten than not, those most affected by this situation have no means to articulate their perspectives and no other choice but to accept the *status quo*. For example, priority areas for development have to be accepted by the Ifugaos as presented to them by the Ifugao Terraces Commission (ITC) without the benefit of consultation. The result is an alienated, hand-out-dependent (though still paid) workforce that sometimes completes below-quality work in expectation of another round of externally generated and funded projects.

An integrated approach to natural resource management is now necessary as it becomes evident that efforts to save the terraces are not just about a struggle to control the environment by technical intervention (terrace wall rebuilding projects), but it is also an attempt to help by bringing different actors to work together in its management. The challenge is to facilitate the convergence of all these actors so that they work together to improve Ifugao's situation.

ADAPTIVE MANAGEMENT: THEN AND NOW

Aside from maintaining a frugal lifestyle in their harsh mountain environment, the most remarkable Ifugao means of sustaining their unique habitat was the strong social network. This network consisted of definite leaders and territories, work organisations, and a system of law based entirely on custom and taboo that regulated their society, including the way people used their natural resources. The comprehensive documentation of *Ifugao Law* (Barton 1919/1969) details how this ancient society administered justice and order to preserve itself and its environment. The *ubbu* and *baddang* are volunteer workgroups that play a "vital role in the regular upkeep of the ricefields, especially so that employment of work animals is impractical" (Dulawan 1992:26). The *ubbu* and *baddang* are usually composed of neighbouring households that take turns working on each other's terrace farms. Rotation schedules are drawn up and are faithfully obeyed, but allow flexibility in case a serious

situation arises (e.g., terrace erosion or the collapse of a dike) which requires the re-direction of efforts.

The *himpuntona'an*, or agricultural districts, (Conklin 1980) in Ifugao tradition each have a particular centre point, or *puntona'an* (ritual field), wherein constituents, led by their respective *tomoná* (agricultural leader) converge to perform their rice rituals and essentially decide to jointly commit themselves to concerted, responsible actions for the good of the community. For example, a cropping calendar was followed because it evenly distributed the effect of pests over a large area, which helped in achieving a higher total harvest. These and many other traditional natural resource management practices (Barton 1930; Conklin 1980; Dulawan 1992; Alanguí *et al.* 1994) demonstrate what is now called 'adaptive management'. Both the practical and the theoretical practices emphasise learning-by-doing and the community learns through trial and error.

Adaptive management "*deals with the unpredictable interactions between people and ecosystems as they evolve together*" (Berkes and Folke 1998:10). This development "*requires policies and actions that not only satisfy social objectives but also achieve continually modified understanding of the evolving conditions and provide flexibility for adapting to surprises.*" (Holling *et al.* 1998:347).

In other words, keen monitoring of the environment and interpretation of unfolding events are essential in enabling resource managers to adapt and undertake corrective actions. This is essentially the process of learning described by Bos (1974) and which is elaborately described by Maturana and Varela's (1987:27) concept of "*all knowing is doing and all doing is knowing*". Observation and interpretation, or the path of knowledge, enlighten the path of action that is bound by the goals or objectives and constrained by the means. These activities continue (aptly symbolised by the lemniscate³) and the paths of knowledge and action are "*alternately moving into the foreground or receding into the background*" (Bos 1993:4) as one performs periodic assessments of results. This yields feedback from the environment, which is essential in adaptive management

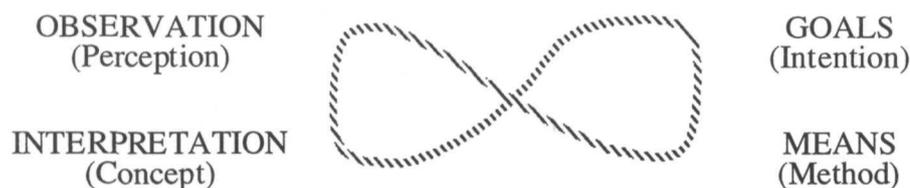


Figure 2: Knowledge-Action path (adapted from Bos 1974).

³The infinity symbol in Mathematics

as it helps determine the corrective action to be taken. Adherents of adaptive management point out its similarities with traditional natural resource management and argue that in the search for sustainable development, *"flexible social systems that proceed by learning-by-doing are better adapted for long-term survival than are rigid social systems that have set prescriptions for resource use"* (Holling *et al.* 1998:358). Because agriculture is not purely seen as a production of input-output goals, but a way of life for indigenous peoples, adaptive management is learning about how to live with nature.

What made the old Ifugaos' adaptive natural resource management so successful was that they undertook the process of learning collectively without external subjugation and within a definite territory of their own. In other words, there were neither exploiter-exploited relationships between people and the environment, nor among the people themselves. Colonisation disrupted this balance and today, externally planned natural resource management - typified by the mainstream top-down development model - is in effect. Together with the local people, different agencies must now come together to work for the same cause: Creating a new workable strategy for present day Ifugaos to sustain the environment that supports them. But divergent views, goals, and objectives clash as each party tries to proceed according to

their chosen development path. Complicating the matter is the fact that the action of one affects the desired outcome of the others. Negotiations enabling convergence of all these actors, allowing them to work together, are inevitable. These negotiations, if we are to follow the old Ifugao example, necessitate collective learning or joint learning.

JOINT LEARNING WITH IFUGAO ACTORS

Most learning processes take place in a collective setting, including those that produce extreme individualists (Serrano 1998). Individuals acquire knowledge and skills, as well as attitudes and values, as they relate to one another. However, each of us sees the reality we experience through our own *"window of the world"* (Bawden *et al.* 1989) or *"law of the lens"* (Zaltman 1982; in Barabba, 1990) and, therefore, what one learns is determined by his/her beliefs and favoured perspectives (Figure 3). Explanations, theories, or hypotheses that we develop from what we see are tested as we experience them. Kuhn (1962) calls these theories (constructed by observation, experience, and testing) paradigms that provide model problem-solution examples that have to change (paradigm shift) when new experiences no longer conform to them

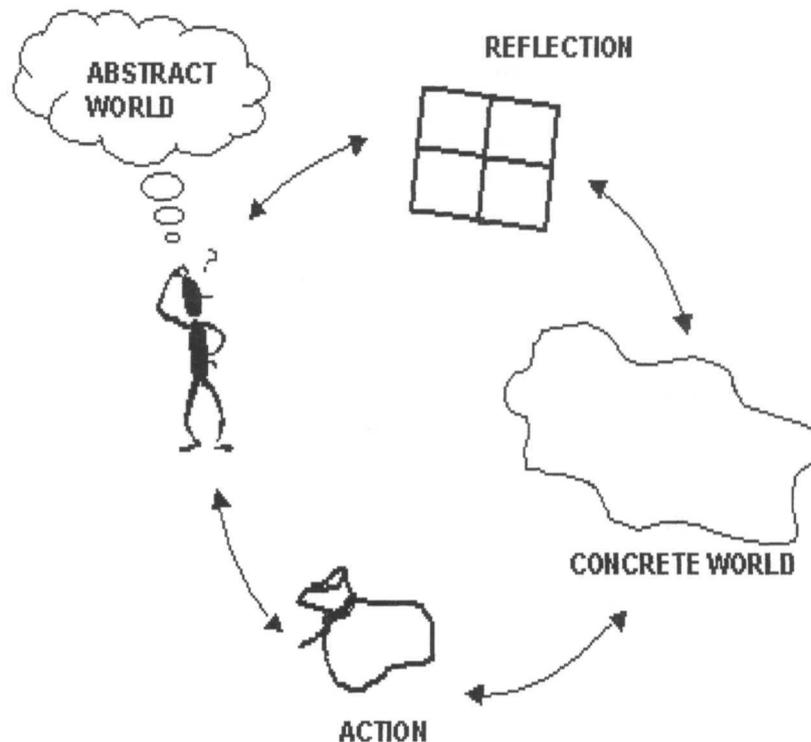


Figure 3: A Learning Process (adapted from a diagram presented by Bawden and Macadam at the Agricultural Knowledge Systems and the Role of Extension Seminar, 21st-25th May 1991, University of Hohenheim, Stuttgart, Germany).

(they become anomalous). Checkland (1993) explains this phenomenon through the German word *Weltanschauung* (world view), which describes the existence of meanings that different people attribute to what they perceive according to the human activity system⁴ they are engaged in, and which shapes the way they handle the issues they face:

"The uniqueness of individual experience and the idiosyncratic way we go about making sense of this, in addition to the particular actions that we feel are appropriate to take under specific circumstances, make learning very personal." (Bawden and Macadam 1991:8).

Hence, if collective action is required from diverse actors - such as those involved in natural resource management - collective learning becomes necessary in order to negotiate the meanings each makes of the problematic situation, and to reach an understanding and joint plan of action. Power struggles are bound to happen in the process of negotiation as actors refuse to yield and take on a different perspective. But individual satisfaction with the overall impact of results may further increase the level of unity for the next round of joint action. The importance of joint learning is emphasised by the fact that *"there is no individual way out of our present ecological predicament, which is caused precisely by the collective impact of human activities across the globe"* (Röling 1997:15).

"Joint learning" (Pretty 1994; Bawden *et al.* 1989), *"collaborative learning"* (Daniels and Walker 1996), *"platforms for decision making"* (Röling 1994), *"building bridges"* (Beek 1997), and *"social learning"* (Woodhill and Röling 1998) are but some of the recent calls to action emphasising the importance of activities which encourage combining knowledge from various sources and perspectives, including laypersons or scientists, politicians or activists, in order to jointly address the complexity of natural resource management. Emphasis is given to understanding because in a complex situation involving multiple perspectives, defining the problem is itself problematic. Experts in their own fields can enrich each other's capacity to understand the problematic situation they are trying to solve. Bawden *et al.* (1989:13) describe this enrichment as *"sharing different ways of seeing the world as a first step in doing new things in it."* Information describing the natural resources of the environment is shared and forms the basis for management decisions in drafting development strategies.

At this point, I will identify the social actors of the problematic Ifugao setting. A social actor does not only refer to

an individual, but also to a group of people categorised by the primary role this group plays in the natural resource management process. This is the concept of agency (Giddens 1984; in Long and van der Ploeg 1994) or the capacity to make a difference or to exercise some sort of power to effect change in a particular undertaking. For example, in Ifugao natural resource management, local farmers, municipal and provincial government offices, the national government, line agencies⁵, non-governmental organisations, and tourist operators each have their own objectives, criteria, interests, and perspectives that determine the actions which affect the course of natural resource management and its overall development. In other words, they have their own knowledge processes and *Weltanschauung*. These are the social actors that need to engage in joint learning to understand their problematic situation, and learn how to adapt their natural resource management practices.

Joint learning does not have to be undertaken in a formal gathering with all actors present. All actors *do* need to be involved in the development of procedures for the interaction of all their different knowledge processes. These actors are engaged in social relations and can become effective only through them. Indeed, such social relations that allow such actors to influence on another (Latour 1986) and are operationalised through communication channels such as memoranda, public meetings, petitions, bilateral or multilateral agreements. Long and van der Ploeg (1994) noted that in the process of making decisions and actions, social actors implicitly or explicitly use such means in formulating objectives and presenting arguments for the decisions taken. I will describe later the configuration of this communication channel.

Limited time and resource constraints allowed me to actually engage with only a small number of social actors. Aside from joining the local farmers of the study area whose perspectives need to be articulated, I also identified the municipal and provincial governments as key actors in the formulation of natural resource management policies. My learning engagement with the local Ifugao farmers was more intensive because in the present arrangement, theirs are the marginalised perspectives which need to be considered in order to increase their capability in the ensuing negotiation processes.

⁴This can be the profession or discipline one is engaged in, or the economic class one belongs to.

⁵Local government bodies with particular lines connected to national bodies such as the Department of Agriculture, Department of Environment and Natural Resources, Department of Education and Culture, Department of Health, National Irrigation Administration, etc.

A NEW TECHNOLOGY AT HAND

The accelerated rate at which Ifugaos' forests are disappearing, the terrace walls are crumbling, and the Magat Dam is silting requires a far more rapid understanding of the situation than has been the case in previous traditional natural resource management strategies. It is for this reason that information technology is being harnessed. Adaptive management takes advantage of available technology to facilitate learning about changing situations in the environment that require rapid corrective action. My research explores the use of Geographic Information Systems (GIS) technology to facilitate the joint learning process in adaptive natural resource management.

Definitions of GIS vary. Most describe it as a computerised database about spatially referenced (or geographic) phenomena that provides the following four sets of capabilities to handle data:

1. Input;
2. Management (storage and retrieval of data);
3. Analysis; and
4. Display (Aronoff 1989; Goodchild 1992).

GIS has its roots in traditional maps and cartographic processes. However, a major difference from the analogue counterpart is that GIS now consists of an organised set of numbers that provides the possibility for new procedures in-

volving spatial statistics, map algebra, spatial analysis, and modelling (Berry 1995:xi). These spatial analysis functions distinguish GIS from other types of information systems and make it suitable for various applications in which geographic location is central to the analysis.

In GIS, data are represented as layers (for example several map sheets) each with a particular theme that describes the environment under study (see Figure 4). For example, roads and railways may be combined in a single layer of transportation data; rivers and streams may be combined in a single layer of hydrological data; and forest areas, terraced farms, and grasslands may be combined in a single layer of landcover/landuse data. For each of these map layers, attribute data (descriptions about each feature under study) can also be represented in tabular form which is organised to maintain the links with the map form. Analysis is achieved through map overlay procedures following map algebra, spatial statistics, spatial querying, and algorithms to derive information from the original set of data. Maguire *et al.* (1991), Burrough (1986), and Thompson and Laurini (1992), provide comprehensive overviews of GIS and its applications. One important application area is providing decision support for natural resource management and this GIS-feature is now widely used in land use planning, forest monitoring, biodiversity conservation, and protection of habitat (Maguire *et al.* 1991).

The widespread use of GIS for decision-support systems raises the alarm that "top-down development planning will be reinforced because GIS hardware, software, and data

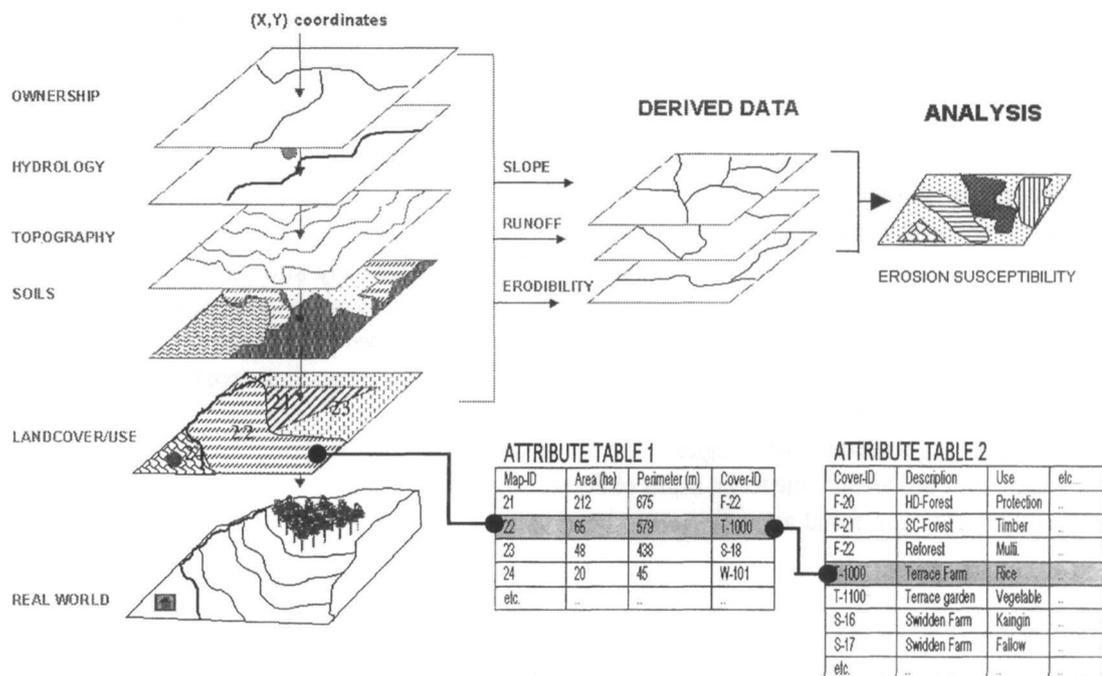


Figure 4: Schematic diagram of Geographic Information Systems data organisation and analysis.

are expensive, and require a high-level of technical expertise" (Chambers *et al.* 1998:27). And whilst GIS is seen as a potential tool for empowering communities (Poole 1995) it is also viewed as an invasive technology that gives advantage to computer-literate members of the society while marginalising others (Rundstrom 1995; Pickles 1995). It is my view that whatever technology is introduced, the social dynamic in which it will operate largely determines whether it will empower or marginalise local communities. Even if poor farming communities cannot afford the GIS technology, if they are empowered communities or are undergoing an empowerment process, they can find ways to access such technology (*e.g.*, donations, joint programmes with universities). This will happen only if they are convinced of the benefits of GIS.

The technology is here to be explored, and it is becoming cheaper, more user-friendly, and more accessible (Young 1993). Many opportunities and facilities exist for making computers and computerised information systems such as GIS serve communities so that they can learn more about their environment and encourage joint efforts to adapt to the changes that are quickly taking place. Beek (1991) also cited the need to harness new communication and information techniques to make the "*products of surveying and mapping*", which are widely available and offer a lot in understanding the environment, "*more applicable at local levels of decision making in natural resource management*" (Beek 1991).

My main consideration is the role that GIS technology can play, if any, in the joint learning of different Ifugao natural resource management actors in order for them to better understand the changing environment they will be managing. The organisation with which I work, the Philippine Rural Reconstruction Movement (PRRM), is engaged in har-

nessing whatever means to help build local people's capacity to jointly undertake activities that enhance their development. However, GIS, with its heavy reliance on modelling the real world, has to consider both quantitative and qualitative representations of spatial knowledge in constructing a negotiated perspective (see Figure 5). The necessity of using participatory methods in designing GIS becomes evident as different views of a common world are shared among natural resource management actors - sketch maps, official maps, satellite images, and aerial photos. If agreement is reached, the model of the real world is necessarily a negotiated model or a compromise. In PRRM-speak, it is a levelling-off among the actors. My aim (as is PRRM's) is to equip local communities jointly understand and articulate their views in such negotiation processes. GIS technology is not the solution in itself, but is a very promising tool for learning about the environment that is to be jointly managed.

REDISCOVERING FOLK GIS

Before setting up my computer, I first examined the Ifugao's traditional natural resource management process in order to determine which activities actually utilise spatial information. I did this by integrating with my host community, Barangay Bangaan, and four other *barangays* in the study area. A *barangay* is the smallest political-administrative unit in the Philippines. My integration into regular community life gave me the opportunity to experience traditional ways of planting and harvesting rice on the terraces in workgroups called *ubbu* and ample time to informally observe and talk with the local inhabitants. I also joined local meetings called community development planning meetings. What I learned

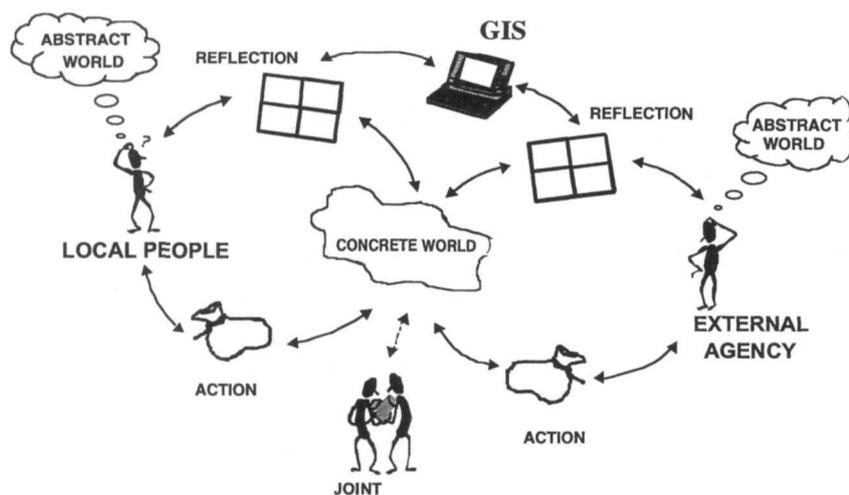


Figure 5: GIS-assisted knowledge process in learning about the world.

was complemented by reading Ifugao' written history and by interviewing the elderly.

As the Ifugaos have an oral tradition, knowledge of their resource management was conveyed from one generation to the next through myths and chants in the performance of the rituals to their rice God. These chants were also recited in the performance of rituals for specific purposes (e.g., harvesting, weeding, marriage feasts) or at the wakes of prominent members of the society. An example is the Ifugao hudhud (harvest song) entitled *Hudhud hi Aliguyon* (The Harvest Song of Aliguyon)⁶.

These songs and chants, together with the rituals and personages, can be considered the Ifugaos' traditional information system. Locations of important resources were noted (e.g., forests above the fields), reconnaissance was carried out (e.g., searching for an area with the best trees), and the manner of utilising and managing these resources (e.g., channelling water) was relayed to the society at large. The verses were revised, updated, and recited as the need arose to ensure that the community and future generations were informed of traditional natural resource management activities. While storage and retrieval relied on human memory, oral rendition, with the whole community in attendance, validated the information. Different versions proliferate, but these variations may also be attributed to the initiatives of the agricultural leaders in adjusting the songs to particularities in their respective territories and/or changes in their environment. In any case, older versions disappeared with

time.

I found that their history of collective natural resource management had its own information system that was embodied in their rites and rituals, and helped them manage their space successfully. Their successful information system (the use of chants to convey knowledge) was due largely to their collective effort. The *mumbaki* (priest) and *tomoná* (agricultural leader), and the leadership of the *lupun* (council of elders) had relied on the cooperation of their constituents in keeping the oral tradition alive through generations. Old Ifugaos understood and utilised spatial information concepts because these were important in carrying out their basic activities, such as:

- Delineating their territory;
- Determining the highest water source, on which the highest possible terrace depends;
- Describing the irrigation canal routes;
- Assessing the extent of forest reserved for *muyong* (woodlot) area;
- Recording the location and sequencing of fallow periods for their *swidden* farms;
- Monitoring locations and extent of field damage that requires maintenance; and
- Describing the location of wildlife habitat.

The same information remains important today in managing the same terrace ecosystem, but the breakdown of the traditional management system and its accompanying in-

HUDHUD HI ALIGUYON (THE HARVEST SONG OF ALIGUYON)⁶

*Ihulukday dinolayan di payoda;
Wanna wanna-konday nahudda,
Di nalagnut ya dullawaon.
Pammunguda, kapyanda,
Hopyadanday liting umday talukuluk,
Panipatondah tapon di
pumbanngan,
Ihidolday pidipidda,*

*Ugge naholongan di umal-algon
aamod.
Dawatonday gopgop to taluluk,
Waday muntikuy hiben,
Di butnmable on inu-unud di aamod.
Ipagawada gawana,
Ipuhulnah inhohladan di baleda.*

They climbed the forests above the fields;
They searched the place,
For the best of trees.
They felled the trees, hollowed them out,
For channelling water;
They made the waterfall,
They channelled it to the fields,
And over the village stone wall;

His comrades piped the water.
They directed the water to flow,
They found a way
The comrades followed it to the village,
They did what was to be done -
They let the water flow into
their compound.

⁶ *Transcribed and translated by Amador T. Daguió (Castro et al. 1983).*

formation system aggravate the present situation.

Aberley (1993:13) has also observed spatial information concepts in his study of *"maps in minds"* or *"cognitive maps"* of the indigenous peoples in Micronesia and their ability to store an *"ordered information about a huge amount of physical and ecological detail in their memory"*. For example, they know and remember exactly where to hunt, where their enemies are, what plants are edible or medicinal and their location, and where protection, lookout points, and fuels can be found; information that is *"compounded by changes through time (seasonality) and migration"* (1993:13). Other research on indigenous spatial analyses, such as those performed by the great Mayan civilisation (Cho 1997), the Inuit and Creek Indian tribes (Rundstrom 1995), the Maoris of New Zealand (Harmsworth *et al.* 1995), and the Bushmen of Namibia (Powell 1998) details ancient abilities to manage space. Chrisman (1997:3) likewise noted that *"human societies have collected and processed geographic information for millennia"* and cited the discovery of ancient maps and clay tablet representations describing routes, distant places, and territorial boundaries. Gould (1991) explains that spatial reasoning is fundamental to human survival and that *"spatialisation of the real world"* is needed for cognitive processes, whether in the past or the present.

Spatial analysis is not new to the Ifugaos, but spatial analysis with a computer is. The presence of three computer shops in Ifugao (one of which even offers computer lessons) is noteworthy. The younger generation is interested in exploring new avenues, including the Internet. However this interest is another cause for their exodus to find high-paying jobs in the cities. Organisations such as PRRM can help in putting the technology to good use in serving local development. It is hoped that the new generation of computer-literate Ifugaos will not need to go to the cities to apply their newly acquired skills and to earn decent wages. Sooner or later, computerised GIS will become an integral part of their development processes. This follows Clark's (1997:61) observation about the human ability to create 'artefacts of thinking' and in internalising the external, such that *"the external environment becomes a key extension to our mind."* The 'external props,' such as GIS, enable us to share our different views of the world (visualised as map layers), focus more clearly, understand the problematic situation, and take action.

⁷A catchment area is the smallest hydrologic unit—a natural drainage system, and can be aggregated into sub-watersheds, and finally, the watershed. A watershed is an area that drains water to a common outlet (usually a river) as concentrated runoff.

⁸A digital elevation model (DEM) is a digital (i.e., expressed in numbers) representation of relief, or the contour variations of the land surface in relation to the surrounding land (see ILWIS 1998).

GIS-ASSISTED JOINT LEARNING

DIGITAL ELEVATION MODELS (DEM) AND BOUNDARIES

My first experience in using GIS with the Ifugaos was in delineating the boundary of my study area for which I used a topographic map at 1:50,000 scale. The official land use map (of the same scale) indicated boundary lines for the *barangays* of the study area, but these were straight lines which followed the subdivision lines of the government surveyor. I asked the local farmers to sketch a map of their *barangay* so that I could understand how they delineated boundaries (Figure 6). At first, I had difficulty in understanding the sketch, but oral descriptions made it clear:

"At the other side of that mountain is Barangay Batad; at the other is Barangay Anaba; and the other side of this river is Mayoyao. We can only make our uma (swidden farm) within this area, or else the other barangays will be angry." (Pers. comm. Tanengan 1998.)

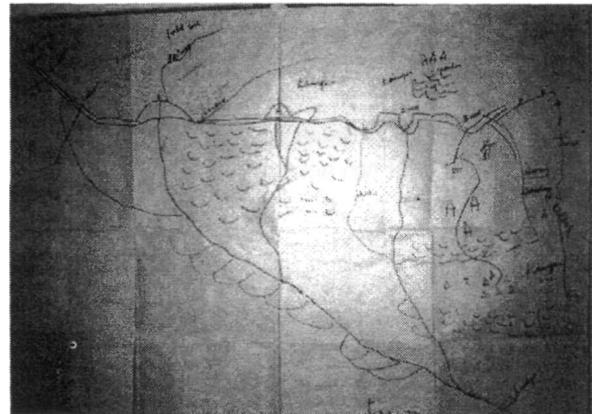


Figure 6: Local farmers' sketch map showing natural divides as boundaries.

Thus the Ifugaos determine the boundaries of the area that they utilise and manage by identifying a catchment⁷ area and protecting it against incursions from others.

Because mountain divides or mountaintops that form small watersheds serve as boundary limits, I constructed a digital elevation model⁸ (DEM), sometimes called a digital terrain model (DTM), during one of the workshops with

local participants helping to delineate these boundaries. It should be noted that the time-consuming creation of a DEM was not done solely to delineate boundaries. Other activities that may be facilitated using the DEM include aerial photo interpretation, slope calculation, and general spatial analysis operations requiring height information. More importantly, by relating any map with the corresponding terrain surface in a three-dimensional (3D) model, relationships between spatial data sets or between features can be discovered and understood. An example is taken up in the following section where the relationships between spatial data sets or between features can be discovered and understood. An example is taken up in the following section.

Figures 7a and 7b show the DEM and a hill-shading⁹ view of the study area and demonstrates how easily the boundaries of areas to be managed and protected can be delineated. The local people's initial fascination with the DEM process (workshop participants were at first simply smiling while intently viewing the screen) slowly developed into an understanding of relationships of points in space. For example, during the workshop, participants were able to identify areas of the same elevation. With our hands holding the computer mouse together, one volunteer drew a single contour line continuously across the screen over the map: "*So, Sitio Bocos is just as high as Barangay Kinakin!*" (pers. com. Tanengan 1998.) I also realised why the local people would often say that Barangay Batad is so close to Bangaan, when in fact it took at least two hours of hiking to get there. The DEM indeed showed the proximity - it was simply on the other side of the mountain!

When workshop participants were asked about the significance of the DEM-generated boundary lines (Figure 8), their common remark was that it allowed them to appreciate the shape and relative sizes of their *barangay*. The arbitrary straight lines drawn on official maps did not make sense to them. Tracing their village boundary allowed them to make a connection between map features and the real world. For myself, the DEM-generated boundary lines delineated the study area and addressed one basic requirement of my research. It also generated a better understanding of the research area by providing a glimpse from a higher scale, which helps when making sense of what is viewed while on foot (e.g., the interconnectedness of one *barangay* with another in the watershed). Delineation of boundaries was just the beginning of the joint learning through local activities that GIS supports.

TRACING THE WATER DISTRICTS

Conklin (1980:6) identified the agricultural districts or *himpuntona'an* in his study of Ifugao agriculture and observed that in "*cultural, social, technical and environmental terms, these agricultural districts are both the largest and the most functional territorial units in Ifugao.*" A ritual field, *puntona'an*, is owned by the *tomoná* (agricultural leader) and is the focal centre of each agricultural district. It is the first to be planted and harvested each year. Using Conklin's description, present verification showed that these agricultural districts approximate to the *barangays* of today. Barangay Bangaan used to refer to the agricultural district and its central hamlet *ox sitio*, of *Bangaan* where the ritual plot is also located.

During discussions with local farmers however, it became evident that there used to be three *tomonás* for Barangay Bangaan: Lakay Ambojnon, Lakay Hipog, and Ina Chulimay. These individuals were thus in charge of three *sitios* - Bangaan Proper, Dalican, and Batwag, respectively. I was puzzled. Using Conklin's observations, each *barangay* had only one *tomoná*, not three. After discussing this fact with local villagers it became obvious that the current political-administration had combined three *barangays*. After I looked at their original locations in the 3D-view of Bangaan, I found that they represented three different catchment areas (see Figure 10). Batwag is located at the uppermost stream region, while Dalican and Bangaan Proper branch in two opposite directions. Each *barangay* had independent irrigation sources and thus they were referred to as independent water districts. It seems that the Ifugaos of old demarcated their management units in terms of these independent irrigation divisions formed by the catchment area.

⁹A view that simulates one light source.

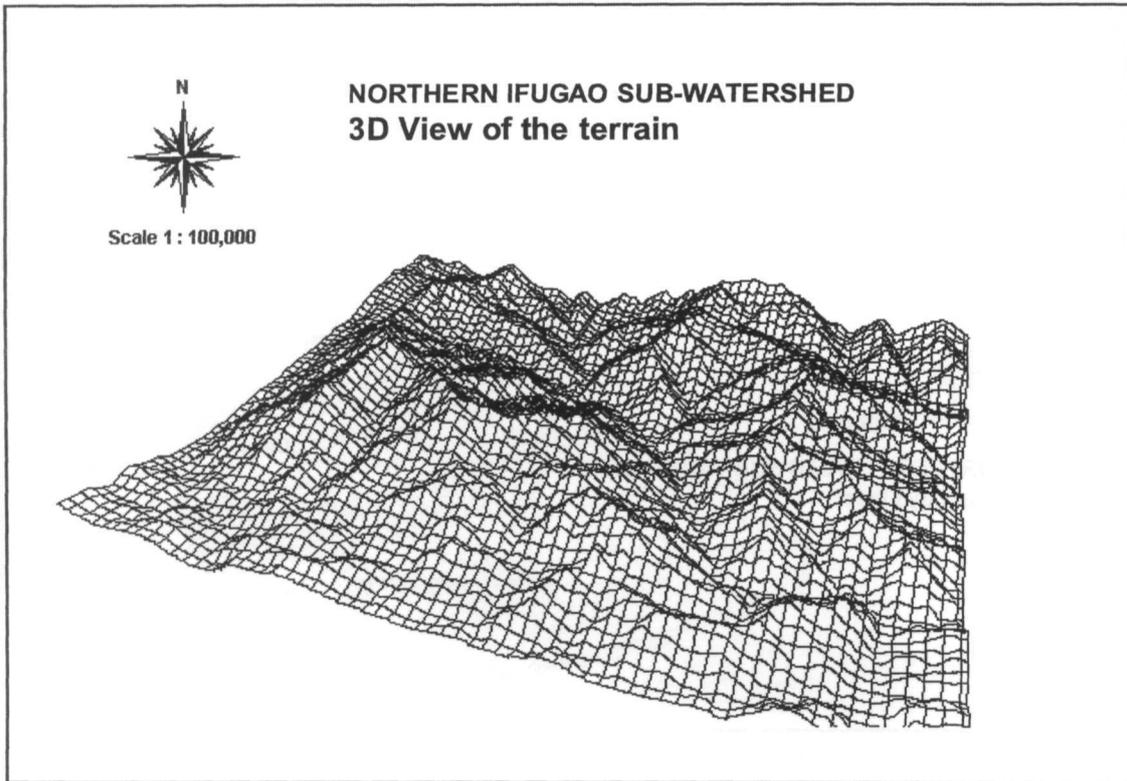


Figure 7a: The Digital Elevation Model of the Study Area.

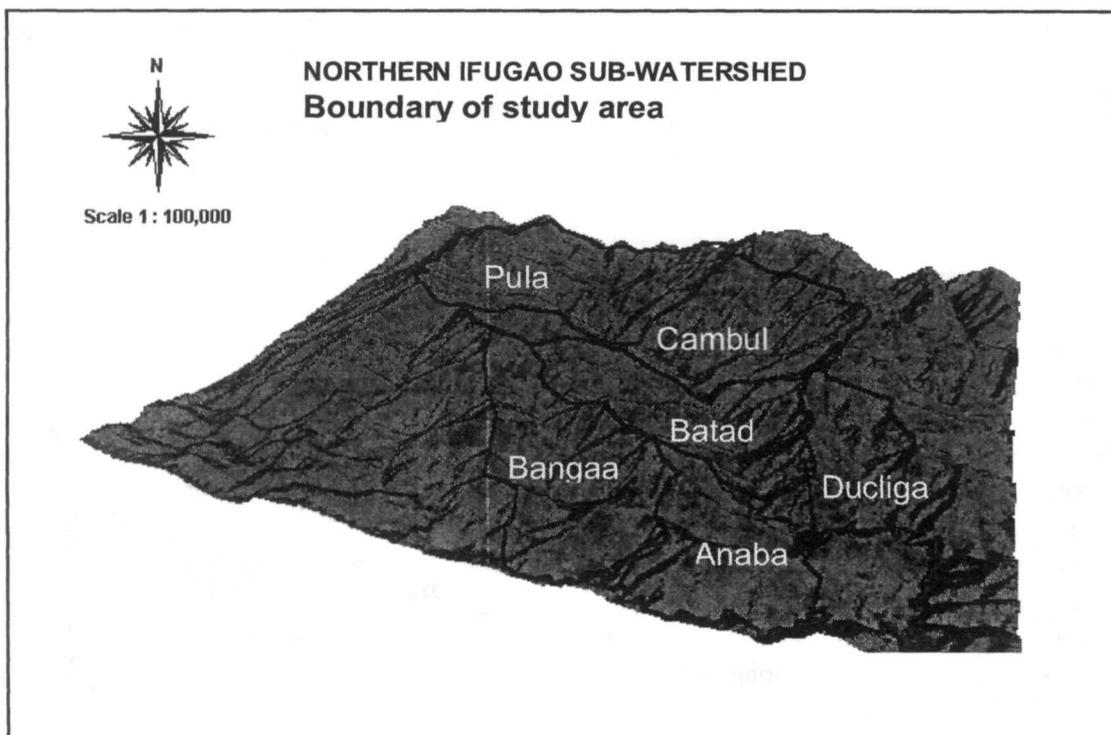


Figure 7b: Hill-shading view of the study area showing boundary lines.

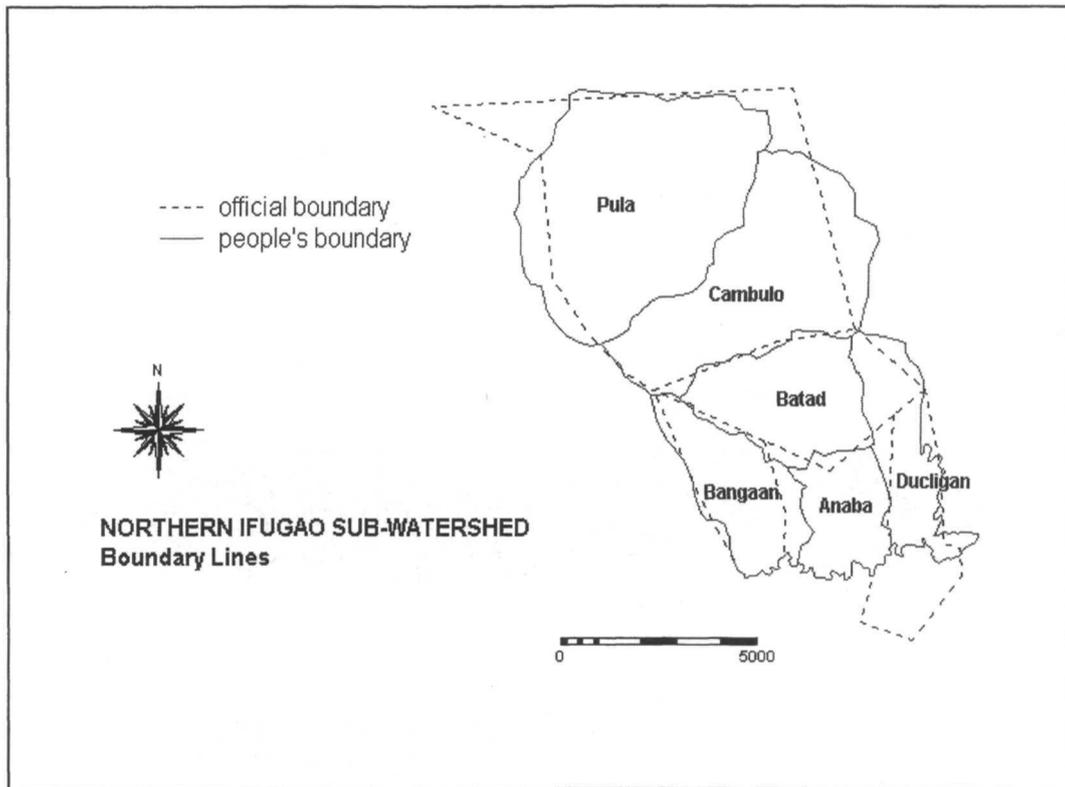


Figure 8: Present-day Ifugao boundaries (scale in metres).

My research is concerned with tracing the organisation of past and present Ifugao society in managing its environment. Thus I use the term 'water district', which represents the past natural management unit corresponding to a catchment area. They were not only managing the terraces and their swidden farms, but they were managing the whole catchment area, which is a small watershed. Figure 10 illustrates the typical Ifugao pattern of land use and its Entity Relationship (E-R) diagram¹⁰. The *payoh* (terrace farm), the *muyong* (private woodlot), and *uma* (swidden farm) together with the *aiá* (irrigation canal) and *latangan* (residential lot) are intertwined and represent the totality of the Ifugao farming system.

The *uma* are usually planted with *camote* (sweet potato) as the staple food next to rice, which is only grown in the *payoh*. The *muyong*, sometimes called *pinugo* or *hinaob* (communal forest), consists of second growth forest that can be used for house construction, woodcarving, and as firewood. The *muyong* also embodies traditional forest management that is complementary to the terraced rice culture. Its maintenance system prevents soil erosion and provides moisture necessary for terrace cultivation. The value of the forest is reflected in its unique law of inheritance: The

muyong is not sub-divided but is wholly inherited by the first child to encourage total forest protection.

ORGANISATION OF A WATER DISTRICT

After identifying the traditional natural resource manage-

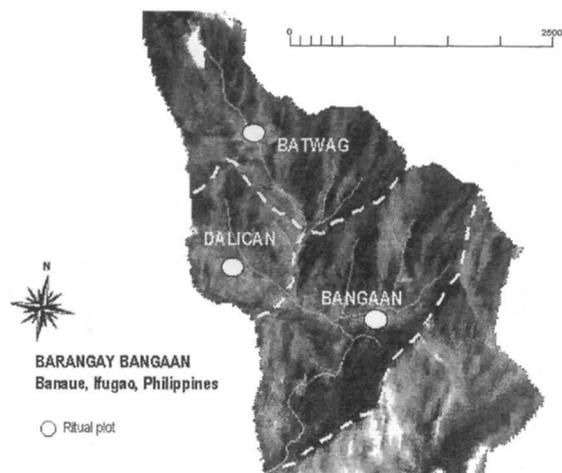


Figure 9: Apparent independent water districts following the delineated water catchment boundaries (scale in metres).

¹⁰ *Adiagrammatic technique*

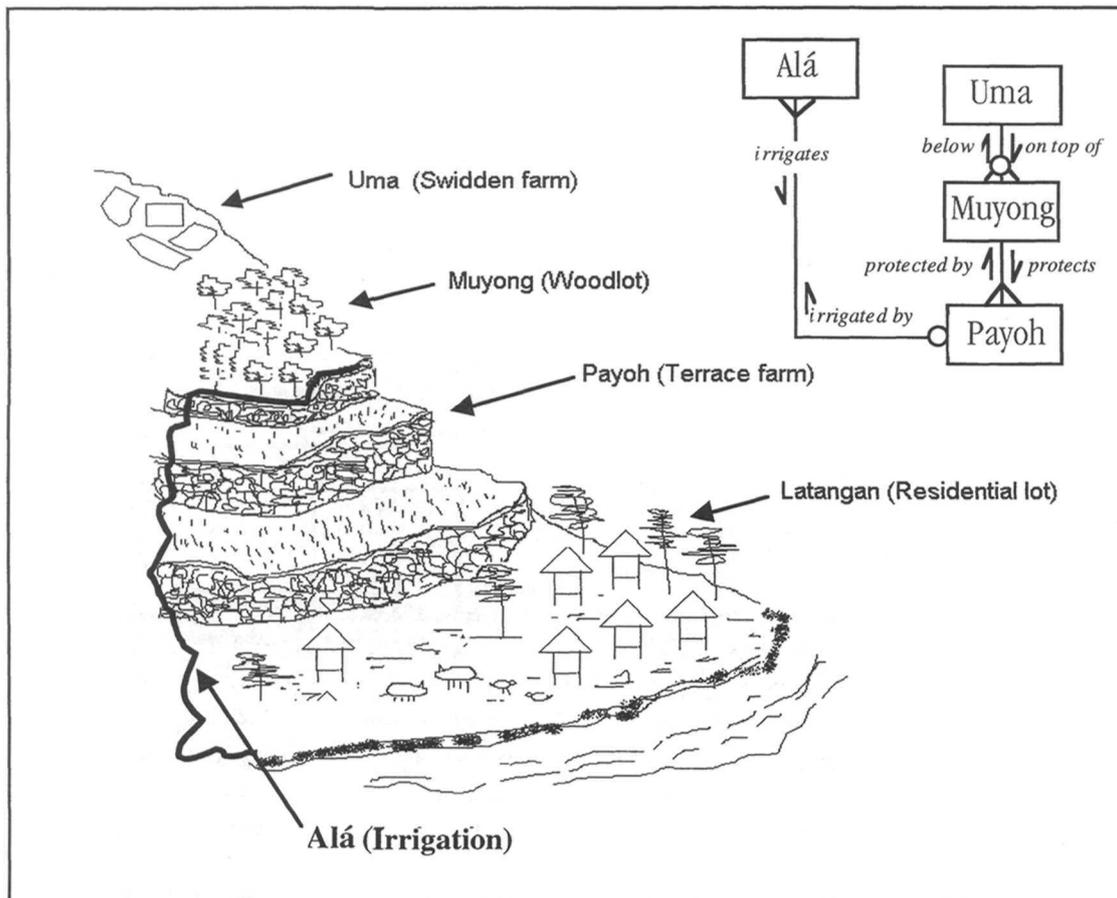


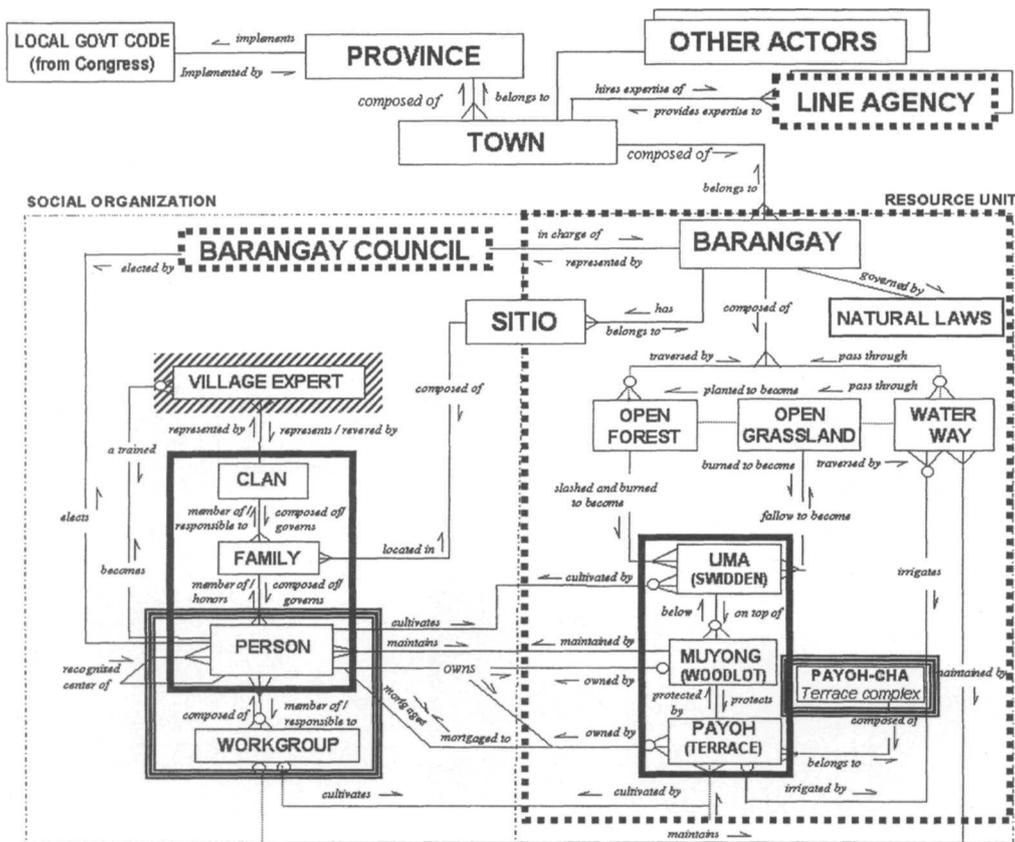
Figure 10: Transect map of an Ifugao water scheme.

ment unit, the water district, I inquired about the organisation of the inhabitants of this water district. Kinship had determined leadership patterns and functions among Ifugaos before the introduction of present day *barangay* captains and *barangay* councils. Local governance used to emanate from the clan heads or *lallakay* who, together with other village experts are collectively called *lupun* (council of elders). They were the wise men of the village versed in customary laws, their clan's genealogy, and village history.

In Figure 11, I used the Entity Relationship (E-R) diagram (Chen 1976) to illustrate the organisation of the traditional water district. The Entity Relationship diagram is a special diagrammatic technique for database design in GIS. It includes the most important semantic information about the system being modelled (in this case, a problem situation in Ifugao natural resource management) as it is used to build a conceptual model of that system (an understanding of how it works). An entity is something that can be distinctly identified: A person or a village. Relationship is an association among entities, for example, 'member of' is a relationship between family and person entities. In the direction of the arrow between two entities, the notation is read thus: A family is composed of many persons and a person is a member of a family; a town is composed of many *barangays* and a

barangay is a part of a town. A more complete description of this organisation emerges as the study progresses and more information about the relevant entities and relationships is discovered. I borrow from this modelling technique with clarification that the E-R diagram and other data models developed by other means, are just an "epistemological device, a coherent means of investigating the problem domain rather than being a description of the real world" (Lewis 1994:143).

What emerged from the final E-R diagram is a depiction of how the community used to be tightly organised around a definite area of responsibility, which starts with the family and the clan that is mainly responsible for family-owned space (denoted by the privately owned *uma-muyong-payoh* cluster). Such responsibility extended to the whole home region as a person joined a workgroup (*ubbu* and *baddang*) in maintaining the neighbouring properties and their shared property or common property such as the irrigation system and the open forests. The *tomoná* coordinated the workgroups in instituting their agricultural calendar and customary law regarding resource use. The *tomoná* were supported by the *lupun* to jointly oversee district-wide management of resources and coordination with neighbouring districts. Communities and tasks revolved around the rice



As in Figure 11 the bold, dotted, and triple lines signify management responsibility over a specific resource unit(s) by a specific social organisation(s). Most noticeable in this figure is that today the Barangay council and the Line Agency are responsible for the management of resource units whereas traditionally the Lupun, Village Expert, and Clan were responsible for the management of these resource units.

Figure 12: Present-day Ifugao NRM set up.

nologies such as high-yield rice varieties and species, such as the golden kuhol (*Pomacea caniculata* sp.) - the edible snail that is now considered a pest.

WATERSHED MONITORING

The PRRM recognises the potential of the local people's information network in what it calls "environmental scanning and mapping" (PRRM 1994). This activity is headed by the Community-Based Community Organisers and is being undertaken yearly when community development planning workshops are conducted. The Community-Based Community Organisers head the monitoring teams and coordinate with the members to update such information. They produce sketch maps that show the status and relative locations of different resource and land use activities (ter-

race farms, swidden farms, *muyong*, residential areas, open forests) of the community, and important points such as spring boxes¹², schools, churches, footbridges, etc and river networks. In Figure 13, the river network is indicated and it is interesting to note that the status of the entire irrigation network was recorded from memory. All that was required for the map to be complete was a formal recording of their volunteered information and casual field verification. During Barangay Bangaan's community development planning workshop, it became evident that the map also served as a basis for planning and discussing activities that the community hopes to undertake during the remainder of the year, e.g., rehabilitation of (by cementing) a major irrigation canal.

The foregoing activities that utilised spatially located information encouraged my exploration of using GIS to support local level terrace monitoring with the vision of combining information for the entire watershed with forest information. This is due to the fact that in traditional Ifugao

¹² A concrete box that collects water from the spring to which plastic or steel pipes are attached for distribution.

natural resource management, terrace management is intertwined with management of the whole catchment area (as discussed above). I started with participatory image classification and sought the help of the local farmers in interpreting a SPOT¹³ satellite image of the study area in order to gain an understanding of the various types of land cover information conveyed by the image.

The computer-generated classification was further refined by their knowledge of the area. For example, when some high-elevated areas were incorrectly classified as terrace farms, their knowledge that there were no terraces on such high areas guided me to re-classify them.

The final map of the classified SPOT satellite image showed the extent of the forest cover and the terrace farms. We analysed

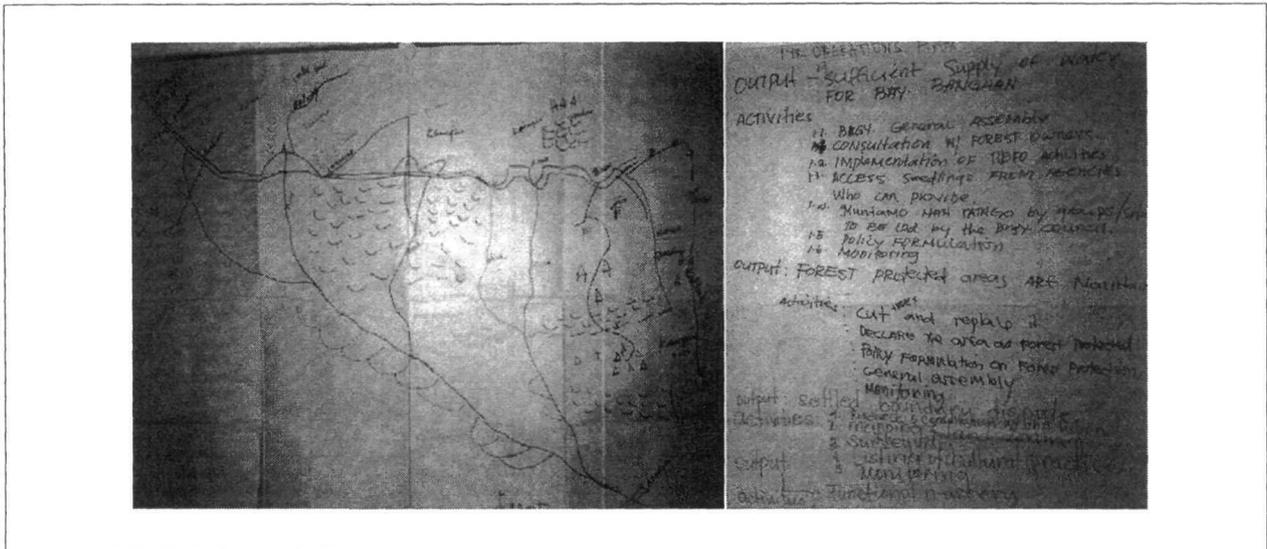


Figure 13: Community sketch map and accompanying program of action.

I first described to the farmers the meaning of the different colours in the image: Red for forests, blue for the rivers, and light green for man-made structures. Then I placed the image over the DEM to obtain a 3-D view and enlarged a prominent feature in the image - the Banaue Hotel, which is the only large building in the area. The farmers immediately saw the connection, and spontaneously identified other features in the vicinity of the hotel and in the rest of the image. When I asked how they were able to do that, one of them remarked: "We see because we know!". They also recognised the large white spots as clouds because with Ifugao's high elevation, clouds are usually seen around the mountaintops. With such a wide area covered by one satellite image (60x60km), they were able to look at their community with respect to the whole region. When I informed them that 70% of the Ifugao river system supplied water for Magat Dam, one exclaimed, "What? And we do not have electricity!".

The local farmers helped to classify the satellite image by identifying sample pixels (picture elements or the smallest unit of an image), in this case describing an area on the ground (see ILWIS 1998 for details about image processing).

the map together and noted how the forests were being encroached upon from the lower to higher elevations, and by roads. It also showed that the terraces were clustered around the river network.

Table 1 describes different land cover classes obtained from classifying the satellite image and their distribution over the study area. This table generated an animated discussion amongst participants as they joked about the relative forest areas of their *barangays*. This was an indication of their pride in the way they managed their respective areas. There was also awareness of the gravity of the situation as one pointed out the need to protect the thinning forest. Thus, the local farmers recognised the help that interpreting a satellite image could provide in monitoring their terraces. One Community-Based Community Organiser asked if their partner agencies had access to this kind of image, and I replied that access was possible. Then she concluded that those agencies could monitor the progress of their reforestation projects even if they did not visit the site.

Next I devised a method to facilitate terrace monitoring by utilising the sketch maps which contain landmarks and other features important to the local farmers. Although this

¹³ *Système Pour l'Observation de la Terre*—a French earth observation satellite launched in 1986.

<i>Class</i>	<i>ANABA</i>	<i>BANGAAN</i>	<i>BATAD</i>	<i>CAMBULO</i>	<i>DUCLIGAN</i>	<i>PULA</i>
<i>High-density Forest</i>	27	227	268	879	84	1904
<i>Secondary Forest</i>	110	287	351	464	185	261
<i>Swidden Farm</i>	130	140	131	211	97	191
<i>Terrace Farm and others</i>	26	6	31	22	31	34
<i>Grassland</i>	227	96	163	225	244	116
<i>Bare Soil</i>	30	10	12	10	77	1
<i>Waterbody</i>	18	20	16	30	17	57
<i>Cloud</i>	0	11	20	81	0	33
<i>Shadow</i>	0	7	1	24	0	44

Table 1: Summary of the landuse/landcover classes (in Hectares) after classifying the SPOT image.

exercise was not implemented due to lack of time, I shall describe the steps that we took to develop the method.

Together with volunteer participants, we used the Global Positioning System (GPS¹⁴) to determine the locations of important landmarks and features. When one farmer realised that the GPS could also indicate elevation, he asked if he could borrow it to determine the height of a waterfall in his *barangay*. He was thinking of their project proposal to build a micro-hydro power generator. His group had tried to measure the height of the waterfall by tying a piece of stone to a long piece of nylon string, suspending it above the base of the waterfall, and measuring the length of the exposed string. This method was impractical however due to obstructing vegetation and thus the GPS would be of great help.

Aside from landmarks, we also noted the locations of turning points and intersections along the terrace farm boundaries to help gather as many significant data points as possible. Because of the tediousness in measuring points for each terrace step, I decided to make use of the *payoh-cha* or terrace complex as the smallest boundary unit. These points were plotted on a screen using the ILWIS® programme. The

topographic map in the background served as a guide to ensure that digitised lines were of the same elevation. Mapped contour lines were traced and the connected points were measured. The result was a map of the terrace complexes of the *barangay*. Laying this over the DEM for a 3-D view refined the final map. The SPOT satellite image in the background helped to visually determine the relative accuracy of the plotted points. Wayward points were edited along the boundary lines.

The Community-Based Community Organisers served as team leaders that monitored the status of the terraces in their respective areas. They completed their respective monitoring sheets by shading problem areas and indicating the problem: Erosion, an abandoned terrace, a damaged wall, no irrigation, *etc.* Barangay Bangaan was divided into four monitoring areas (Figure 14) according to proximity. It became evident that these areas correspond to the three original catchment areas described earlier, along with an additional disputed area.¹⁵ Time constraints did not allow for implementation of this terrace monitoring scheme. Only the database was created using the gathered data for Barangay Bangaan.

¹⁴A GPS is a navigational satellite receiver that computes its triangulated position (i.e., based on three known points) and displays it as coordinates. Reception of four satellites produces a 3-dimensional fix which means the elevation is also computed aside from the coordinates of the location.

¹⁵Barangay Bangaan has a boundary dispute with neighboring Barangay Anaba.

However, during our last community development planning meeting, the PRRM staff and the Community-Based Community Organisers agreed upon the general procedure for the flow of information (Figure 15).

With this procedure, the Community-Based Community Organisers monitor the terrace conditions and complete monitoring sheets that are collected by PRRM's office staff. The results are relayed back to the Community-Based Natural Resource Management Council of the *barangay* and become the basis of their action plan for their workgroups. The same process can also be used for communicating with the municipal and provincial board or other external agencies to make a request for any assistance or to raise any issues that need direct attention. Such a process is also a joint learning system, as the interaction of knowledge processes is gleaned from each node of communication.

THE PROVINCIAL BOARD

The experiences with the local Ifugao farmers were later discussed with the provincial government board during a meeting that I arranged for the purpose of presenting the initial results of this research and retrieving comments, especially on the idea of joint learning systems. The following are brief descriptions of dialogue:

1. Water boundaries: All parties recognised the significance of the term 'water district'. The board cited the need for irrigation canal monitors during the summer and there was agreement to use natural divides in the delineation of boundaries. The board members seriously considered using GIS to help resolve growing boundary disputes (see Box 1).

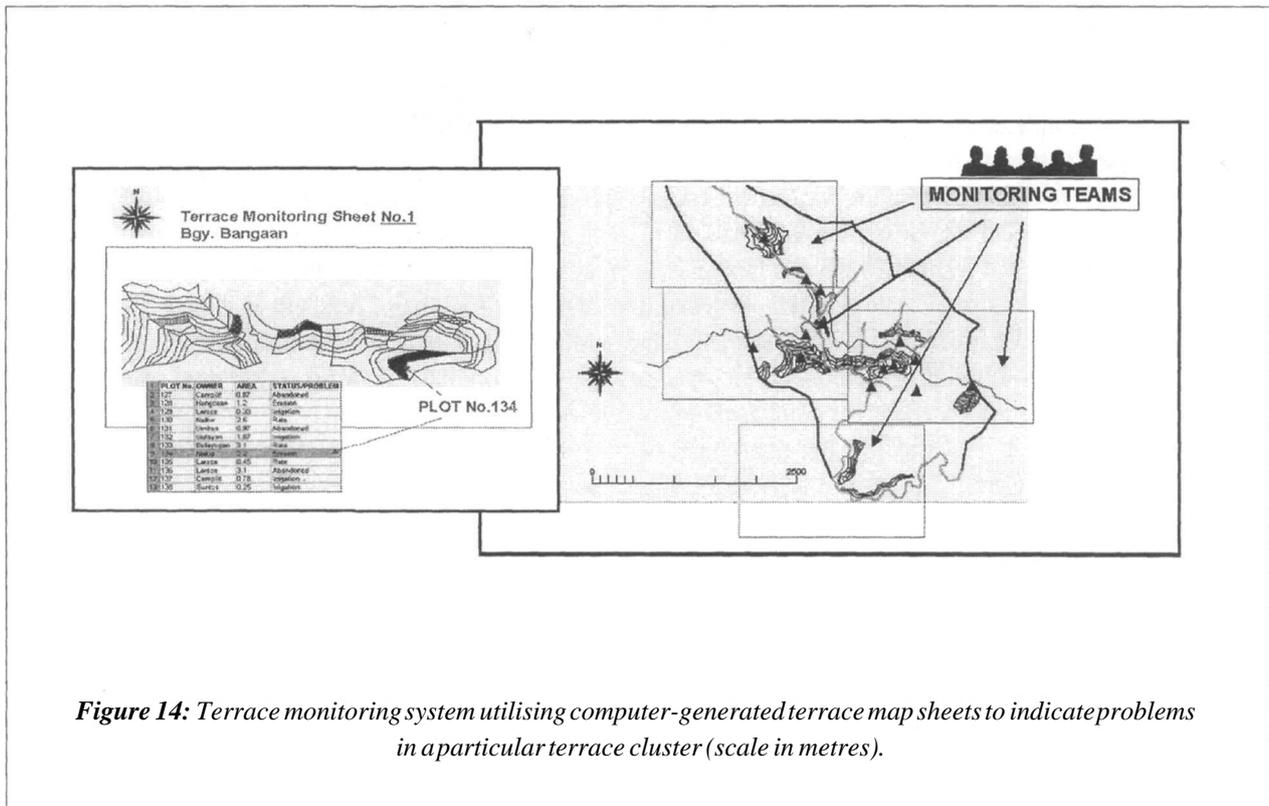


Figure 14: Terrace monitoring system utilising computer-generated terrace map sheets to indicate problems in a particular terrace cluster (scale in metres).

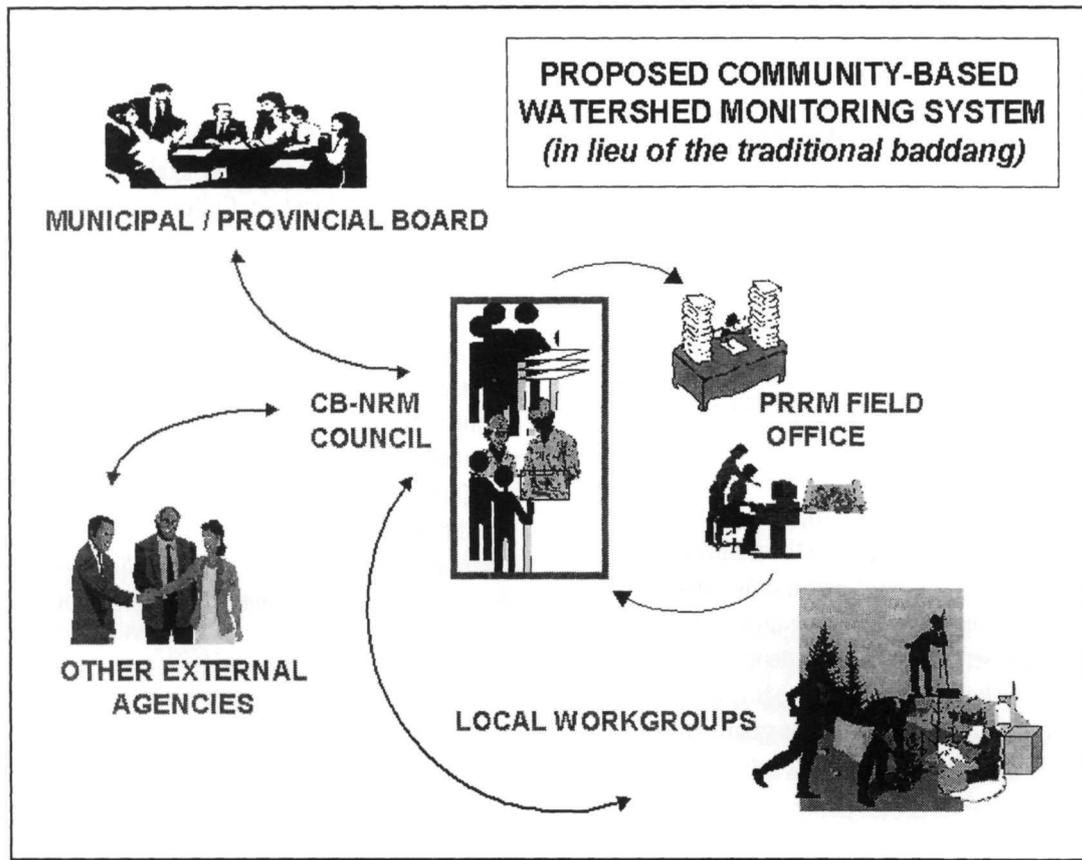


Figure 15: Proposed community-based terrace monitoring system showing general procedure for flow of information.

BONTOC, Mountain Province. After the loss of at least seven lives in a full-blown war over water sources, members of the Dalican tribe offered a truce to the Fidelisan tribe of northern Sagada. At least 600 residents have been displaced by the tribal war over water sources at the boundaries of the tribes' lands. The tribes have been shooting at each other with high-powered weapons since May 6 when Fidelisan warriors surrounded Barangay Dalican. Residents have already left the area. A ceasefire has not yet been officially agreed upon by the two tribes and hostilities could still escalate if Fidelisan warriors try to overrun their villages despite their truce notice.

Box 1: Ceasefire in Tribal War Postponed (Philippine Daily Inquirer 16 May 1999).

2. Traditional boundaries: The board recognised that traditional boundaries and present political-administrative boundaries are generating confusion among some adjacent *barangays*, especially now that resources are more scarce. They also recalled other cases of boundary disputes and the necessity to devise mediation approaches other than the traditional conflict settlement schemes¹⁶ commonly used by adjacent terrace owners, which rely on the physical prowess of representatives from contending parties. Members of the board noted that the highlighting of traditional water district boundaries might be a further option for resolving conflict between *barangays*.
3. The old and new natural resource management arrangements: The older members of the board had not realised the nested platforms configuration before, but they clarified that collective work was just the norm - it was expected of them. The diagrams also helped them recall the changes that had taken place in their communities' and the lessons from the successes of their ancestors. But they pointed out that their changed lifestyle made it difficult to implement traditional practices today - there are more off-farm activities and the younger generation are often indifferent. They joked about the way they dressed - that they now have to wear shoes. This not only shows the extent of external influence in the Ifugao society, but the expenses entailed by present-day necessities. As

the terraces were traditionally for rice cultivation (which is for local consumption), today's differing needs require them to seek other income-generating jobs. Hence, they resort to off-farm jobs in the lowlands, tourism-related work (woodcarving, weaving, tour guiding), and vegetable growing. Engaging in most of these jobs, in turn, results in fewer farm hands.

4. Learning: I pointed out the need for community members, especially the younger generation, to become more knowledgeable of their history in order to gain lessons from their successful ancestors. They agreed and informed me that efforts were already being undertaken by the provincial office of the Department of Education, Culture and Sports (DECS) to address the issue. An excerpt from a recent newspaper article shows some developments in this regard (Box 2). But the general concept of learning about the changing conditions of their environment emerged during the discussions as they cited the need to monitor the status of their forests. One board member pointed out the crucial role of the *barangay* captain in directly monitoring and discussing the sorry condition of the terraces with constituents. Another board member noted that: "*The satellite image can help a lot in showing the overall condition [of the terraces].*"
5. Forest monitoring: The issue of using satellite images for forest monitoring was raised by one board member. They were surprised to learn that the SPOT satellite image was classified with the assistance of local residents in the study area and the Vice-Governor asked me where I had obtained the data. He recognised the ease at which provincial forest management could be carried out by remarking that, "*without having to go to each of those mountains, we can easily monitor the progress of our reforestation projects.*" I referred him to the national mapping agency in Manila.

It is encouraging to see that our discussions during the meeting have been followed-up: A recent newspaper carried an article on using GIS for monitoring the condition of Ifugao's terraces (Box 3). However, the article reveals that

¹⁶ *The ug-ugub involves throwing of freed shoot arrows at a target. The target may be each other's back or the fields concerned. The bultong is a wrestling match between the representatives of contending parties.*

"Educators have finally realized that the ancestral knowledge and ingenuity that allowed the building of rice terraces and the whole way of life that revolves around the land, should not vanish. The DECS in Ifugao has created what it calls 'Indigenized Learning Guides' for Grades 2 and 6 for pupils in the province. Learning guides for other grades would follow. Through the 'indigenized curriculum,' the pupil, for example, appreciates that it was not only ingenuity and engineering skills that built the rice terraces; equally, if not more important, was the Ifugao's cooperative tradition called baddang dang-a, which other Filipinos call bayanihan.

The effort to 'indigenize' social science subjects for Ifugao elementary pupils is praiseworthy. But there are a few parts of the learning guides which must be improved and clarified: Kaingeros or swidden farmers, for example, are blamed for the loss of forests in the province. Other historical studies suggest loggers (who came from outside the province) were to blame for the destruction. The Ifugaos, in fact, should be credited for preserving their forests through shifting agriculture and forest management system called muyong (clan or communally managed forests). The remaining forests in the province today are found largely in the muyong areas."

Box 2: Regaining Ifugao's Fading Cultural Glory (Philippine Daily Inquirer 8 June 1999).

GIS is being seen simply as a mapping tool; its strength in spatial analysis is not yet appreciated or understood. But this is a promising start in using information technology to understand the environment.

CONCLUSIONS

These experiences in designing a GIS-based system together with the local farmers of Ifugao show how GIS helped develop local knowledge and processes. Local farmers were enthusiastic about using information technology. They were excited about the thought of learning more about their own environment and when they saw their respective *barangays* in relation to the region as a whole they soon realised their inter-connectedness, as well as their neglect. The extent of deforestation and its relative distribution across the study area

generated awareness of the seriousness of the situation. First farmers joked about which *barangays* were the least forested areas and showed respect for those *barangays* with the greatest area of forest. But soon they became concerned about the state of their forests and feared that they would become like

Aside from the land-use plan, Dait (Chairman of the Ifugao Terraces Commission) said UNESCO had approved an initial fund of \$50,000 for a "geographic information system" (GIS) mapping project for Banaue. Using computers, the GIS can be used to monitor, for example, what area of the terraces was eroded or converted into residential zones.

Dait also revealed how the Ifugao Terraces Commission helped encourage the Ifugao State College of Agriculture and Forestry (ISCAF) to motivate its agriculture students to learn the art of terracing from the Ifugao farmers. "This is to ensure that the age-old engineering skill that built the rice terraces won't vanish," Dait said.

Box 3: Mapping project (Philippine Daily Inquirer - 22 February 1999).

those of their neighbours, Ducligan and Anaba, whose forests have severely deteriorated.

In general, the inhabitants of the study area were very interested in learning about their environment as a group. There were lively exchanges during the meetings and the presence of the computer screen enhanced their enthusiasm to learn. I particularly recall their enthusiasm in attempting to understand what was happening to their environment. Two women who had been to an earlier discussion in one *barangay* walked the two kilometre distance to the following discussion in another *barangay* so that they could "see it again on a bigger computer screen." - I had used a small-screen laptop during my earlier talk.

GIS also inspired new ideas and new solutions as the inhabitants of the study area thought of ways to use GIS techniques (e.g., in determining the elevation of the waterfall). This shows the potential of GIS as a tool in joint learning and in adaptive management. If more actors with diverse interests and viewpoints participate, more ideas will be generated and deliberated.

This research also shows how GIS techniques were used in tracing and appreciating the history of the Ifugaos' traditional natural resource management. GIS techniques also helped to elucidate the establishment of their traditional management units (water districts). Ultimately, the under-

lying reason for creating water districts was to accommodate adaptive management. GIS helped facilitate this appreciation among the participants of the workshops, including the provincial board who also showed the potential of GIS in resolving boundary disputes, in monitoring the status of the terraces, and in monitoring forest health. The use of GIS in monitoring the many components of the environment as well as its use in the social arena mirror to a certain extent the concept of total watershed management by the old Ifugaos whereby forests and watersheds were managed by a number of social actors. Traditional natural resource management practices of strict, collective monitoring of the environment can be reinforced by the use of new GIS technology.

The old Ifugaos have demonstrated a successful joint learning approach by using their traditional institutions such as the *tomoná*, and the accompanying rituals, songs, and chants in the collective management of their fragile environment. Through their simple collective effort, they have transformed a forested area into a productive habitat through great artistry. Their ancient skill in managing space, in utilising spatial information, and in adapting to their fragile environment can be greatly facilitated by GIS. It extends their understanding and reinforces the fact that they will not remain an isolated and neglected people, but will become part of the greater community of peoples who must play a part in making difficult choices for the present imperative of creating a sustainable society. This research has shown that GIS technology can help us learn, together, from our past success in order to live more harmoniously with nature.

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Summaries

Les Ifugaos des hautes terres du nord des Philippines gèrent avec succès leur écosystème en terrasses, qui remonte à plus de 2000 ans. La connaissance de techniques de gestion traditionnelle des ressources naturelles se passe de génération en génération par des mythes et des chants et des rites louant le dieu du riz. Les conditions font l'objet maintenant de dégénération par suite de l'incursion d'influences socio-politiques modernes. Différents organismes sont en train d'essayer de sauver les magnifiques terrasses ifugao, en particulier depuis qu'elles ont été incluses dans la liste de l'héritage mondial de l'UNESCO. La gestion adaptative est une nouvelle approche qui ressemble à la gestion traditionnelle des ressources, mettant l'accent aussi sur l'"apprentissage par l'action". Cependant, elle a l'option d'utiliser les technologies récentes. La technologie des systèmes d'information géographique (SIG) sont un outil prometteur et ses possibilités d'utilisation sous forme participative sont examinées. Un "apprentissage conjoint" assisté du SIG est présenté comme stratégie de gestion adaptative pour faciliter la visualisation de différentes perspectives et aider à comprendre la gestion conjointe de l'environnement.

Los Ifugaos de tierras elevadas del Norte de las Filipinas han manejado su ecosistema en terrazas exitosamente por 2000 años. El conocimiento de la práctica tradicional de manejo de los recursos naturales ha sido transmitido de una generación a la siguiente mediante sus mitos, cantos y la celebración de rituales de alabanza a sudios del arroz. Actualmente, las condiciones se están degradando como resultado de la incursión de influencias sociopolíticas modernas. Distintas agencias están tratando de salvar las magníficas terrazas de los Ifugao especialmente después de haber sido incluidas en la lista de áreas consideradas Patrimonio de la Humanidad por la UNESCO. El manejo adaptativo es un enfoque nuevo que se asemeja al manejo tradicional de recursos en cuanto a que destaca el "aprendizaje a través de la práctica". Sin embargo, incluye la opción de utilizar tecnologías recién disponibles. La tecnología de los Sistemas de Información Geográfica (SIG) es una herramienta promisoriosa y se explora su uso de manera participativa. El aprendizaje conjunto realizado con la ayuda de SIG se propone como una estrategia de manejo adaptativo para facilitar la visualización de perspectivas diferentes y para ayudar a entender el ambiente que se maneja conjuntamente.

Culture and Cosmivision: Roots of Farmers' Natural Resource Management

Irene Dankelman¹

Although natural resources conservation and management aim to improve situations in the ecosphere, it is crucial to understand processes and relationships in the sodosphere. The motives and beliefs through which people function are rooted in communities' cultures and related cosmivisions. Throughout the world cosmivisions have looked at the relationships between society, nature and the spiritual world as integrated parts of life. Many natural elements have a sacred meaning and people's uses of nature, e.g., in agriculture and also astrology, are guided by traditional knowledge systems, beliefs, ceremonies and rituals. Traditional institutions have been assigned specific tasks in natural resources management. Although many elements resulted in sustainable use of resources, these systems have not always had a positive impact at social or ecological levels. With globalisation and changes occurring in the environment, cultures also change rapidly. However, it is argued that a thorough understanding of cultural roots, beliefs, traditions, and power relations is essential for the conservation and sustainable management of resources at community level. Adaptive management should take account of these elements, so that it is both culturally and ecologically effective.

INTRODUCTION

The focus of this paper is natural resource conservation and management. In this context I pay special attention to what culture and cosmivision mean for people's vision of natural resources, and what the implications are for natural resource management and decision-making. This paper aims to give a global view of the central issues of culture and cosmivision².

should have a positive impact on processes (and products) in the 'biosphere'. Focussing on social actors in our effort to understand natural resources and management, we implicitly underline the fact that social processes, decisions, and actions are crucial factors in natural resource conservation and management.

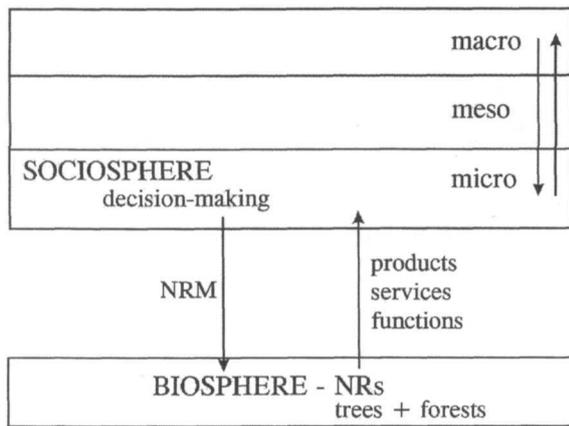
The meso- and macro-levels also have a major impact on local level decision-making and power relations. I illustrate this relationship in Figure 1.

FRAMEWORK FOR ANALYSIS

Ultimately we deal with processes that are formed by and among people in the 'socosphere'. Processes formed here

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²Cosmivision: The way in which communities understand life, the world and the cosmos; in which the relationships between the social world, the natural world, and the spiritual world are central



NRM = Natural Resources Management

NR = Nature Reserves

Figure 1: Interaction between the socio- and biosphere.

Farmers are at the centre of the micro-level (see Figure 2). With their families, they constitute the communities at the local level. Each community is 'embedded' in its specific culture, which is a product of the history of the community and encompasses its 'cosmivision' (including spirituality), its knowledge systems, social organisation, and its productive, day-to-day practices. Culture plays a major part in the vision (perception, spirituality), knowledge, practices, and positions of individual farmers.

This whole social complex acts within its physical environment (geographical location and natural resources base: Figure 1); an environment that changes over time, and with which local people, communities, and cultures interact in many different ways.

Some questions which can help our understanding of the dynamics in this complex picture are:

1. What does the culture have to say about natural resources, the environment, nature, and about natural resource management? How is that view expressed? How is decision-making defined by a specific culture?
2. What is the social position of the farmer (in decision-making) in the family, the community, and traditional institutions, and in relation to the meso- and macro-levels?
3. What is the vision, knowledge, and practice of the farmer regarding nature, natural resources, natural resource management, and decision-making?
4. What role do experts, as outsiders, play? What is the nature of the cultural (knowledge) bias experts bring?

Decision-making in natural resource management is a process that involves:

- Individuals.
- The community; and
- Society (in which the place of an individual or a

community in the hierarchy determines the process of decision-making to a large extent).

Questions to be asked here are:

1. Who makes decisions and who does not - those within the hierarchy and institutions?
2. What decisions are made - contents, peoples' vision/knowledge, cultural links?
3. How are these decisions made - process of decision-making and power relations?

CULTURE AND (COSMO)VISION

Although not directly visible to an outsider, in societies in the South (as well as the West and East) in which conventional western technologies, beliefs, and values have been accepted, one finds a persistent core of indigenous culture and indigenous knowledge below the surface (Reichel-Dolmatoff 1996). In decision-making by rural communities on natural resource management, cultural heritage remains a determining factor (Haverkort and Hiemstra 1999).

WHAT IS CULTURE?

Culture refers to the body of socially acquired traditions which already appeared in rudimentary form among mammals (especially primates):

"Many animals possess learned traditions that are passed on from one generation to the next and that could be seen as a rudimentary form of culture...It is only among the hominids that culture has become a primary source of adaptive behaviour, more important than biological evolution involving changes in gene frequencies." (Harris 1980:35).

The great evolutionary step of culture is that the capabilities and habits of culture-bearing animals are acquired through social heredity rather than through the more ancient process of biological heredity (Harris 1980).

In 1873 Sir Edward Tyllor stated:

"Culture... is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society... laws of human thought and action..."

So both mental and behavioural aspects can be distinguished (Lessa and Vogt 1979). The geographer Peter Jackson defined cultures as *"...maps of meaning through which the world is made intelligible"* (Davis 1999).

No culture exists in a vacuum. Culture has a history, its own dynamics and context, both with its linkages to the physical environment and with other cultures. Culture is

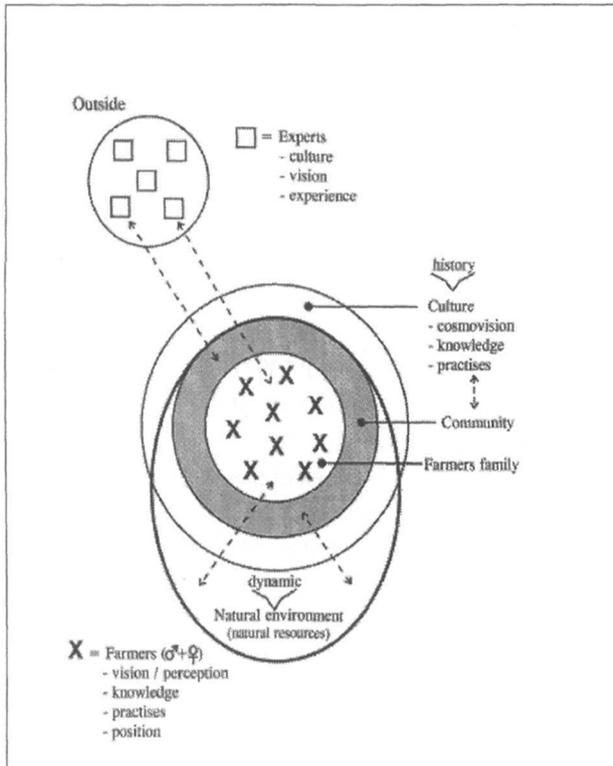


Figure 2: Farmers, culture and the outsider.

from all times and all places. It differs and changes continuously and in this respect, can be compared to a natural system, for example an ecosystem.

The world harbours a great diversity of cultural expressions, which are transmitted from one generation to the next. The vitality of a culture may be expressed, for example, in the state of its language. Throughout history about 10,000 spoken languages have existed. Today, about 6,000 languages are spoken, but more than half of those are unlikely to survive the next century (Dankelman and Ramprasad 1999).

Worldwide, some 300 million people still possess a strong sense of identity as members of an indigenous culture. There are at least 5,000 indigenous cultures in existence (Davis 1999) the people of which are asserting their cultural identity and claiming their right to control their own futures. Not only are tools, diets, art, laws, language, and customs a manifestation of a specific culture, also present are visions of life and an understanding of the surrounding environment.

THE GLOBAL NATURE OF COSMOVISION

Cosmovision refers to the way certain populations understand life, the world, and the cosmos. The relationships between the social world, the natural world, and the spiritual world are central to people's cosmivisions. Cosmovision explains

the ways in which natural processes take place and the roles played by supernatural powers. Philosophical and scientific premises are made explicit (Haverkort and Hiemstra 1999). Huizer (1999) describes it as a "holistic awareness", an inner civilisation from which we can learn.

For many rural, but also urban people throughout the world, their cosmivision still feeds many aspects of their life, including their spirituality, day-to-day actions, rituals, symbols and arts, food production, and relationships with nature and other community members. Cosmovision has a significant impact on the way people organise their lives.

Trying to understand people's cosmivision does not mean that we should romanticise it. There are positive elements in cosmivisions, such as their contributions to sustainable land-use, conservation, and wise management of resources, but there are also elements that can lead to social instability, inequity, or over-exploitation of resources. Whatever the effects are, cosmivision often forms an important (hidden) motivation for people's feelings, thoughts, and acts.

In India, the classical traditions as well as the popular or folk traditions are still very much alive. Generally they converge. Only occasionally do they diverge. The Vedic culture blossomed about 6,000 to 8,000 years ago. The Vedas are a collection of hymns, mantras, and prayers, written in Sanskrit, in which the sacred knowledge of the cosmos is communicated. The cosmos is seen as a great being, as a cosmic organism. The different parts of the world are identified as parts of her body. The primary natural elements, of all life forms (the *Pancha Mahabhutas*) are air (*vaya*), earth (*prithvi*), water (*Jala*), fire (*agni*), and either sky or space (*akasha*). All living beings are born and evolve from these and return to these after their death. The Vedas see the world as a creation with a divine substratum. All creations are equal and are bound together by divine love. Humans have a particular responsibility, as they have been endowed with unique powers of discrimination, knowledge, and wisdom (Mahale and Sorée 1999; Sundar and Balasubramanian 1999).

In more traditional thinking the relationship between humankind and nature is central. No distinction is made between the sacred and the profane. Everything is sacred. It is every person's responsibility to live in partnership with nature. Many of these beliefs pertain mainly to agro-ecological practices. For several tribal groups, food crops like millet, rice, and grain are sacred, and a gift of the Goddess of the Earth.

In the Sri Lankan Buddhist tradition, at least eight different forces and powers are recognised:

- Power of the moment.
- Power of a specific location.
- Power of sound.
- Power of symbols.
- Mental powers of certain individuals.

- Power of plants (*e.g.*, powers that go beyond the nutritional and pharmaceutical values).
- Power of place and space (*e.g.*, where certain events have taken place); and
- Supernatural powers (*e.g.*, spirits and divine beings).

It is not only important to understand these forces, but also to look for a balance and synergy among them.

In Ghana, Africa, the perspective is that there is a 'Triad' between the ancestors, the living, and the generations yet unborn. The universe has been created by the almighty God, who is represented on earth by many other Gods (earth God, rain God, tree Gods). Nature is a living being, with all parts interrelated and humanity as part of nature. Nature does not belong to mankind, but mankind to nature (Millar 1999a).

Essential elements of the Andean worldview are still alive and widespread. In the Andean cosmivision, the human, natural, and spiritual worlds are inseparable. They are in a constant dynamic interaction with each other. *Pacha* forms the central notion of life; *Pachamak* - the spiritual life; *Pachamama* - the material life, Mother Earth; and *Pachankamachana* - the social life (Rist *et al.* 1999; Zambrano *et al.* 1999).

DEITIES

All around the world people believe in the existence of natural and supernatural divine beings and spiritual forces: Gods, spirits, and ancestors. These forces can have a positive, creative power, which can help human beings and nature. Conversely, they can also be destructive or harmful. In India in most villages, the Gods and Goddesses of the Great Tradition are mainly worshipped by upper caste Hindus, while most village people honour their own village deities (often Goddesses), which ensure good crops, timely rains, fertility, and protection from diseases. In Latin America, symbiosis between the indigenous Gods and the Christian God and saints has taken place.

NATURE

*"We feel the Earth as if we are within our mother.... To heal ourselves we must heal the Planet and to heal the Planet, we must heal ourselves... Our territories and forests are to us more than an economic resource. For us they are life itself and have an integral and spiritual value for our communities. They are fundamental to our social, cultural, spiritual, economic and political survival as distinct peoples"*³ (IAITPTF 1997).

In many cosmivisions nature, and all her constituents and products, is considered sacred.

The following is a list of examples of sacred items:

- Mother Earth - *Prithvi and Pachamama*.
- Sacred mountains and rivers (*e.g.*, the Ganges).
- Trees (*e.g.*, ficus, *mahua*, tamarind, mango).
- Plants (*e.g.*, lotus).
- Crops (*e.g.*, coconut).
- Animals (*e.g.*, tigers, Indian bison, and cows, which are frequently taken to be a symbolic representation of the earth).
- Birds (*e.g.*, peacock, pigeon); and
- Stones, caves, and rocks.

The sacred forests, which in India are known as *onum*, are inhabited by divine beings. Land and other natural resources are often seen as gifts of the God(s) to their ancestors of common property.

Ancient texts, such as the Indian Upanishads, emphasise the importance of trees. Tribal people believe that they are children of Mother Nature, and that she protects and guides them. In traditional Indian thought people were urged to adopt a 'live and let live' attitude, not only towards humans, but with all life (Shenoy *et al.* 1999).

In many parts of Africa, traditional philosophy has ascribed a sacred significance, especially to land. Femme Biligon, a Konkonba elder from North Ghana has stated:

"The common awareness that the earth we are part of has been entrusted to us and can in no way be considered as property or commodity to dispose of as we please (like the White man does) has always been deeply embedded in our traditional beliefs." (Millar 1999a).

Land is considered to be the property of the earth spirit and the giver of all means of life. An Ashanti chief in Ghana (Nana Sir Ofori Atta I) notes: *"Land belongs to a vast family of whom many are dead, a few are living, and a countless host are still unborn"* (Millar 1999a).

³ This quote is taken from the Indigenous Peoples Earth Charter and Charter of Indigenous-Tribal Peoples of the Tropical Forests, 1992 (IAITPTF 1997).

In several African regions large areas were demarcated as sacred. Sacred shrines and groves, woodlands and wetlands, were deemed spiritual habitats and the foundations of survival. The uses of these areas, such as grazing, hunting, felling trees, or collecting firewood, were strictly regulated (Gonese 1999a).

The people of the Peruvian Andes see themselves as sons and daughters of the mountains and as the brothers and sisters of animals, such as the condor and llama. The ritual relationship with *Pachamama* (Mother Earth) is still alive, as are traditional values such as joint labour for community purposes (*minka*) (Rist *et al.* 1999). People believe that potatoes have a spirit. "*Spirit of the potato; this is your day; take care of the food; accept the alcohol and coca leaves*" (Zambrano *et al.* 1999.) This kind of belief is common in indigenous societies (and historically, in early western societies such Greek society) in which the staple crop is the central focus of community life and is critical to the basic survival of the village.

ASTROLOGY, RITUALS, AND SYMBOLS

Not only does the earth and her creatures play an essential role in cultural spirituality, but so do the stars and planets. In the Vedas the Sun is seen as the soul of the universe, or the soul of time and the planets as reflectors or transmitters of light and solar energy.

Astrological observatories from thousands of years ago can still be found in Asia and Latin America (in Peru such observations are 3,500 years old) and the role of astrology is still prominent in many cultures. Astrological information is extensively used to determine the moments (days, hours) when different activities should or should not take place (cosmic influences). The astrological information guides social, natural, and spiritual activities.

Although they vary from region to region, a wide range of rituals are performed in order to please (or worship) the Gods and spiritual beings (deities). A ritual can be defined as a spiritual activity carried out in order to create the conditions for a certain material or social event people want to happen. Rituals are performed in all important social and productive activities, such as in agriculture and health practices. They have a protective, prohibitive, or promotional character. Offerings, or *poojas*, in India form important elements of the ceremonies.

Symbols, such as *Gondas* or chalk marks are used by *disaries* or *guniyas* to please evil spirits and to protect crops from humans, animals, and witch craft. Walls of houses also contain *gondas* that concern production systems, e.g., agriculture (Shankar 1999b).

KNOWLEDGE

Most of the cosmovision knowledge is taught to the young by elders orally. Much of that knowledge is preserved in the form of folksongs, proverbs, myths, and sages. Generally folk songs are mostly retained by village women, whereas the knowledge relating to the agricultural activities of men is often preserved in the form of dance and instrumental music. Instruments, such as the sacred drum and horn of the YaaGalbo in Kenya, are also used at special occasions by elders (Linguist and Adolph 1996).

Knowledge systems are important parts of local cultures. They are location specific, holistic, and relate to diversity. They can not be seen outside the context of the mode of production in which they function. Folk knowledge often reflects farmers' perceptions and understanding of ecology, crops, land, labour, and livestock, much of which is received from ancestors, and by experiences and strategies in day-to-day natural resource use and agriculture.

In the old Vedic traditions classical texts reflect scientific insights. The *Vrkshayurveda*, or Science of Plants gives a detailed description of different aspects of plant life. Nomenclature and taxonomy, collection, seed selection, irrigation, testing of soils, (un)favourable meteorological conditions, and the use of plants as indicators (Sundat and Balasubramanian 1999).

For outsiders who have a background in the formal (natural) sciences, it is often difficult to understand the real meaning of indigenous knowledge. In most cases we see a mix of indigenous and outside knowledge systems. Some communities are influenced to a great extent, whereas others are still mainly governed by their traditions, which are not static, but change over time.

Indigenous knowledge is not, by definition, equally spread across communities. There may be some people within the community who monopolise, exploit, or misuse it.

AGRICULTURE

Many indigenous knowledge systems relate to agriculture and there is a close relationship between cosmovision and agriculture. Guided by cults, agriculture was shaped. The word *cultus* - or worship - is related to culture, and from this word the word cultivation is derived. The words cultivation, tillage, care, worship, and honouring are all related and find their roots in the natural environment (Nilson 1994).

Traditional agriculture in India is one of the oldest and most advanced forms of food production, which ensured food security and preserved biodiversity over centuries. The tradi-

tional practice was essentially an integrated system involving crops, trees, and livestock (including fish) that was eco-friendly (Singh *et al.* 1998). Cultivation was based on the astrological calendar and was framed with several rituals and offerings. The Vedas see agriculture as the area where humans and the divine can co-operate - the most honourable of situation. The Vedas also contained the so-called *Bhoomi Sukta*, or Earth hymns, and the *Anna Sukta*, or food hymns. Apart from the classical texts on the Science of Plants, the *Mutte* is a body of agricultural science, containing a wide range of agricultural practices written on palm leaves. Only traditional functionaries, like *disaries*, *poojari*, and *guniyac* could possess *Mutte* (Shenoy *et al.* 1999).

For more than 3,500 years in Andean culture, agriculture was the main activity, intimately connected to religion. The culture emphasises the relationship between society and

nature in a certain *Pacha* (time and space). In astrology, the ritual calendar and agriculture are closely linked. The landscape has a symbolic value and the land-use system was based on risk minimisation. Decisions on farming were also influenced by weather predictions.

In traditional practices agriculture is often a community activity, where individual decisions have to fall in line with communal decisions, which are made by a village chief.

TRADITIONAL INSTITUTIONS AND DECISION-MAKING

Traditional communities are often well organised and they and their functionaries, often play an important role in natu-

Country/ Region	Institution	Local Name	Function
India	Village Headman	Naik	Administration, maintaining order, settling of local land disputes.
	Medicine man	Disari	Spiritual-religious matters, knowledge management, health; dates festivals/rituals.
	Priest	Poojari	Religious protocols, performance of rituals <i>e.g.</i> , associated with agriculture
Sri Lanka	Village Council	Gurus	Administrative leadership villages
	Buddhist monks and priests		Extensive knowledge about <i>e.g.</i> , regarding agricultural practices and indigenous techniques
	Masters		Teach astrology, ritualism, medicine
Africa	Village chief	Tindana	Political leaders, administrative and judicial functions
	Earth priests		Spiritual power, power over land, control powers of the chief
	Soothsayers		Can act as medium: and as prediction
	Spirit Mediums		Can read messages sent through the animal world by the spiritual world, custodians flora and fauna
Andes	Three highest ancestral authorities	Alcades	Regulate allocation of land rights and land rotation; elected each year
		Jilakatas	Protect plots against negative influences; i.e. ensures that the community respects Pachamama
		Layas	Can read signs of nature
	Local healers	Curanderos	Healing
	Soothsayers		Makes prediction

Table 1: Traditional institutions and their function in India, Sri Lanka, Africa, and the Andes.

ral resource management decision-making relating to land, water, or biological resources. They regulate community administration, decision-making, elements of fanning, and the rites and rituals related to cosmovision. These traditional functionaries often combine political power with spiritual skills.

In the Indian *Panchayat* system, village leadership, water, and land management are well organised (see Table 1, previous page). The village headman (*naik*) is often a farmer or well-known healer who is responsible for village administration, maintenance of order, and the settling of local land disputes. The *disari* is the medicine man of the village and he is responsible for spiritual-religious matters and has considerable knowledge of local agro-ecological practices and land management. He also fixes the dates for festivals and rituals. Religious protocols of the village and the performance of the rituals associated with agriculture fall under the responsibility of the priest or *poojari* (Shankar 1999a).

In Sri Lanka, agriculture based on indigenous knowledge could also flourish because of its institutional backing. The villages are administratively led by a village council and village chief, but Buddhist monks and priests are well respected because of their invaluable knowledge about agricultural practices and indigenous techniques, and as teachers of religion and spirituality. *Gurus*, or masters, teach astrology, ritualism, and medicine (Upawansa and Wagachchi 1999).

In many African traditions the elders receive much respect. Chiefs are the political leaders and are responsible for the administrative and judicial functions in societies. The earth priests (*tindana*), however, have a great deal of spiritual power and power over land, as they can communicate directly with the God of the earth. They also control the powers of the chief and his accountability. Soothsayers can act as a medium, predict the future, and assess the wishes and intentions of the Gods (Millar 1999a). Spirit mediums can read the messages sent through the animal kingdom by the spiritual world and they are considered the traditional custodians of flora and fauna. This is true in Zimbabwe. Although they do not have a written literature, many of them teach how to live with nature (Gonese 1999a).

In the Andes, a mixture exists between the ancestral pre-colonial organisation and the syndicate system (in which the production at the haciendas was arranged through co-operatives). Both are based on completely different visions and are not compatible, resulting in many conflicts. In the ancestral system the three *alcades* are the highest authorities who are elected each year. They regulate, for example, the allocation of land rights and land rotation. The *jilakatas* protect the plots against negative influences and see that the community pays tribute to *Pachamama*. The traditional institutions also included *layas* who can read the signs of

nature, local healers or *curanderos*, and soothsayers (Rist *et al.* 1999; Zambrano *et al.* 1999).

In many different cultures we see similar situations in which functionaries play administrative and judicial roles, and regulate land allocation, land use, agriculture, natural resources, and healing, religious, and spiritual matters. They are important sources of knowledge on these matters. The accountability of these people is difficult to judge and their power has certainly changed over time, but in dealing with decision-making in natural resource management, we have to be aware of these institutions and their influence.

GENDER

Studies have not, as yet, paid much attention to gender differences in cosmovisions and how they effect women's positions at the household level and in the community (NEDA 1997). In almost all indigenous societies, the position of men and women differs, not only at the household level, but also within indigenous institutions. The roles that women can play in spiritual and political leadership are very limited. For example, the female *gurumayi* or priest in Indian tradition is only allowed to attend and officiate at rituals and ceremonies relating to the family Goddess or spirits in which she is specialised. Notwithstanding their extensive knowledge of agriculture, seed selection, conservation, propagation, and local resources, most of the women are confined to contributory roles in rituals and sacrifices, such as preparing food, fetching water, and brewing local beer. Their entry into to sacred places is restricted (Shankar 1999a; Millar 1999b).

CHANGES IN CULTURES

As Erla Zwingle mentioned recently in *National Geographic* "Goods move. People move. Ideas move. And cultures change." (Zwingle 1999).

The majority of human cultures have evolved from hunter-gatherer cultures, in which people lived in 'a giving environment' in close contact with nature and the spiritual world, to a culture of settled agriculture and animal husbandry, in which the differentiation between poor and rich, and urban and rural communities has become more apparent (De Groot 1999). After the first cultural wave of agriculture, and the second of industry, today a third wave - that of information - is taking place, leading to a differentiation between agricultural nations, 'smokestack countries', and now knowledge-based economies (Zwingle 1999). In village communities the contacts with merchants and the arrival of Christians caused rapid changes in religious practices, rituals,

cultural values, and local institutions. Sacred woodlands were turned into game parks (*e.g.*, in Zimbabwe by the colonists) and local people were only allowed to enter after paying the high tourist entrance fees (Gonese 1999b). This not only led to conflicts between villagers and outsiders, but it also resulted in disharmony within villages. Nowadays communities have frequent contacts with the mass media. This has resulted in major changes in local habits and beliefs, and these factors have had an especially major impact on the younger generation (there are 800 million teenagers in the world).

"The question is [not if ancient cultures should change or should not but] whether ancient cultures will be free to change on their own terms...." concluded the ethnobotanist Wade Davis (1999) recently.

With the erosion of biodiversity, there has been an accompanying erosion in the diversity of indigenous cultures, knowledge, traditional institutions, and cosmovision. Threats to cultures are also threats to unique ways of life (Dankelman and Ramprasad 1999).

A chief in the Frafra area in Northern Ghana mentioned to the coordinator of the non-governmental organisation CECIK (Centre for Cosmovision and Indigenous Knowledge; Tamale, Ghana):

"Long ago my people and I showed our concern about (the) disappearing trees. The (local) dam was constructed by consulting our ancestors through soothsayers. The ancestors told us that the Gods were protecting those trees, because for them, the trees were living creatures just like humans, and so needed protection. When the irrigation project came along, it did not give us the opportunity to consult our Gods, and went ahead and cleared the trees on the farming side. So all the trees for being annoyed walked away from the area: Never to come back again." (Millar 1999b).

THE ROLE OF OUTSIDERS

In many of the communities where the management of forests has been put on the development agenda, indigenous concepts of life, as part of the community's knowledge systems, are still very much alive and frequently influential. However, outsiders often fail to notice this and villagers have learned not to express themselves. The colonial and post-colonial economy has neglected their age-old life-support strategies. Many development activities are based on conventional systems of education and technology, neglecting - or even rejecting - the importance of the local cosmovision, culture, and indigenous knowledge, as if western science is too superior to take cognisance of locally developed science.

Even in methods, such as participatory technology development (PTD), farmers have to participate in processes of technology development that have been defined by outsiders (Haverkort and Hiemstra 1999). Many development agencies and non-governmental organisations (NGOs) are unable to understand or deal with spirituality as a vital part of farmers' indigenous knowledge, because from the western scientific point of view, it is considered metaphysical and irrelevant.

There are organisations and outsiders who have documented the technically useful items of indigenous agricultural practices, but often that is done without reference to, or knowledge of, the symbolic or ritual matrices in which they occur (Mahale and Sorée 1999). On the other hand, a critical approach is always necessary. Farmers do not always have a thorough knowledge and insight into what they are doing or why. Customs, practices, and rites can also be applied purely because of habit, which we see in our own lives as well.

For development organisations there is a need to look more into endogenous development. That is development that is based on the strength of local knowledge, culture, and ecosystems, with the openness to discuss and experiment with traditional, as well as outside, knowledge and practices. A basic understanding of the diversity and dynamics of local cultures, indigenous knowledge, cosmovisions, and institutions is a prerequisite for sustainable development and management of natural resources. A new strategy only has a chance of being adopted if respect and a certain equilibrium exist between the components of cosmovision: Nature, society, and the spiritual world.

RECOMMENDATIONS

In order to achieve the goal of natural resource management, it is essential that good communication and co-operation exist between development workers, environmental managers, and local populations. For that, according to Haverkort and Hiemstra (1999), the following is needed:

- Specific attitudes and skills to build a relationship with the local population and its traditional institutions. Outsiders need to show respect for, and interest in, local values. They need to consider how to make the local people understand their viewpoints, how to understand the local people's views, and how they relate to the spiritual powers and the cosmovision that the people represent.
- A decentralised, location specific development approach is required, which takes into account social and physical characteristics.
- Familiarity with the cosmovision and the culture of

the area in relation to natural resource management, by studying previous studies.

- A non-bias, but critical relationship with the traditional and spiritual leaders, but also, and explicitly, with other members of the community.
- Help to strengthen community members' capacity to negotiate.
- An interest in folk culture (including music and symbols), traditional ceremonies and rituals, festivals, and endogenous methodologies (*e.g.*, use of astrology, agricultural calendar, management regulations) in relation to natural resource management.
- An agreement on the goals and methods to be used for learning about indigenous knowledge.
- Participation in documentation leading to preparation of documentation in a form that it can be used by the population.
- Discussion and assessment of results with members of the community.
- Awareness of gender differences and other social stratifications, such as age, caste, and class. Women and other marginalised groups should be heard and involved. Their visions, perspectives, knowledge, and rules (also related to cosmovisions) should be considered; and
- A strong understanding of, and respect for, intellectual property rights. Piracy, not only of biological resources, but also of local knowledge (for example through a Code of Conduct), should be avoided.

Re-training and self-development is often necessary, as most outsiders have undergone training based on western concepts and paradigms. We must learn how to learn from communities, and, perhaps even more importantly, become aware of our own bias and prejudices.

Through a dialogue, we can opt together for a blend of traditional systems of governance and natural resource management with western concepts and local needs. The COMPAS team advised: *"Search for synergy between cultures. Avoid struggle and domination, as we can learn from each other. Agree with each other, or respectfully disagree"* (Haverkort and Hiemstra 1999).

CONCLUSION

In a world in which the local and global ecological crisis effects communities worldwide (Johnston 1994), we are all looking for sustainable and equitable solutions for natural resource management that support ecological and human life, now and in the future. As a person who has been trained

in a western context, I can draw lessons from my experiences meeting people around the world, from the COMPAS programme, and from anthropologists, sociologists, and development specialists who know far more about the sociosphere. More time must be taken to look more explicitly for the roots of people's actions - their cultural backgrounds, their cosmovision, their visions, and their motivations'. Questions have to be asked such as: Which places and natural elements have a sacred value to the people we work with? What do the trees and forests mean to them? How has the landscape changed during their lives and those of their (grand)parents?

Consultation is necessary to determine the right moment to implement common plans according to their intuition, knowledge, and astrological calendars. Which rituals and offerings should be part of our programmes? What symbols should be used? Why? We must aim to learn more about the scientific insights of the community and to share our knowledge and experiences. We must communicate with the village headman, the healer, the priest, but most of all, sit and work together with the local women - the reproducers of the land and its flora and fauna - with their knowledge and visions, cultural roots, and spirituality. They are the ones who are still so often unheard.

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Summaries

Bien que la conservation et la gestion des ressources naturelles visent à améliorer des situations de l'écosphère, il est indispensable de bien comprendre les processus et les relations de la socio-sphère. Les motifs et les croyances qui guident les individus dans leurs actions sont enracinés dans les cultures des communautés et les cosmovisions connexes. Dans le monde entier, les cosmovisions se sont intéressées de près aux relations entre la société, la nature et le monde spirituel en tant que parties intégrantes de la vie. Bon nombre d'éléments naturels ont une signification sacrée et les utilisations de la nature par les individus, par exemple dans l'agriculture et aussi dans l'astrologie, sont guidées par des systèmes de connaissance traditionnels, des croyances, des cérémonies et des rites. Des institutions traditionnelles sont été chargées de tâches spécifiques concernant la gestion des ressources naturelles. Bien que de nombreux éléments aient abouti à l'utilisation durable des ressources, ces systèmes n'ont pas toujours eu une incidence positive aux niveaux social et écologique. Avec la mondialisation et les changements intervenant dans l'environnement, les cultures changent aussi rapidement. Cependant, il est soutenu qu'une compréhension parfaite des racines culturelles, des croyances, des traditions et des relations est essentielle à la conservation et la gestion durable des ressources au niveau communautaire. La gestion adaptative devrait prendre en compte ces éléments afin qu'elle soit efficace du point de vue à la fois culturel et écologique.

Aún cuando la conservación y el manejo de los recursos naturales tienen como meta mejorar situaciones en la esfera ecológica, es de importancia fundamental entender los procesos y las interrelaciones en la esfera social. Las motivaciones y creencias según las que operan las personas están arraigadas en las culturas y cosmovisiones de las comunidades. En todo el mundo las cosmovisiones se han fijado mucho en la relación entre la sociedad, la naturaleza y el mundo espiritual como partes integrantes de la vida. Muchos elementos naturales tienen un significado sagrado y los usos que hacen las personas de la naturaleza, por ejemplo en agricultura, son guiadas por sistemas de conocimiento tradicional - incluyendo la astrología -, creencias, ceremonias y ritos. Las instituciones tradicionales han sido asignadas tareas específicas en el manejo de los recursos naturales. Aunque muchos elementos resultaron en el uso sostenible de los recursos, estos síntomas no siempre han tenido un impacto positivo en el ámbito social o ecológico. Con la globalización y los cambios en el medio ambiente, las culturas también cambian rápidamente. Sin embargo, se argumenta que se requiere un entendimiento profundo de las raíces culturales, creencias, tradiciones y relaciones de poder para la conservación y el manejo sostenible de recursos en el ámbito comunitario. El manejo adaptativo debe tomar en cuenta estos elementos, para que sea efectivo desde un punto de vista cultural y ecológico.

Decision-making in Local Forest Management: Pluralism, Equity, and Consensus

Jon Anderson¹

This paper first addresses property regimes and multiple interests and attempts to demonstrate that multiple interests in forest management are not the exception but the rule. It then discusses simple decision-making criteria for forest management and identifies two major (but not necessarily exclusive) scenarios of decision-making - hierarchical and consensual. These are summarised briefly and some of the problems are discussed, including the informal tools used by those excluded from these decision-making methods. The consensual approach has recently been subject to analysis that throws doubt on the practicality and usefulness of consensus and of techniques, particularly participatory ones, which promote it. The paper suggests that pluralistic understandings and approaches may be able to provide a set of characteristics or criteria upon which other approaches might be evaluated, built or refined. Finally, the paper addresses some of the critiques that have been focused on the use of pluralism, especially concerns about equity.

INTRODUCTION

Decision-making in forestry is becoming more complex due to the increasing range and power of groups demanding a role. While traditional 'expert authority' approaches are increasingly untenable, widely recommended consensual approaches are also fraught with difficulties. These approaches tend to overestimate existing or potential consensus on matters of substance, such as the objectives and means of forest management. They promote participatory methods which can be politically naive and impractical. Pluralism may offer a better understanding of the local situation and may point the way to approaches that are more realistic and effective. Pluralistic approaches are not without drawbacks and have been questioned on equity grounds. However, the simple recognition of the existence of divergent and irreconcilable groups may be a step forward for less powerful groups. Approaches that are more pluralistic tend to be inherently explicit, critical, and transparent. They can also incorporate proc-

esses and structures for promoting checks and balances, learning, and self-correction.

"TREES, GRASS, SNAKES AND NASTY THINGS..."²

Different groups have different perceptions of forests and forest management. During a study of traditional classifications of forest lands in villages surrounding a national forest outside of Bamako, Mali different groups of women, men, and youths were asked to draw the 'forest' with a black felt tip pen on a large flip chart (see Sow and Anderson 1996). Figures 1, 2, and 3 (see over page) show the results. These might be compared to Figure 4 which represents a more traditional forester's perspective. Differing perspectives, even within a village, reflect the pluralistic nature of communities and the complexities of forest management

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²Sirafin Doumbia, a leader of a women's group from the village of Farabana, outside of Bamako, Mali, gave this reply when asked what was in the forest.

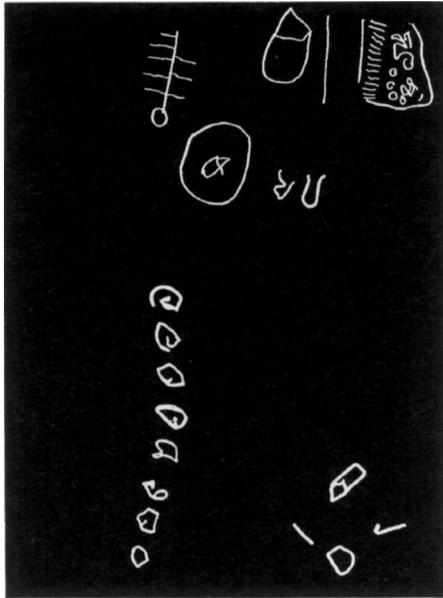


Figure 1: Line drawing of the Monts Mandingues National Forest in Mali by a group of women from the village of Farabana. The line of circles represents specific tree species. The line of circles represents specific tree species. Small objects in the corner represent utensils made from forest products—one can recognise mortar and pestle

Figure 2: Line drawing of the Monts Mandingues National Forest by the men's group from Farabana. Note roads, plantations, guardhouses, and the author's truck.

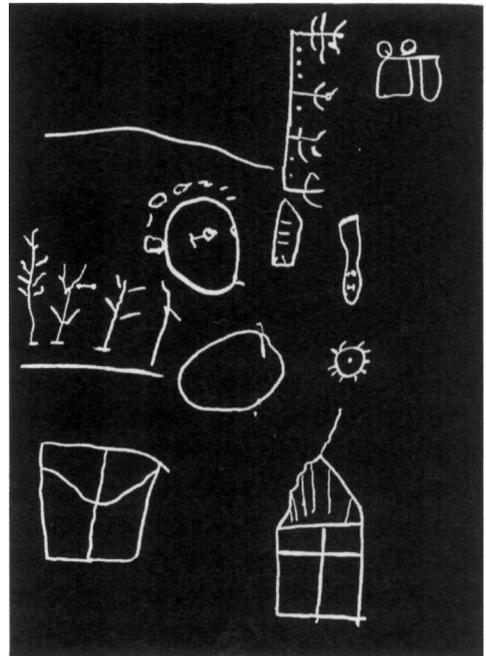
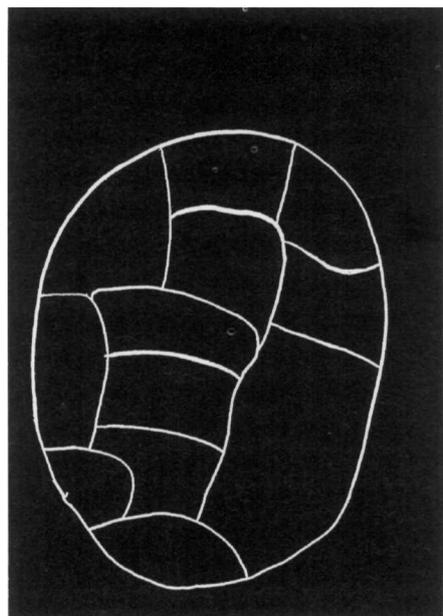


Figure 3: Line drawing of the National forest by the youth group of Farabana. Upon presentation to the plenary group this image was immediately dubbed the soccer ball by other villagers. Each octagon represented areas in the forest such as laterite hardpan (almost devoid of vegetation and stands of certain species (such as *Isobertia adoka*). Note resemblance to Figure 4.



KARTA över
SKOGEN 2³
 i Gefinge s:n, Halmstad k:n
 Hallands län
 Upprättad år 1990 av:
 SKOGSVÅRDSSTYRELSEN

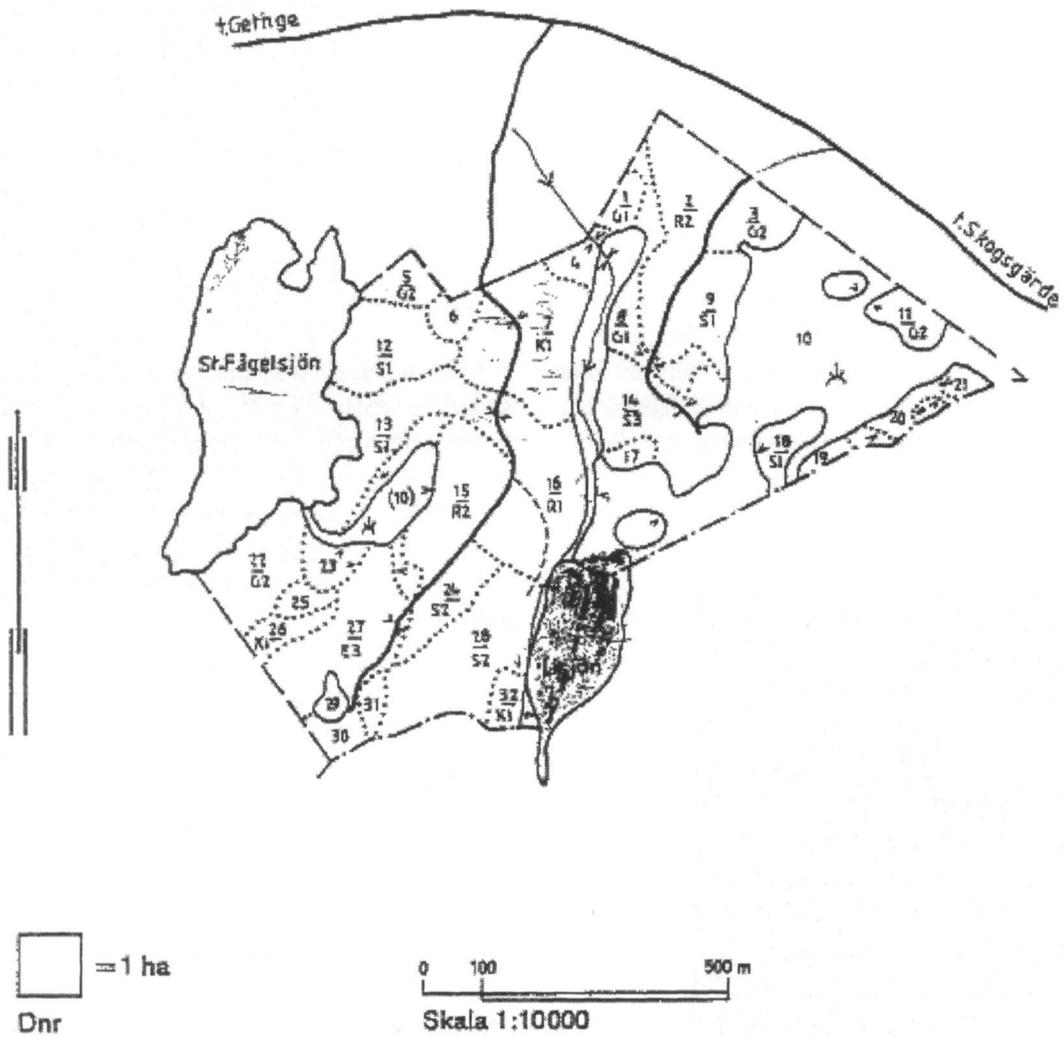


Figure 4: A more recognisable line drawing of a forest (not the Monts Mandingues) done by foresters.

CHALLENGES TO FOREST MANAGEMENT SYSTEMS

Many global trends seem to render forest management institutionally more complex. These trends include several important 'isations' such as decentralisation, democratisation, liberalisation, and globalisation. There are increasingly more groups, such as advocacy non-governmental organisations (NGOs), development NGOs, private companies, local community advocacy groups, user groups, consumer groups, foundations, levels and mandates of governments, all demanding a role in decision-making about forests. As these groups have become more vocal the potential and actual level of conflict has risen. From the direct challenges of lawsuits in the USA to the more indirect, but sometimes just as effective use of the weapons of the weak,³ conventional forest management is being contested (Anderson *et al.* 1999).

There are also movements to internationalise some aspects of management, adding yet another layer to the institutional scene. Some international agreements, such as the conventions on biological diversity, desertification, and climate change affect how forests are managed locally as witnessed at a recent conference titled *International Institutions: Global Processes - Domestic Consequences*. Governments and non-governmental entities will be held accountable, to some extent, to international forums and standards. Although private owners may not like it, it is possible that international agreements will reach down to their level.

In addition to becoming more complex, many see forest management becoming more urgent as part of a global 'eco-challenge' (Roling 1998). The eco-challenge includes global warming, deforestation, loss of biological diversity, water shortages, pollution, and other consequences of environmental impacts. While the eco-challenge is broader than forestry it is clear that forestry and natural resource management play a key part in addressing these wider issues. The eco-challenge also implies time limits. There are some decisions that have to be made and acted upon before certain thresholds can be reached.

With these new trends and challenges comes a spate of new ideas in management, of which the decision-making process seems key. Many new terms are floating about: Joint forest management, ecosystem management, collaborative management, community-based natural resource management, community forestry, adaptive management, co-management, adaptive co-management, *etc.* While this type of diversity can be productive, the urgency of the eco-challenge

implies an imperative to find effective management schemes quickly. Yet, the complexity of the situation works against the need for expeditious identification and the implementation of sound approaches.

For most of the problems of the eco-challenge (and the livelihood challenge) some sort of collective action is needed. No single entity can resolve the issue of global warming, deforestation, or habitat loss. However, the plurality of actors seems to mitigate against either expeditious or collective action, let alone both. There is growing urgency along with growing complexity and these two trends do not seem to be easily reconciled.

PROPERTY REGIMES AND MULTIPLE INTERESTS

The type of forest ownership influences forest management (Clement 1999). Four types of ownership are commonly mentioned (McKeon and Ostrom 1995) although the divisions and distinctions between them can be somewhat artificial:

- Public forests (*e.g.*, forest reserves, national forests, forest classées).
- Private forests (*e.g.*, small forest owners, large forest companies).
- Common (shared private property) property forests (*e.g.*, communal/village forest lands); and
- Free or open access forest.

In many places it is felt that the existence of multiple interests and the need to accommodate them mostly applies to common property regimes, to a lesser extent to public or government owned lands, and not at all to privately held lands. However, although the degree of intensity may vary, multiple interests come into play in all types of ownership. On public lands, a range of actors are demanding roles in decision-making and finding it unacceptable that governments decide without consultation. In common property or shared private property, the various co-owners must come to agreements about the management of the area, but are also subject to rules and regulations from outside (external government interests) and from pressure from other groups. Even private individual owners are subject to government regulations on things such as harvesting techniques and the safeguarding of protected species (such as *Faidherbia albida* in many countries of the Sahel). They are open to social and consumer pressure from NGOs and neighbours about management. Sometimes even the implicit or explicit threat of government regulations promotes self-regula-

³Weapons of the weak refer to the activities and behaviours adopted by peasants to level out the decision-making playing field discussed in James Scott's 1985 book *Weapons of the Weak: Everyday Forms of Peasant Resistance*.

tion among property owners. In Australia, for example, watershed groups have become more actively involved in self regulation, partly in response to what they perceive as potential moves by government to impose regulations, especially concerning water quality. Mechanisms for joint decision-making and negotiation are necessary for all these property regimes.

No property rights are absolute. Property rights are a bundle that can be larger or smaller, but never total (Lynch 1998). Most property owners must take account of other interests either legally as a result of government rules and regulations or illegally (due to social or economic pressure from NGOs, consumers, neighbours, and other actors).

The response to the existence of multiple interests is not to carve up forestlands so that every different group or institution has its own piece. This is clearly self-defeating. Many groups do not want ownership rights, but do have influence over the management of large areas of forest ecosystems. Decision-making mechanisms that are somehow responsive to multiple interests are needed.

For example, if one assumes that free or open access is an undesirable and unsustainable state of affairs (and there is empirical evidence to this effect), then a key to the sustainability of the other property regimes may reside in the ability to exclude and the reality of exclusion. Exclusion may be of uses and/or users and can vary in time. For example, in Mali, some villages regulate the timing of the collection of certain fruits. Without regulations the tendency of collectors is to try and harvest before other collectors. This makes the harvest time earlier and earlier until unripe fruits are harvested. The decision on when to harvest is based on some variable bio-physical criteria and is not a set schedule. The purpose of the rules is to avoid free access problems and compromising the harvest.

Exclusion should, therefore, not be construed as a failure or an undesirable state (as some advocates of participa-

tory, consensual approaches might say), but a necessary part of most sustainable management practices. (Exclusion of apparently legitimate interests might even be necessary in some cases. To be equitable, the process of exclusion should be as inclusive as possible and there may have to be compensation and consistent controls.) Controversy arises not about exclusion in theory, but exclusion in practice - who gets excluded? One of the main challenges seems to be how to undertake collective action for exclusion.

DECISION-MAKING SCENARIOS FOR FOREST MANAGEMENT

Beckley (1998) helpfully breaks down forestry decision-making into three elements:

1. Locus, which refers to the location of decision-making and whether it is near the resource or further afield at the national or even international level.
2. Structure, which refers to how decisions are made - either through rigid vertical structures where decisions are made by relatively few people or through more horizontal structures where decision-making involves larger numbers of actors and consensus is sought.
3. Scope, which refers to the breadth of issues or objectives that decisions are addressing. This ranges from fairly limited straightforward objectives, such as conservation, to a broader range of multi-purpose management objectives involving timber harvests, non-wood forest product harvests, environmental services, recreation, and other goods and services.

Beckley considers the case of Canada and compares four forest management systems: Industrial Forestry; Co-management; Community Forestry; and Non-industrial Private For-

	Industrial Forest	Co-managed Forest	Community Forest	Non-industrial Private Forest
Locus of decision-making control	International or national	Provincial or local	Local	Individual or household
Structure of decision-making power	Hierarchical	Consensual	Consensual	Individual or consensual
Scope of management objectives	Narrow	Broad	Broad	Broad

Table 1: Decision-making dimensions of four forest management systems (based on Beckley 1998).

estry, according to the two broad decision-making criteria.

Table 1 demonstrates the two broad types of decision-making (at least for these important management systems). One is hierarchical in structure and narrow in scope (industrial and to some extent governmental), and the other is consensual in structure and broad in scope (co-management, community forestry, and non-industrial private forestry). It should be pointed out that some management systems can combine the two scenarios under one structure. The categories are not comprehensive or exclusive.

NARROW HIERARCHICAL SCENARIO/ APPROACHES

The first scenario that Beckley presents might be called the Expert Authority Model or Scientific Rational Model. It stems from the belief that a few people have superior knowledge (or rights) and can therefore impose their management plans on forests and other forest stakeholders. This model is fairly common. Not only do most large industrial firms use it, but most governments (forest departments) use it as well. Most public forests are run by forest services, sometimes with clear para-military approaches, under a strict hierarchy. A fairly typical manifestation of this rigid structure is DAD - Decide, Announce, Defend. Based upon the sometimes questionable perceptions of their superior knowledge and skills, technical authorities decide amongst themselves the management objectives and techniques, announce these to the world, and, once the outcry of stakeholders who have not been consulted is heard, defend these decisions.

PROBLEMS OF THE HIERARCHICAL APPROACH

The problems that beset this approach are fairly well known and well described. Some include the inability to take into consideration local knowledge and perceptions, and distance of the hierarchy from the realities of the field. There have been questions about the effectiveness of the approach, the motives of the managers, the superiority of their knowledge and management skills, *etc.* However, the expert authority decision-making scenario continues to play a role and may be important under certain circumstances, such as when quick action is needed on a sudden well defined environmental crisis such as a forest fire.

This approach has also been critiqued on equity grounds because it does not take into consideration in any meaningful way the values, perceptions, knowledge, and skills of local groups. It has also been criticised because local legitimate stakeholders are excluded from the decision-making

process and often, in the end, do not reap benefits. This is somewhat ironic in the case of government hierarchical approaches. While some observers indicate that in many cases governments cynically nationalised forests in order to extract wealth (the rent-seeking state) (see Malla 1999), others point out that governments sometimes have acted to ensure the public interest. In the western United States, for example, some of the impetus for the national park and national forest system was the perceived over-logging and over-exploitation by private interests and the need for more long-term, sustainable management - with a view to manage for the under-represented future generations. In some of the Sahelian states it appears that government forests are a continuation of a policy that combined a self-serving element with one that was meant to assure more equity, not less.

In the Expert Authority Model it appears that there are sometimes legitimate interests that are not represented in the decision-making process. However, this is not to say that those who are not represented are without power or recourse. Even in situations where a free press, access to a legal system, right to assembly, and other rights are not available, options exist. The less powerful and the excluded are not without weapons for trying to level the playing field. James Scott in his 1985 book *Weapons of the Weak: Everyday Forms of Peasant Resistance* describes a range of these weapons:

- Foot dragging.
- Dissimulation (pretend not to have or to feel, hide true feelings and motives).
- False compliance.
- Pilfering.
- Feigned ignorance.
- Slander.
- Arson; and
- Sabotage.

Anyone who has worked in forest management at the field level must recognise these tactics and can perhaps identify more. Over time these weapons create a formidable arsenal and, according to Scott, may be less visible, but more important than peasant uprisings and revolts. Characteristics of these weapons include:

- Little co-ordination or planning.
- Use of implicit understandings and informal networks.
- Forms of individual self-help; and
- Avoiding direct symbolic confrontation with authority (Scott 1985:xvi).

'Weapons of the weak' are important in several ways. They are not unique to the expert authority approach and can affect consensual approaches that leave groups out. These weapons may be important to recognise since they may sig-

nal inadequate attempts to accommodate pluralism, hide conflict and inequity, and compromise efforts over the long run.

THE BROAD CONSENSUAL SCENARIO

APPROACHES

The second general scenario that is defined by Beckley is characterised by the consensual structure of decision-making and the broad scope of management objectives. Consensus based decision-making is often linked to participatory methods and mechanisms. Participation is seen as essential for consensus and consensus is seen as essential for progress on sustainable forest management. Beckley's article, entitled: *Moving Toward Consensus Based Forest Management: A Comparison of Industrial, Co-managed, Community, and Small Private Forests in Canada* states that at least for co-management and community forestry, "maintaining the commitment to consensual decision-making is a key ingredient for success" (Beckley 1998). In the article Beckley stresses the need for participation. This is a sentiment that is often echoed in forestry circles these days. However, it is perhaps useful to question both the idea and practice of participation and of consensus as a goal.

PROBLEMS OF THE BROAD CONSENSUAL SCENARIO

Participation and consensus are two possible general problems that need to be understood.

It is not the point to criticise participation as a whole. Certainly participation has resulted in tremendous benefit for some people on the ground and has served to highlight a whole range of issues such as equity and conflict. Participation exists in many forms. There are attempts to establish categories and scales of participation. It is therefore not an easy concept to pin down and deal with. Justice cannot be done here as to the benefit or constraint of participation. Several of the problems that have been identified with participation relate to its political, and for some, populist nature and its susceptibility to manipulation.

Participation, which slides into populism, tends to idealise the local community and the capabilities of local people. Brown points out the:

"difficulties of applying principles of participatory development in situations where the notion of 'community' is a contested one, where elites are likely to capture any increases in value of the resources and where participation takes place in a context of fundamental imbalance" (Brown 1998).

He also points out that *"the underlying difficulty is that the political language of Collaborative Forest Management (CFM) is the language of consensus (even if dressed*

up as 'conflict resolution') and of participation in its softest sense" (Brown 1998). A populist agenda can also make strange bedfellows of the power to the people advocates and the anti-government conservative movements which see in this approach less power for governments and, therefore, more liberty and opportunity for the profit seeking private sector. Brown (1994) summarises the major weaknesses of the populist participation trend as:

- Ambiguity of terminology.
- Depoliticisation.
- Anti-professionalism.
- Universalisation; and
- Stereotyping.

Participation, at least in some of its forms, may be insufficient to deal with the complexity and urgency of the eco-challenge.

Consensus has been seen by some as a way out of the dilemma of the expert authority basing its power on some absolute answers that science is supposed to provide. It is defined as general agreement amongst a group of people about a subject or about how something should be done. Intuitively this sounds extremely satisfactory - that if we can't call on absolute findings of science, then general agreement should give us a decent decision-making process or procedure.

There are, of course, situations where consensus is good when it is achieved for the right reasons. Rescher (1993) defines the requirements of good consensus as being:

- Freely given: No one is coerced (explicitly or implicitly) or forced into a consensus (this echoes the idea of conflict resolution as 'coercive harmony').
- Adequately informed: The consensus is based on adequate knowledge of the matter at hand, and that people have information that they need and are not agreeing without knowing the alternatives or the ramifications of their agreement.

However, Rescher (1993) raises many issues about consensus in his book subtitled *Against the Demand for Consensus*. First, as is clear from the above conditions, consensus may be rare, temporary, and difficult to reach. Consensus can also be critiqued on the grounds of its practicality. In the real world, how likely is general consensus about a complex substantive problem? What would be the time necessary to secure it? In addition, the description of property types and collective action seems to show that exclusion is necessary for sustainable forest management. Is the search for consensus compatible with the need for exclusion?

Even when consensus is reached, Rescher (1993) claims that it is:

- An impediment to creativity and innovation.
- An invitation to mediocrity; and
- A disincentive to productive effort.

These are serious charges, especially if we think that continuous learning is needed for adaptive management. While many people feel that innovation and learning come from the interaction of different ideas and knowledge systems, consensus seems to dull and render us complacent about this interaction.

Finally, consensus may not mean equity or assure that the public good is obtained:

"Even if a wide range of interests do come together to practice consensus forest management, does that guarantee that the general public's interests are better represented than existing management models?" (Beckley 1998).

PLURAL SOCIETIES, PLURAL REALITIES, AND DIFFERENTIATED FORESTS?

Leach *et al.* (1997) and others (see also Enters and Anderson 1999) in a critique of the idea of consensual communities talk about communities as:

"..not, of course bounded, homogeneous entities, but socially differentiated and diverse. Gender, caste, wealth, age, origins, and other aspects of social identity divide and cross-cut so-called community boundaries. Rather than shared beliefs and interests, diverse and often con-

flicting values and resource priorities pervade social life and are struggled over and bargained over... social and environmental differentiation suggests that there may be many different, possible problems for different people." (Lezchetel. 1997).

This description coincides closely with the notion of pluralism as recently applied to sustainable forestry and rural development (FAO 1999). Not only is there pluralism at the level of communities but pluralism is generally pervasive and exists through the levels of society and government. Pluralism has at least two elements - it is a practical description of the world (empirical reality), as well as part of political and development discourse. For some ideas of a pluralistic perspective on forestry and rural development see Box 1 below

Participatory forestry and co-management of forests is sometimes interpreted as implying two partners - the local community and the forest department. For example, Vira (1997) states:

"Understanding the dynamics of participatory forest management requires field-based research to concentrate on the two partners to such regimes, the forest department and the village community."

Without even considering the other types of organisations likely to be present - other villages, NGOs, private interests, other government departments, *etc.* - we have already seen that communities themselves (and forest departments to be sure) are bundles of separate interests and groups. Rarely, if

- Different groups have, and always will have, different experiences, positions, opinions, and objectives on sustainable forest management and rural development.
- Groups are autonomous and independent.
- There is no single, absolute, universal, and permanent solution to any substantive natural resource management problem - for any given land unit there is no single, absolute, sustainable management land use scenario (there are numerous sustainable scenarios).
- No group/organisation can claim a superior or absolute scenario; sustainable forestry and rural development decision-making is no longer the sole mandate of expert authorities.
- A system of organisational checks and balances is central to avoiding the errors of a narrow, single-entity management system - this is the positive aspect of bounded conflict.
- Conflicts are inevitable and cannot be resolved, but can be managed.
- Equity in decision-making is a distant but worthy ideal.
- Platforms, mediators, and facilitators are often needed to provide the conditions for negotiation and co-operation needed for sustainable forest management.
- Communication is essential and helps participants understand their differences better
- Consensus is unlikely, but progress can be achieved without it.
- Approaches to SFM (sustainable forest management) that aim at consensus are often misguided and unsustainable.
- Proactive approaches and new processes of sustainable forest management decision-making in pluralistic environments are emerging - more experience is needed.

Box 1: Summary of Some Key Concepts for Pluralism in Sustainable Forestry and Rural Development (From Anderson *et al.* 1999).

ever, are the interests of only two groups at stake. The reality is more likely plural than dual.

There have been a number of approaches and methodologies developed that have tried to deal with the reality of a pluralistic world, although they are not classified together as pluralistic methods. In addition, no one has rigorously compared them to a pluralistic understanding of the world with a body of methods and tools or has developed specific tools for these situations. At this stage, what we can do is look at existing tools and see which may be more effective under pluralistic conditions.

Pluralistic tools should share characteristics that may make them more suitable for accommodating multiple interests. For Daniels and Walker (1999), characteristics include:

- Multi-stage processes.
- Constructive, open civil communication.
- A focus on the future and acknowledgement of the past.
- Emphasis on learning; and
- Power sharing 'levelling of the playing field'.

For Rescher (1993), pluralistic approaches require:

- Legitimate diversity.
- Restrained dissonance or bounded conflict (Lee 1993).
- Acquiescence in difference; and
- Respect for the autonomy of others.

Other characteristics may include:

- An acceptance of conflict.
- Explicit recognition of differences and diversity; and
- Critical reflection.

Tools and methods which may integrate some of these characteristics include: Appreciative inquiry, transactive planning, search conferences, constructive confrontation, collaborative learning, civic science, patrimonial mediation, and subsidiarity (FAO 1999). Appreciative inquiry has been used in large private companies and by NGOs working in Mauritania (Eliot 1999). Collaborative learning has been used to help plan and implement forest fire recovery activities on a national forest in the western United States and in land management planning processes (Daniels and Walker 1996). Patrimonial mediation and subsidiarity was developed in Madagascar on programmes designed to decentralise and assure rights in local land management (Babin *et al.* 1999).

LEARNING

Leach *et al.* (1997) state that forest management policies and programmes "... must be responsive, adaptive, open to the unexpected, continuously testing, examining and monitor the unknown implications of different trajectories of environmental change." This is a very demanding challenge of continuous learning and adaptive management, especially since, as Hirst (1997) says, "we have proven that we are not very good at constant learning". It may be relevant to ask which of the decision-making scenarios promotes the most learning and adaptation.

Some recent work seems to indicate that learning increases with interactions - from the contacts between different perspectives and knowledge systems (Engel 1995). One of the largest private companies in Norway states that in order to compete globally, its managers must seek out different perspectives and make use of those perspectives. They must understand that the measure of an organisation's creativity is directly related to its diversity. "A company can't be creative when it employs a group of homogeneous people, ... creativity and innovation come from putting unlike people together" (Fishman 1999). Approaches that can deal with and integrate pluralistic situations may help promote levels of learning useful for adaptive management.

To a certain extent, these interactions and low-level conflicts have to be promoted and encouraged, at the same time ensuring they do not get out of hand. Some of the conflict management literature advises against coming to agreement or consensus too soon, partly because it can short circuit the process of finding new and innovative solutions (McCarthy *et al.* 1984; Shell 1999). Recognition of a pluralistic reality and the consequent promotion of approaches that encourage organisation and group interaction in bounded conflict may be part of the response to the need for learning. Organisational arrangements that encourage checks and balances may help to promote learning.

The hierarchical and consensus decision-making scenarios may limit the possibilities of such interaction. Rescher (1993) points to the negative impact of consensus on creativity, innovation, and, thus, learning. Hierarchical approaches also limit interaction and may confine learning to a small group within one learning and knowledge framework.

OBJECTIONS TO PLURALISTIC APPROACHES AND INSTITUTIONAL ARRANGEMENTS

The concept of pluralism can be applied in many areas.. It can be a descriptive framework for empirical reality It can

serve as a vision, tool, or strategy. It can also serve as an analytical or normative framework (of how things should be) which transcends into a more political discourse. The first use, as a way of describing the world, because of the recent criticisms of participation and consensus, seems to be gaining acceptance. Its use as a tool in political discourse is somewhat more controversial.

Carter (1999) has identified a series of possible types of constraints or possible problems for a more pluralistic approach. These include:

- Resistance of forest departments.
- Complex approaches used as an excuse for stalling.
- Mediation - the government, which often plays the role of mediator, is not, in fact, neutral.
- Collaborative mechanisms may be extremely difficult to establish in newly settled areas at the forest frontier where social capital may be low.
- Pluralistic approaches where NGOs may have particularly important roles and yet their accountability to others can be questioned; and
- Networks of organisations and their importance.

These constraints also seem to apply to other approaches involving the participation of different actors - they do not appear to be specific to pluralist approaches.

Carter does, however, raise several important issues that seem to relate specifically to more pluralistic approaches. One is that pluralistic approaches take every position, value, or interest at face value and as being equally legitimate. The objection implies that pluralism allows for a *laissez-faire* state that is both passive and relative. This might lead to more powerful but less legitimate interests staking equal claims and using its power to dominate more legitimate claims. For instance, if all claims had to be considered equally, then a claim from a recently formed private sector fuelwood transporting company might have equal footing with the claim of a local user group who had been managing the forest for centuries. This does not seem fair or equitable.

However, pluralism does not claim that all views and values are equally legitimate in action; although, it does claim that a groups' autonomy should be respected. This is different than saying that each claim has equal validity. We can disagree with people while respecting their right to have and promote their own perspective.

On participation, Christoplos (1999) states "*there is no special technique that we can apply to vaccinate ourselves against the manipulation of participation to immoral ends. The only way is to be explicit and critical, to ourselves and to others.*" This is perhaps a strength of more pluralistic approaches which emphasise explicit recognition of differences.

Because of the need for exclusion, the purpose of nego-

tiation in pluralistic situations where differences are deep-rooted is not to obtain consensus or total agreement, but to obtain acquiescence. To be explicit and transparent, the process of negotiation should be as inclusive as possible, even if the outcome leads to exclusion. This process has the same constraints as other attempts to build platforms, such as deciding who is a legitimate stakeholder, who convenes, who participates, and what procedures are used. It should also be noted that pluralism is not an argument against collective action. Instead, it is an argument for realistic, collective action that leads to decisions that are practical and realistic.

Approaches for accommodating multiple interests in forestry are not perfectly equitable, but at least start from a recognition of different viewpoints and groups and may integrate processes (checks and balances) that lead them to be more equitable than other approaches. Hierarchical and consensual approaches, once a decision is made, may have fewer mechanisms for revisiting the decision or control through checks and balances. They may ignore or 'assume away' initial differences: Hierarchical by assuming others do not have the knowledge or skill to contribute, and consensual by assuming that consensus is possible and, therefore, rushing to agreement. Recognition of differences, and being explicit and critical about them, may lead to transparency and accountability, which in turn may be useful for approaching equity.

While being critical of the idea of consensual communities, Leach *et al.* (1997) see its usefulness in political discourse (particularly with governments) as a possible tool for gaining more authority and responsibility for communities. Arguing that communities are capable of coming to consensus or are naturally consensual might facilitate delegation and devolution of authorities and responsibilities to them. On the other hand, it might be possible to argue that what demonstrates a local community's theoretical potential to manage resources well is the fact that they are pluralistic and display systems of checks and balances. Thomson (1994), for example, develops the idea of legal recognition of community capacity for self-governance where local communities understand and apply the adage that "*no man is a fit judge of his own cause,*" an example of a pluralistic check and balance. For instance, communities in Mali that have traditional rules and regulations concerning forest use often have separated the functions of identifying infractions and the application of sanctions (at least upon appeal) (Thomson, pers. comm. 1994).

CONCLUSION

This paper has focused on the challenge of forest management in an increasingly complex world. Traditional ap-

proaches of either hierarchical or consensual management seem intuitively attractive, but also have problems and may be limited in applicability and scope. A more pluralistic understanding of society and communities (and perhaps also forests and sustainability) may help move towards more realistic approaches. Some tools and methods (from participation, conflict management, as well as other fields) appear to exist, but are yet to be systematically evaluated and tested from this angle. Pluralism as political discourse presents risks, and like participation, is open to manipulation. However, it tends to be inherently fairly explicit, critical, and transparent and promotes processes that allow for checks and balances.

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Summaries

Cet article porte sur les régimes de propriété et intérêts multiples et essaie de démontrer que les intérêts multiples dans la gestion forestière ne sont pas l'exception mais la règle générale. Il examine ensuite des critères de décision simples pour la gestion forestière et identifie deux principaux scénarios (mais pas forcément exclusifs) de prise de décisions - hiérarchique et par consensus. Ces scénarios sont résumés brièvement et certains des problèmes sont examinés, notamment les outils informels utilisés par ceux qui sont exclus de ces méthodes décisionnelles. La méthode par consensus a récemment fait l'objet d'une analyse qui jette le doute sur la nature pratique et l'utilité du consensus et des techniques, en particulier des techniques participatives, qui l'encouragent. L'article suggère que des modes de compréhension et approches pluralistes pourraient fournir une série de caractéristiques ou de critères à partir desquels d'autres approches pourraient être évaluées, établies ou perfectionnées. Enfin, l'article examine certaines des critiques qui ont porté sur le recours au pluralisme, en particulier les questions relatives à l'équité.

Este trabajo se trata, en primer lugar, de regímenes de propiedad e intereses múltiples y de los intentos de demostrar que estos intereses múltiples en el manejo forestal no son la excepción sino la regla. Luego discute los criterios simples para la toma de decisiones en cuestiones de manejo forestal e identifica dos escenarios fundamentales (pero no necesariamente exclusivos) para la toma de decisiones - el jerárquico y el consensual. Estos se resumen brevemente y se discuten algunos de los problemas, incluyendo las herramientas informales utilizadas por aquellos que han sido excluidos de estos métodos de toma de decisiones. Recientemente, el enfoque consensual ha sido sometido a un análisis que siembra dudas sobre la practicidad y utilidad del consenso y de las técnicas, especialmente las participativas, que lo promueven. Este trabajo sugiere que los entendimientos y enfoques pluralísticos podrían proveer una serie de características o criterios sobre la base de los cuales se podrá evaluar, construir o refinar otros enfoques. Finalmente, este trabajo trata algunas de las críticas que han estado enfocadas en el uso de la pluralidad, especialmente en cuanto a temas relacionados a la equidad.

Plural Perspectives and Institutional Dynamics: Challenges for Community Forestry

Melissa Leach¹

Co-management approaches in forestry have frequently failed to fulfil their promise and have generated unexpected conflicts. This is partly because their settings are more socially, institutionally and ecologically differentiated and dynamic than is often assumed. This article outlines and illustrates key dimensions of this dynamism, and hence answers why more adaptive, reflexive processes of forest and natural resource management may be needed. Part I addresses some of the socially diverse interests and dynamics existing among forest users and the variability and unpredictability of ecological processes, and hence outlines a dynamic landscape perspective on forests. Part II critically reviews analytical tools for tracking the details of these dynamics, and dealing with key issues of resource access and control. In this context, Part III illustrates how institutional dynamics can work out in practice when villagers, governmental, non-governmental, and donor agencies interact in the practice of community forestry. The need to take account of multiple institutions and power relations, to manage pluralism rather than necessarily attempting to achieve consensus, and to appreciate social and ecological uncertainties, suggests that forest management should seek to influence processes rather than to define states, and be adaptive rather than pre-planned.

INTRODUCTION

The last decade has witnessed a worldwide movement towards decentralised and community-based approaches in forestry, as in other areas of natural resource management. While the origins, justifications, and forms vary, governments, donor agencies, and non-governmental organisations (NGOs) are now developing devolved or co-management arrangements between local forest users and the state, whether by giving community groups some official management stake and benefits from hitherto state-controlled resources, or by rendering official, existing local management of forest resources.

This paper takes such community-based approaches as a starting point not only because they are now so ubiquitous, but also because they pose unprecedented challenges for forest and natural resource management. Co-management initiatives are to be welcomed, representing, at least in theory, major departures from earlier approaches in which

natural resource management was driven by state agendas and resource control, and apparently offering greater potential to meet local priorities and livelihood goals. In practice, however, co-management in forestry - as in other natural resource sectors - has frequently fallen short of expectations. The expected consensus at the community level has frequently not been manifest. Certain elite groups have sometimes benefited while other resource users have been marginalised. Conflicts have emerged over how resources should be managed, and even what the goals of management should be. Thus, expected sustainability or improvement in forest condition has frequently not been achieved. These problems, and others highlighted in a growing body of critical literature on community-based natural resource management (*e.g.*, Pimbert and Pretty 1995; Western *et al.* 1994) arise, at least in part, because the settings to which community forestry interventions are introduced are more

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socially, institutionally, and ecologically differentiated and dynamic than their proponents tend to assume.

The examples in this paper lay out and illustrate some dimensions of this plurality and dynamism, and their consequences for community forestry interventions. It hence both addresses the contexts in which new approaches (such as adaptive management) must operate, and indicates some reasons why they may be needed. In doing so, this paper covers much diverse ground, inevitably in a rather schematic fashion. Part I addresses aspects of the socially and ecologically dynamic setting for community forestry. First, it addresses the plurality of interests in and perspectives on forests which exist among forest users, local and non-local, and the socially dynamic relationships between them. Second, it outlines how current thinking in ecology emphasises the differentiated and dynamic nature of forest environments. Forest landscapes, in this context, need to be understood as continually shaped by ongoing, interrelated social and ecological dynamics.

In Part II, the paper introduces and illustrates some analytical tools that can help track the details of these dynamics and their implications for particular people's livelihoods. These emphasise the key importance of access and institutions in shaping people's relationships with forests. It is precisely these institutional relationships which tend to be transformed in community forestry interventions. In Part III, then, I draw on recent case material to illustrate how these institutional dynamics can work in practice when villagers, governmental, non-governmental, and donor agencies interact in the practice of community forestry. Ultimately there are some problematic consequences. Throughout these sections, I draw on examples mainly from West Africa, not to imply any uniqueness or universality in the situations there, but more to provide some continuity between illustrations. The conclusion briefly raises some implications for policy and practice, towards approaches which can embrace plurality and social and ecological dynamics.

PART I. SOCIAL AND ECOLOGICAL DYNAMICS

DIFFERENTIATED 'COMMUNITIES' AND PLURAL PERSPECTIVES

Approaches to community-based natural resource management and forestry have often been premised on the assumption, implicit or explicit, that a distinct local community of forest users exists. While definitions vary, approaches commonly focus on *"the people of a local administrative unit... of a cultural or ethnic group... or of a local urban*

or rural area, such as the people of a neighbourhood or valley" (IUCN/WWF/UNEP 1991:57), or those living in or around a particular tract of forest. Such communities are seen as relatively homogeneous, with members' shared characteristics distinguishing them from outsiders. From this image, it is seen as relatively straightforward to establish a group or committee to represent community interests, and for this to engage in consensus building and agreement with outside agencies in establishing forest management plans.

However, much research and practical experience now defy this imagery, showing it to be a badly flawed representation of social 'realities on the ground'. Communities are not, of course, bounded, homogeneous entities, but socially differentiated and diverse social structures. Gender, caste, wealth, age, origins, occupation, and other aspects of social identity divide and cross-cut so-called community boundaries. Now commonplace in social science literature, and long integral to the critique of community development approaches in development studies more generally (*e.g.*, Holdcroft 1984), serious attention to social difference and its implications has been remarkably absent from the recent wave of community concern in environmental policy debates.

Social differences within communities can be linked to sharp differences in which resources are valued and why. Pastoralists or those owning domestic animals may value forestland as a source of grazing, browse, or fodder, for instance, in a way that others do not. Gender divisions of labour and responsibility frequently give women particular interests in fuelwood and wild foods, whether oilseeds, fruit, nuts, or leaves. Herbalists may have particular interests in the forest as a source of medicinal plants, or an environment where these can be selectively preserved or cultivated. Poorer people may depend more than others on gathering forest foods or craft materials to make items for sale and so on.

In some cases, certain trees may offer resources of such overriding priority (or multiple use) for livelihoods that there is community consensus to conserve them. A case in point would be the oil palms, which are encouraged and protected by villagers throughout West African humid and transitional forests. These palms are universally valued for their edible and saleable oils and by specialists for many other social and economic purposes. In other cases, socially-differentiated forest resource uses may be complementary. For instance, in some West African humid savannahs, farmers and herders have developed complementary relationships between starkly different land uses since intense cattle-grazing can, by suppressing fire and importing manure and seeds, pave the way for a transition to forest thicket which farmers then use for agricultural fallow, fuel, and poles (Fairhead and Leach 1996). But in other cases, differentiated uses may conflict. In Sierra Leone, for example, conflicts frequently erupted between husbands and wives when men felled forest canopy

trees in order to regulate shade for their cocoa and coffee plantations. These canopy trees were ones from which women had been collecting oilseeds (Leach 1994).

Resource uses which overlap spatially, seasonally, or in terms of the regulations applying to them may all, in particular settings, be a source of conflict. As Babin and Bertrand (1998:20) put it:

"It is extremely unusual for a single area to have only one use or user, or to be used for only one period of the year, and the opposite is more generally the case: a combined plurality of simultaneous and/or successive uses by different users, each of whom is subject to precise rules regarding access and use, and may or may not have management or decision-making power over the resources of the area in question,"

While in some circumstances diverse and often conflicting resource priorities may be overtly struggled and bargained over, in other situations implicit conflicts may be kept off the agenda by prevailing social and power relations which shape people's perceptions of their interests. Work on gender has demonstrated particularly well how institutions - including those for natural resource management - which might appear to be acting for a collective good, actually serve to shape and reproduce relations of unequal power and authority, marginalising the concerns, for instance, of particular groups of women or poorer people (*e.g.*, Kabeer and Subrahmanian 1996; Goetz 1996).

Social difference within communities is also pervasive in knowledge, beliefs, and the wider social meanings which forests bear. In this sense there is a plurality of partial perspectives linked to people's particular social positions (*cf.* Haraway 1991). In the Kissidougou area of Guinea, for example, Kissi and Kuranko villagers generally share a perspective on the forest islands around their villages as social places, the product of their own and their ancestors' enrichment of the previously savannah environment. Some elderly men and women - usually of land-holding lineages - represent the formation of forest patches in a punctuated, intentional way. Leaders descended from the original land owners who claim founder status in a territory, and the political authority associated with this, often emphasise how their ancestors arrived in an empty, relatively inhospitable savannah and initiated the beginnings of a forest island and a settlement there by planting starter trees, especially rings of silk cotton trees to fortify the settlement. One or more of these founding trees becomes a marker of the establishment of a foundational alliance with the land spirits, and remains significant in upholding the family's social and political status amongst other lineages. In contrast, most village men and women represent forest island development in a more gradual way, as simply the logical extension into the past of present everyday activities such as fire protection, gardening, thatch col-

lection, and cattle grazing. Within this perspective, the rings of cotton trees tend to be interpreted as the overgrown relics of the living fence poles of past garden sites. Particularly common among those with relatively little influence over lineage affairs, whether women or men, these everyday explanations locate forest island origins away from the domain of lineage politics within which they are relatively powerless, and within a domain over which they have relatively more control (Fairhead and Leach 1997).

It is not only within communities that one finds differing resource values and frames of reference for understanding forests. As the recent body of work on pluralism brought together by the Food and Agriculture Organisation (FAO) emphasises, forestry and rural development involve an increasingly wide range of organisations and groups, from government departments to international agencies to private organisations and different types of NGOs (FAO 1999). Forestry must thus engage in:

"Situations where distinct groups are actively autonomous and independent, but often interdependent, with legitimate claims and different positions on critical substantive issues...based on separate values, perceptions, objectives and knowledge." (Anderson *et al.* 1998:3).

For instance, today it is plausible that the same forest area may be the concern simultaneously of a forestry department interested mainly in sustainable production forestry; timber-felling and saw-milling firms interested in rapid economic gain from lumber; a wildlife department concerned with protecting animals and biodiversity; government and NGOs concerned with watershed protection; and others promoting recreation, ecotourism, or local livelihoods.

The emphasis on autonomy in FAO's conception of this plurality of organisations gives a rather static impression, perhaps underplaying the processes, interrelationships; science-policy interactions, funding dynamics and networks through which, over time, organisations may develop the stance they show at any one time. Equally, organisations themselves are far from homogeneous and contain their own internal dynamics and power relations. Personnel may have different backgrounds, knowledge, and work incentive structures; those of an urban-based senior forest official may be very different from those of a front-line extension worker, for example (*cf.* Joshi 1997). It is through negotiation and struggle both within and among organisations that particular conceptions of forest, values, policy priorities, and associated regulations become established and may change.

While some contributions to the growing policy debate on pluralism in forestry and sustainable development treat communities as one among other groups involved with forestry, pluralistic institutional settings are, in reality, overlaid and intersect with intra-community differences and dynamics. The divide between community and external

institution becomes more ambiguous, and even conceptually breaks down, giving way to a picture of diverse actors and interrelationships cross-cutting any such divide. Work taking this kind of perspective to the impacts of development policy shows clearly how planned interventions have unpredictable outcomes as state projects and practices play out in relation to people's own projects and practices, and the relations of power in which they are structured (Long and Van der Ploeg 1994; Long and Long 1992). As I hope to exemplify in the final part of this paper, such attention to the 'messy middle ground' between community and state is essential in order to comprehend - and perhaps improve - practices of co-management in forestry.

'NEW' ECOLOGY AND DYNAMIC FOREST LANDSCAPES

Parallel with changing understandings of social dynamics, recent work in the natural sciences has challenged many of the static, linear, and equilibrium perspectives on ecological systems that underlie much community-based natural resource management. This has altered the assumptions that can be made about patterns and determinants of environmental change.

Debates within science have firmly challenged earlier views of ecosystems as characterised by balance, stability, and equilibrium (see Leach *et al.* 1997). Long-standing theories of vegetation succession, ecosystem functioning, and species-area relationship, for example, each have equilibrium assumptions at the core of their models and, not surprisingly, their findings and applied management recommendations (*cf.* Botkin 1990; Worster 1990; Zimmerer 1994). Thus, for example, succession theory has emphasised linear vegetation change and the idea of a stable and natural climax as the benchmark against which environmental change is assessed. State forest management in humid West Africa, for instance, has usually been premised on conserving or restoring semi-deciduous forest as the natural climax vegetation of the zone, and on restricting human activities seen to disturb this natural vegetation.

While there have always been disputes within each of these areas of theory, the period since the 1970s has seen a sustained challenge from the emergence of key concepts making up non-equilibrium theory and, more broadly, what has been termed the 'new ecology'. Among other themes, this emphasises first, an understanding of variability in space and time, including an interest in the relationships between disturbance regimes and spatial patterning from patches to landscapes. Second, non-equilibrium perspectives suggest an exploration of the implications of scaling on dynamic processes, leading to work on hierarchies and scale relationships

in ecosystems analysis. Third, a recognition of the importance of history on current dynamics has led to work on environmental change at a variety of time-scales, recognising the significance of contingency and path-dependency. In the forestry sphere, ecological science now rejects many of its earlier models. Analysts of North American and European forests now embrace non-equilibrium theory in ecology considering forest form and composition as subject to constant variability over space and time (Sprugel 1991), and these ideas are an emerging force in tropical forest ecology (e.g., Hawthorne 1994; Richards 1996). In particular, in West Africa, theories of original climax vegetation are challenged by evidence of long-term climatic fluctuations, including a deep drought phase from 3,000 years before present, ending perhaps as recently as 600 years ago (Vincens *et al.* 2000). Ongoing climatic change and its shorter-term legacies must thus be seen as players in people-forest relationships.

These shifts in understanding have important implications for how vegetation form and composition are understood, and hence for management. For example, these new theories recontextualise the key relationship between savannah grasslands and forest areas in many parts of the world. Conventional equilibrium interpretations of succession theory see forests as later successional forms, closer to natural climax vegetation, and the presence of grasslands as evidence of degradation from a once forested state. This linear interpretation of vegetation dynamics has a major influence on the way such landscapes are viewed by policy makers and others (Fairhead and Leach 1996, 1998). But in some areas, forest and savannah may be better seen as alternative vegetation states influenced by multiple factors. Changes in soils, shifts in fallowing systems, manipulation of fire regimes, alterations in grazing patterns and climatic rehumidification have combined to change the relationship between forests and grasslands. This dynamic interaction is thus less the outcome of a predictable pattern of linear succession, but more due to combinations of contingent factors, conditioned by human intervention, sometimes the active outcome of management, often the result of unintended consequences.

Environments thus come to be seen as landscapes under constant change, emerging as the outcome of dynamic and variable ecological processes and disturbance events in interaction with human use. The environment in this sense both provides a setting for social action and is clearly also a product of such action. People's actions and practices may serve to conserve or reproduce existing ecological features or processes. But people may also act as agents who transform environments; transformations which may involve precipitating shifts of ecological state which push ecological processes in new directions or along new pathways. While some actions may be intentional, constituting directed management aimed at particular goals or transformations, others

may be unintentional, yet still have significant ecological consequences.

Over time, the course of environmental change may be strongly influenced by particular conjunctures, or the coming together of contingent events and actions. Practices and actions carried out at one time may leave a legacy which influences the resources available for subsequent actors. For instance, forest cover and quality frequently reflect the legacies of inhabitants' practices, whether historically or recently, in settlement, fanning, soil management, or tree planting. As present practices build on the legacies of past ones, so the causality of environmental change may need to be seen as cumulative, sequential, or path-dependent.

There are many cases in West Africa where the complementary effects of local landscape enrichment practices and climate change have contributed to forest advance and the formation of forest patches in savannah. It had earlier been assumed, according to older theories, that existing forest formations were natural relics in an otherwise unspoiled landscape (Fairhead and Leach 1996, 1998; *cf.* Spichiger and Blanc-Pamard 1973; Amanor 1994). Such a dynamic landscape perspective in forestry thus provides new frameworks in which local land use knowledge and practices can be understood and appreciated in ways that earlier theorisation had obscured; mainly as frameworks of potentially great value in the development of participatory and co-management approaches, yet which challenge earlier management approaches premised on the idea of ecological stability. It also shows how policies premised on outdated theory and false forest history have frequently impoverished land users, and been detrimental to the capacity of the environment to support sustainable rural livelihoods (Fairhead and Leach 1998).

PART II. ANALYTICAL TOOLS: STAKEHOLDERS, ACCESS, ENTITLEMENTS, AND INSTITUTIONS

A variety of analytical approaches and tools have been developed in recent years to clarify and explore relationships between socially-differentiated people and components of a dynamic environment. Without any attempt to be comprehensive, in this section I briefly review four such approaches. While each in itself has some value in understanding pluralistic, dynamic resource management settings as a basis for developing management approaches, they illuminate different dimensions. Through comparing these, I further develop a perspective which starts from the politics of resource access and control among diverse social actors, and sees patterns of environmental change as the outcome of negotiation, or sometimes contestation, between them.

STAKEHOLDER ANALYSIS, RIGHTS, AND RESPONSIBILITIES

At present, a widely used framework in natural resource management and project appraisal is stakeholder analysis, first developed by management scientists. As defined by Grimble and Chan (1995:14), this is:

"An approach and procedure for gaining an understanding of a system by means of identifying the key actors or stakeholders in the system, and assessing their respective interests in that system. "Stakeholders are "groups of people with common objectives and sets of interests with regard to the resource in question and the environment" (Grimble and Chan 1995) who are either materially affected by, or who can materially affect developments designed to bring about a particular transformation. They can be individuals, communities, social groups, or institutions of any size, including sections of government, business, and NGOs. While providing a useful snapshot of the range of people and groups concerned with a given resource issue, the stakeholder approach is essentially a static one which assumes that interests are clear and pre-formed. It is mainly concerned with identifying trade-offs where these interests conflict, and does not attempt to address the social relationships amongst stakeholders, or the power relations which shape how certain perspectives come to prevail. Nor does it address the relative capacities of different stakeholders to be involved in management, as shaped by their social or institutional positions. Finally, developed as a tool for the appraisal of punctual, externally-designed interventions, stakeholder analysis is relatively unconcerned with the longer-term dynamics of ecological and social systems.

An adaptation of stakeholder analysis which attempts to give more operational clarity to stakeholder's relative roles and capacities is the *"4Rs approach"* (Vira *et al.* 1998). This attempts to define stakeholders by their respective Rights, Responsibilities, Returns from a given resource, and Relationships. The focus on rights is particularly significant, drawing attention to tenure issues as crucial in shaping people's differentiated concerns with and capacities to manage land and trees. Discussions around the approach have pointed out the diverse types of property and use rights which frequently co-exist, legitimised by different institutions, and the fluid processes through which these may be negotiated and renegotiated. Responsibility is conceived as emerging from a combination of power, rights, necessary competence, and economic interest (Vira *et al.* 1998:39). Returns are conceived of as both material and non-material. Relationships among stakeholders comprise various facets: Service, legal/contractual, market, information exchange, and power

Aside from providing a more systematic basis on which

to characterise different stakeholders and their relationships with each other and with the forest, this approach aims explicitly to identify imbalances between the four Rs. For instance, certain women may have strong material interests in a forest resource, but lack secure rights over it, or a community organisation may see itself as having strong responsibility for forest management, yet be hindered in practice by unequal legal and power relationships with state agencies and officials. Potentially, the approach could be used as a tool to track the changes in the 4Rs and their imbalances in the context of a particular planning or management approach.

Both these approaches focus - in a fairly static and time-bound sense - on the plurality of perspectives within a given natural resource/forest setting, and in the context of a particular intervention, while examining the positions of a wide range of different stakeholders. Neither, however, gives any consideration to ecological dynamics and the ways these intersect with socially-differentiated activities. Hence these approaches, like conventional approaches to community-based natural resource management, fail to address a range of key questions, such as which social actors see what components of variable and dynamic ecologies as resources at different times? How do different people gain access to and control over such resources, so as to use them in sustaining their livelihoods, and how do they transform different components of the environment through their resource management or use?

ENVIRONMENTAL ENTITLEMENTS, CAPITALS, ACCESS, AND INSTITUTIONS

An analytical approach intended specifically to address these questions draws on the notion of 'environmental entitlements' (Leach *et al.* 1999). Adapted from Sen's 1981 work in the context of famine, the environmental entitlements approach shares Sen's original emphasis on access as well as availability as key in shaping how people experience resource scarcities. Modifying Sen's concepts (see Leach *et al.* 1999) provides a set of analytical tools which can assist the tracking of particular people's access to, use of, and transformation of environmental goods and services.

The environmental entitlements framework is summarised in Figure 1. The upper ellipse represents an environment disaggregated into particular environmental goods and services. Through processes of mapping, these become endowments for particular people. Endowments refer to the rights and resources that people have. Environmental endowments (such as rights to land and trees) may, in turn, be combined with other endowments (such as labour and skills) and transformed into

environmental entitlements which can be defined as alternative sets of benefits derived from environmental goods and services over which people have legitimate effective command and which are instrumental in achieving well-being. These benefits may include direct uses in the form of commodities, such as food, water, or fuel; the market value of such resources, or of rights to them; and the benefits derived from environmental services, such as pollution sinks or the properties of the hydrological cycle. Entitlements, in turn, enhance people's capabilities, or what people can do or be with their entitlements. For example, command over fuel resources - derived from rights over trees - gives warmth or the ability to cook, and so contributes to well-being.

An emphasis on the effectiveness, or otherwise, of command over resources highlights first, that resource claims are often contested. Within existing power relations some people's claims are likely to prevail over those of others. Second, certain people may not be able to mobilise some endowments (*e.g.*, capital, labour) to make effective use of others (*e.g.*, land). The notion of legitimacy refers not only to command sanctioned by a statutory system such as state land tenure frameworks, but also to command sanctioned by customary rights of access, use, and control, or by social norms. In some cases, these sources of legitimacy might conflict, and different people may hold differing views of the legitimacy of a given activity.

The main value of such an analytical approach in specific situations is not its focus on someone's particular endowments, entitlements, and capabilities at a given moment; these represent only a snapshot in time. Instead, analysis focuses mainly on the dynamic mapping processes that link each set. As indicated in the boxes to the right of Figure 1, it can be useful to consider these processes in relation to the institutions that structure them. Institutions can be defined as regularised patterns of behaviour between individuals and groups in society. This both distinguishes them from organisations and acknowledges that institutional rules are upheld by people's ongoing practices. Both formal institutions (*i.e.*, those that require exogenous enforcement by a third party organisation, such as the rule of law) and informal institutions, upheld by mutual agreement or power relations between the people involved, are important in endowment and entitlement mapping.

A simplified example from Ghana illustrates some of the types of endowment and entitlement mapping processes that are of relevance in forest management situations (Figure 2). In Ghana's forest zone, the leaves of *Marantaceae* plants are commonly collected by women and used and sold widely for wrapping food, kola nuts, and other products (*cf* Falconer 1990; Agyemang 1996). The leaves are associated with particular sites and times within dynamic, variable forest and forest-savanna ecology. These include disturbed forest sites, moderately burnt forest, swamps, and abandoned cocoa farms and fallows, especially during the rainy season.

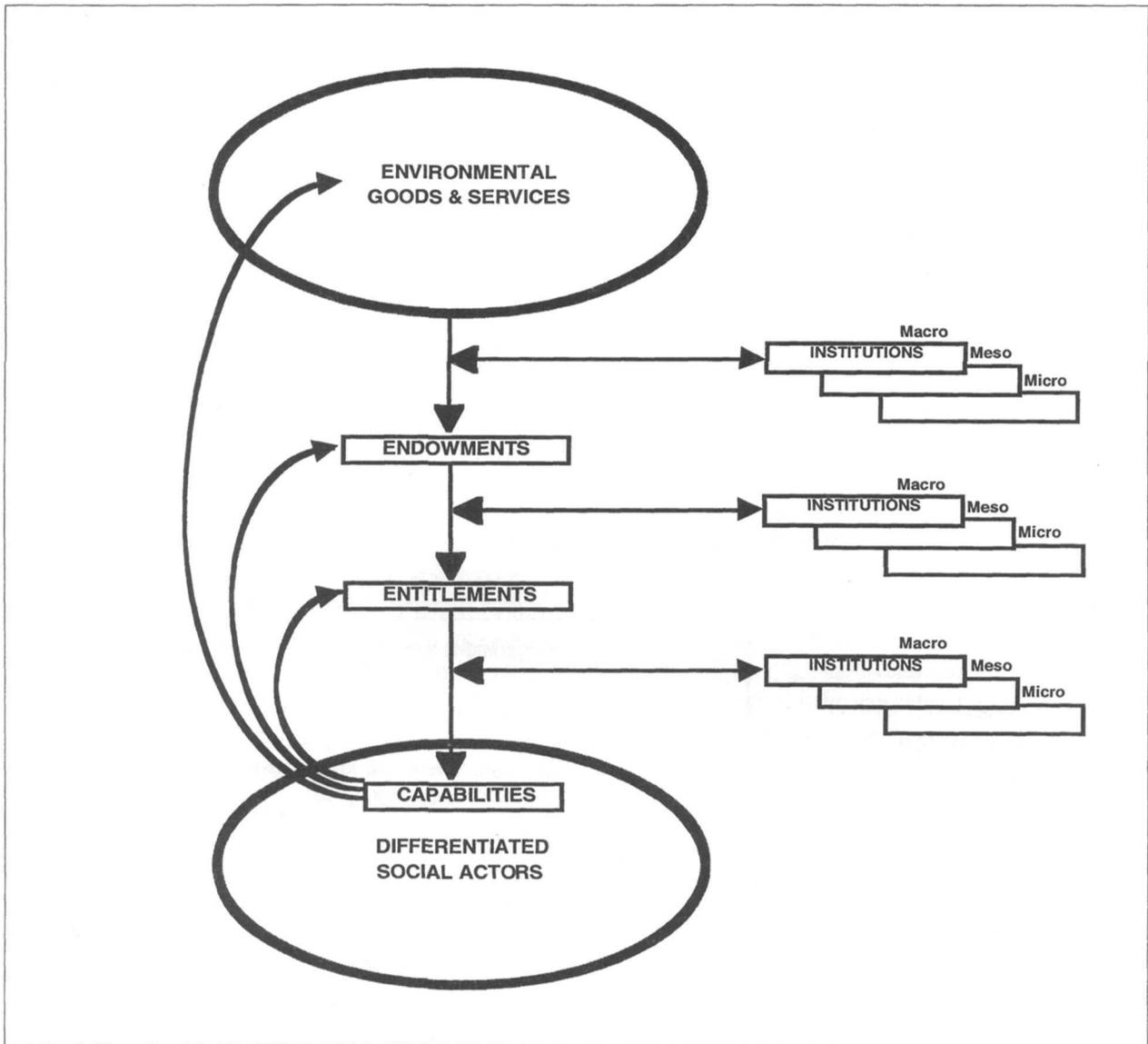


Figure 1: The Environmental Entitlements Framework.

The leaves become endowments - people gain rights over them - in different ways depending on whether they lie inside or outside government-reserved forest. Off-reserve, the leaves are usually the common property of a village, with an actor's endowment mapping depending on village membership. Where they occur on farmland, collection rights are acquired through membership of, or negotiation with, the appropriate land-holding family or farm household. On-reserve, endowment mapping depends on the Forest Department's permit system, with women often using established trading relationships as a source of finance for permits. Without such a permit, leaf gathering is illegitimate from the state's perspective, although it may be sanctioned by customary tenure arrangements grounded in different definitions of reserved land as ancestral farmland.

The set of entitlements derived from *Marantaceae* leaves

may include direct use of the leaves or their sale for cash income. In practice, most women involved in gathering leaves prefer to sell them as an important source of seasonal income. In entitlements mapping, both labour and marketing issues are important. Women may have to negotiate with their husbands and co-wives - in relation to other farm work and domestic duties - for labour time to collect the leaves. They find leaf gathering in groups more effective, so collection depends on membership of a regular group or on impromptu arrangements among kin and friends. There is frequently competition between groups for the best sites, as well as competition for leaves among group members. When disputes arise, whether between individual women, collection groups, or with forestry officials, a 'queen mother of leaf gatherers' - appointed by each village or neighbourhood's women gatherers - helps to mediate them. Market-

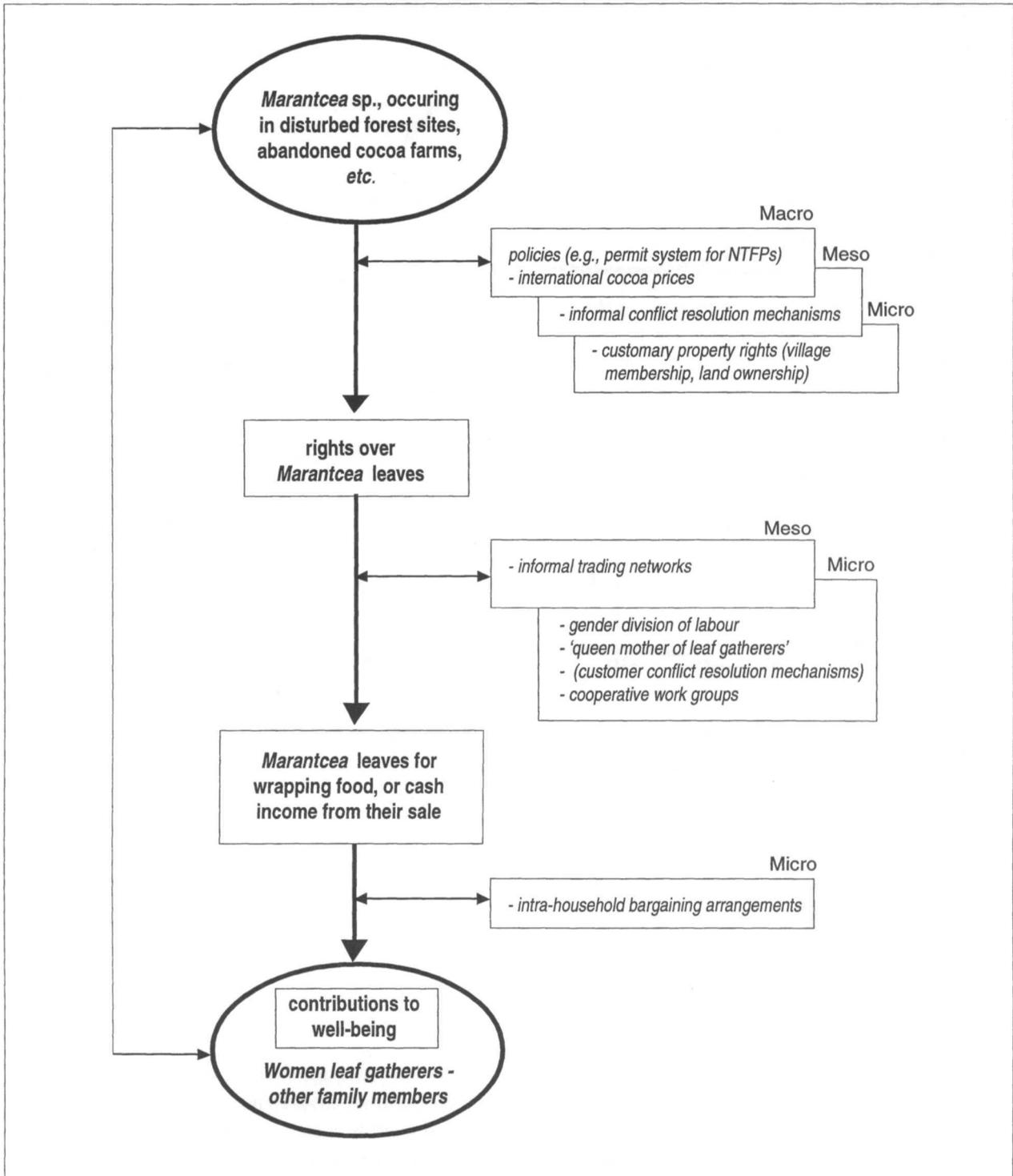


Figure 2: Endowments- and entitlements-mapping in the case of *Marantaceae* leaf collection, southern Ghana.

ing effectively depends on establishing a regular relationship with village-based or visiting traders who will guarantee a reasonable price even at the times of year when the market is flooded. Women frequently invest actively in maintaining such relationships, for instance collecting one type of leaf for one buyer, and another type of leaf for another buyer.

The benefits derived from the cash sale of *Marantaceae* leaves contribute to a woman's capability to ensure that she and her children are well fed and to satisfy other cash-dependent basic needs. In particular, the leaves offer a timely source of rainy season income when money is otherwise scarce. But whether a woman can keep control of the in-

come, and how it is used, depends on intra-household bargaining arrangements, such as negotiations with husbands and co-wives over expenditure priorities and responsibilities for providing food.

This example makes clear that rather than the single, local institution focus, which characterises so many programmes and projects, people's resource access and control, or the mapping processes by which endowments and entitlements are gained, are shaped by many, interacting institutions. These exist at various scale levels from local to international. Internationally, for example, the policies of donor agencies may not only directly shape local approaches to community-based natural resource management, but also influence domestic macroeconomic policy and governance in ways that cascade down to affect local natural resource management. At national or state level, government policies and legislation are of key importance, including land tenure reform policies or approaches to forestry and wildlife conservation and tourism. And institutional dynamics at these levels intersect with the local institutions that influence rural livelihood systems, intra-household dynamics, and so on. Indeed in the environmental entitlements framework, with its primary focus on local resource users and ecologies, it is in these multiple institutions that the governmental, policy-making, and donor stakeholders of the stakeholder analysis and 4R approaches are located. It is frequently the interactions between institutions that lead to conflicts over natural resources or to competing bases for claims. Yet it is also in the potential to shape or alter such interactions that some of the most fruitful ways forward for policy and management lie.

The environmental entitlements approach, then, provides a set of analytical tools for tracking the relationships between particular people and particular environments, and the institutional dynamics of these relationships over time. Clearly though, rural people's livelihoods do not depend entirely on a given set of natural resources. Hence, it is worth considering this approach alongside related others which have framed their concern more broadly with 'sustainable rural livelihoods.' The resources and benefits from a given forest area are thus contextualised within a bundle of assets which help comprise people's livelihoods - or "*the capabilities, assets (including both material and social resources) and activities required for a means of living*" (Scoones 1998:5). People's interactions with forests are set within the broader context of their livelihood options and the factors that influence them. Common to the related frameworks of the Institute for Development Studies (Scoones 1998; Carney 1998; and Bebbington *et al.* 1998) is a conception of livelihood resources' or assets in terms of several types of capital: Natural; produced/economic/financial; human; and social. People build livelihoods from portfolios of types of capital. In

particular, these approaches emphasise the importance of social capital - or the social resources, networks, social claims, social relations, affiliations, and associations - upon which people draw when pursuing different livelihood strategies requiring co-ordinated actions. Both access to livelihood resources, and the ways these are combined, are influenced by a matrix of institutions and organisations. It is into this broader matrix that agencies and planning approaches aimed at co-management of forest resources would slot.

PART III. INSTITUTIONAL INTERACTIONS IN FORESTRY CO-MANAGEMENT: SOME WEST AFRICAN EXPERIENCES

In this final section, I explore further the complex and dynamic institutional processes with which practices of community forestry engage through some illustrative examples from francophone West Africa. Rather than involving any simple devolution of forest rights, responsibilities, returns, and powers from the state to communities, the examples show that community forestry inevitably engages with a complex, historically-embedded, and dynamic set of institutional relationships with legal, financial, political, and even knowledge dimensions.

Historically, in the francophone countries of Burkina Faso, Niger, Mali, Senegal, and Guinea, policies, from colonial times onwards, concentrated forest resource control in the hands of Forest Departments and urban merchants. But from the late 1980s, Forestry Services and donor agencies have launched participatory forestry projects and elaborated new forestry laws. These attempt to decentralise forest management by devolving responsibility to local groups (Ribot 1995). As Ribot emphasises, "*control over forests is configured at the intersection of multiple laws*" (1999:26). These include codes and constitutions which set up levels of national, regional, and local government, and divide powers and responsibilities among them; electoral codes; and technical codes, such as land tenure and forestry laws which specify who gets to make which decisions - amongst elected bodies, technical services, corporations, co-operatives, NGOs, or private citizens. The way these intersecting laws and their interpretation in practice have operated means that decentralisation of responsibility for forest management and the labour required for it has rarely been accompanied by the decentralisation of genuine rights and powers of decision to representative local bodies.

In seeking to work with locally-representative institutions, community-based natural resource management approaches have usually either relied on village chiefs or on Rural Councils. But the representativity and local accountability of both are problematic (Ribot 1999:31). Chiefs, throughout the

French colonial period, on one hand had powers, legitimacy, and accountability grounded in local culture and structures of territory and descent, yet were also frequently integrated with the colonial administration. To the present, chiefs are chosen by state-sanctioned processes combined with locally-sanctioned inheritance, and their allegiance and accountability are varied. Chiefs may be *"not an alternative to the state but rather a particular manifestation of state intervention in the rural arena"* (Ribot 1999:37). Rural Councils, comprised of elected representatives and part of political decentralisation efforts, typically re-group five to fifty villages. But in Senegal and Niger, representatives are firmly linked to national political parties since independent candidates are not allowed to stand. Elsewhere, where candidates are elected by villagers, their decisions are not independent of - and are expected to defer to - those of government administration at prefecture and sub-prefecture level. Furthermore, these relatively large-scale institutions are usually inappropriately positioned to manage forests within village territories. Hence projects have also attempted to set up village-level co-operatives or groupements.

In Burkina Faso, Ribot (1995, 1999) describes the institutional arrangements in a project considered cutting edge in participatory forestry, the joint UNDP (United Nations Development Program)/FAO wood-fuel production project in the forest of Nazinon, 30 miles south of Ouagadougou. In each village surrounding the forest, UNDP/FAO staff have organised villagers interested in commercial wood-fuel production into groupements, which have legal corporate standing under the new Law on Decentralisation. The result is a union of co-operatives with a general assembly and administrative council, empowered to make business decisions and with responsibility for surveying the implementation of all laws concerning forest management. Forest management plans, under the new Forestry Code, are required to be developed by the Forest Service, or under its control, so each groupement's plan must be approved and implemented under the surveillance of the local Technical Office of the Forest Service. Funds generated by the sale of wood-fuel are earmarked to finance forest management activities, as credit for co-operative members and to finance public works serving the larger village community.

In practice, village notables and even non-local urban woodcutters have been able to draw on other sources of power and authority to override groupement officials and make claims on the co-operatives' resources. Chiefs and government representatives have also used their powers to claim co-operative funds for projects 'in the public interest', such as schools to be built outside the village. Thus, *"the powers of village elites and the authority of state backing combine to shape the use of project resources... earmarked for use by the village as a whole"* (Ribot 1999:42). At the same time, the groupements are not representative of entire village populations or communities; rather, they place some powers over wood-fuel management in

the hands of a few self-selected economically interested individuals, while calling on other village men and women for labour. And the decisions the groupement makes over production and management are ultimately subject to Forest Service approval. Thus, in the matrix of laws and institutions in this setting, community forestry has, in practice, come to mean a very limited degree of control by a few private individuals (Ribot 1999).

The Groupements Forestiers approach now being piloted in Guinea's forest region differs from that in Burkina Faso in its focus on multi-purpose forest management and use, in most cases of the peri-village forest islands that surround so many of the region's settlements. While it is too early to evaluate the experience, here I draw on preliminary findings from recent research (Fairhead and Leach 1999) to show how what may appear at first sight as a single type of initiative actually carries very different meanings for those involved: In this case, the state Forestry Service, foreign donors, local NGOs, and different villagers. These different actors and institutions view the origins and reasons for forest groupements from very different perspectives or frames of reference, in ways which reflect their political and economic positions, their knowledge and perspectives on the area's dynamic forest landscape, and their historically-embedded, dynamic relationships with each other.

Since the early 1990s Guinea's Direction National des Forêts et Faune (DNFF) has been attempting to transform itself from a service of repression to a service which works in collaboration with local populations. Elements of this transformation were incorporated into the new Forestry Code of 1990, which made provision for creating designated forests under the control of Guinea's Rural Councils, the CRDs. By 1996, considerable pressure was brought to bear on the Ministry of Agriculture, Livestock, and Forests to alter the code to permit the legal establishment of village and private forests. This was eventually acceded to in a letter of addendum to the forestry code which has been signed by the Minister, but has yet to be passed by the National Assembly.

In the meantime, the Forest Department has permitted the establishment of Groupements Forestiers on the signature of the National Director of Forestry (or the Minister) to a dossier of request from the groupement concerned. Granting back rights over forest trees to villagers, constituted as groups, heralds a major change in forest policy direction in Guinea. Until now, and since early in the colonial period, the state Forestry Service has claimed rights to decide which trees may be felled, and rights to the revenue, with villagers being paid only compensation for collateral damage. In constituting Groupements Forestiers in villages the state appears to hand over these rights to a village association, and, in theory, allows villagers to own and control the felling of timber trees, with revenues going to village infrastructure projects. The dossier requires a map of the forest, with a basic inventory and which shows a zonation and outline man-

agement plan agreed to in conjunction with the sub-prefectoral representative of the forest service. Typically this includes priority zones for tree crops, for enrichment planting, for water source protection, and for timber exploitation. It requires that the groupement constitutes a management committee (seven to eight people), which in the case of a village groupement formulates a village development plan into which forest revenues can feed. Before the request is submitted to the national directorate, it needs to be approved and signed by a committee comprising prefectural representatives of four to five sectoral ministries.

A number of projects and donors have been supporting the creation of Groupements Forestiers, and to date the only groupements created have been those supported by these projects. In particular, several projects within the Programme d'Amenagements des Bassins Versants de la Haute Gambie et Haute Niger, co-ordinated by the Organisation of African Unity (OAU), and funded by assorted donors (European Union, US Agency for International Development, *etc*) have promoted the approach within their areas of operation. These projects have contractualised and now operate through local NGOs - there are three in Kissidougou - mainly formed among ex-members of the once large project staff, who bid for contracts with the project and elsewhere. The sub-prefectoral forest service representatives have now been allocated dual responsibility and accountability to the project and to the state Forest Service, and act as liaison points between them.

These new NGOs have emerged along with the Groupement Forestier approach and it is central both to their sense of identity and purpose. Many of the youthful members see the approach as having originated in the pioneering participatory work in forest conservation they carried out with villagers while working as project staff, and the mutually supportive relationships they established with key expatriate project leaders who thought up the approach and lobbied for the necessary legal changes. This sense of innovation enables the NGOs to represent themselves as uniquely capable of replicating and training others in the approach; important in a contractualised development world. Indeed, the ongoing creation of Groupements Forestiers is also crucial to NGO survival, since most of their project contracts are limited to the time for surveying, village meetings, and paperwork involved in the preparation of groupement dossiers.

Certain ex-project and forestry extension staff, by contrast, emphasise the origins of the Groupement Forestiers approach within problems they encountered in forestry extension, particularly the virtual theft of timber resources by chain saw operators, which limited villagers' incentives for sustainable forestry. From this perspective, the main purpose of the approach is to give villagers more force in the face of timber fellers, and the major role of the groupement management committee and their prefectural federation is in negotiating to get a better deal from loggers.

A different perspective again is prevalent among many ex-

patriate forestry advisors, reflecting their cynicism toward the intent of many nationals of the Guinean Forestry Service. Overt messages about sustainable forest management on the part of national, prefectural, and sub-prefectoral forestry agents are seen as a mask for personal and political interests in timber exploitation, or merely to gain access to the personal financial advantages that projects bring. Overt messages about participation are treated with distrust, as rhetorical statements detracting attention from real interests in maintaining state control over forest resources for financial and other reasons. Emerging from these views is a perspective on Groupements Forestiers which sees them as originating in a struggle against the state Forestry Service. As a senior technical advisor put it: "*there is a need to protect villagers and their forests from the state*" (interview, Senior Aid Official, Conakry, January 1999). In this struggle donors also see themselves as part of a worldwide movement towards community forestry and participation, a geography in which the state is seen largely as an obstacle.

A different perspective again - voiced by many national and prefectural forest service staff - gives the central role in the emergence of the Groupement Forestier approach to the state Forestry Service, and its conscious efforts to improve the effectiveness of forest management. Through Groupements Forestiers, the inventories, and the state monitoring of village forestry management plans, there is a sense of management of village forests where there was no management before. The bureaucracy and capacity to monitor tree stocks enables the forestry administration to be more efficient in collecting tax dues from timber felling, and to stifle illegal operators. Participation also means labour mobilisation for replanting, making fire breaks, *etc*. Where villagers themselves do the work of forest management, it is no longer necessary to send so many foresters. By giving villagers responsibility for carrying out these tasks, monitored by state forestry agents, there is a much greater chance that they are actually done, than when a small number of forestry agents attempt to do them themselves. Linked to these efficiency arguments is a coverage argument. More land is classified, albeit to the benefit of the village and not the state. By responsabilising villagers, the forestry code can be applied with rigour in more locations than would otherwise be possible. Third, a sustainability argument links responsabilising villagers to making them fully conscious of the need to preserve forests around their villages (Direction Prefectoral Forestier) through the education, sensibilisation, and technical advice associated with the constitution of Groupements Forestiers. In imaging groupements as an extension of state activity in this way, prefectural forestry administrators see constituting and monitoring Groupements Forestiers as their role. They do not see either donor funded projects or the NGOs they now fund as indispensable. In short, this perspective presents Groupements Forestiers in terms of transformation and greater effectiveness, not diminution, of state forestry activity.

In several of the discussions in which the perspectives discussed above were voiced, donor, state, or NGO staff did refer to aspects of villagers' practices which might be thought to contribute to a different perspective: Of pressure for Groupements Forestiers from below. These included references to the soundness of traditional forestry management techniques, and to villagers' dissatisfaction with state and project forestry approaches, as evidenced, for example, by the burning of tree nurseries. At the same time, many administrators are aware that forest patches in Kissidougou, at least, have anthropogenic origins, and can cite cases where villagers have spontaneously encouraged the formation of forest and protected forest patches both historically and recently. These pieces of evidence are mustered piecemeal in various discussions to provide extra support for the need to responsabilise villagers. But they do not seem to be put together in a way that would either undermine the need for complex project and state procedures in creating and monitoring groupements, or to deny the need for the sensibilisation of villagers to protect forests. In other words, it is not possible to identify a coherent 'official' perspective seeing Groupements Forestiers as a logical outcome of villagers' past and present management of their dynamic forest landscapes.

Indeed, villagers' strong awareness of the anthropogenic histories of their forests and of the effectiveness of their autonomous management creates worries when they are first confronted with the Groupements Forestiers idea, usually in visits from state officials or NGOs. For example members of the management committee of the Trakore groupement said that when the village was first approached by the sub-prefectoral forestry agent to discuss the possibility of making a groupement, they were afraid. They hesitated. It was their own forest. They had created it and they feared that it would be classified, and for the state. They feared losing control over resources that they knew to be valuable. Only when they were taken to see a groupement already established in another part of the prefecture and heard members explain that when trees were mature they could cut them and keep the profit, were they convinced.

Fears concerning state classification of forest are prevalent among villagers, reflecting a colonial history in which lands were alienated from them for forestry purposes (Interviews, Trakore Comite de Gestion, Trakore village, March 1999; see also Fairhead and Leach 1996). While the groupement approach in law classifies forests for the village, its practices, with boundaries, inventories, management plans, state signatures, and increased state surveillance, are easily taken for state classification. For many villagers, distrustful of the future intent of the Forestry Service, it may appear as a step on the road to alienation. For the village women and men from poorer families, less prominent in village politics, who do not consider themselves as represented

by the village management committee and are very unsure of receiving any benefit from timber felling, these fears dominate their perception of the approach all the more.

Each of these diverse perspectives on Groupements Forestiers presents some actors and institutions involved in the approach rather negatively, and others positively. Nevertheless, each group can find a narrative in which the approach is advantageous to them. It is this that partly explains how the Groupement Forestier approach has emerged in a coalition of interests. However, in another sense, the diverse perspectives reveal that the approach is not actually a common project. Groupements Forestiers continue to mean different things to different people, despite the manuals, procedures, and laws which appear to produce it as a unitary phenomenon. In particular, as elsewhere in francophone West Africa, there is real tension over whether the approach represents decentralisation or further centralisation of control over forests. While certain people applaud (or regret) Groupements Forestiers as a devolution of state resources, others experience it as a loss in autonomy and an extension of external control easily equated in Guinea's history with the state.

IMPLICATIONS

This paper has aimed to show that neither communities, the state, nor forests - the main entities that co-management approaches in forestry attempt to bring together in new ways - are as straightforward, undifferentiated, or stable as many proponents of these approaches might assume. Communities are socially differentiated and diverse, and their members' material and non-material concerns with forests may either complement or conflict with those in a plurality of other organisations, whether state or donor agencies, or private or non-governmental organisations. The environments they interact with are ecologically dynamic, continually shaped over time by interacting social and ecological processes. Yet knowledge of these processes - and perspectives on how particular forests or environments came to acquire their character and may change - is itself differentiated, as the contrasting perspectives of villagers and state officials on the status of Guinea's forest islands illustrates so starkly. In this context, management approaches must deal with several sorts of plurality: Of direct concerns with forest values, material and non-material; of concerns over forest status, pasts and futures; and, as the Guinean Groupement Forestier example illustrated, of concerns with what management approaches might themselves mean in terms of their implications for institutional survival, power, or control.

Analytical tools, such as those outlined in Part II, can help in specifying more precisely the connections between

diverse people and environments, and, thus, in clarifying the dynamic settings in which management approaches are undertaken and which they transform. In particular, in focusing attention on the mapping processes by which components of heterogeneous environments become endowments and entitlements of particular social actors, the environmental entitlements framework outlined in this paper has attempted to provide a dynamic perspective on the role of institutions in people-environment relations. Diverse institutions, both formal and informal, and often acting in combination, shape the ways in which differentiated people access, use, and derive well-being from environmental resources and services and, in so doing, influence the course of ecological change. As people interact with each other and with the environment in the context of these mapping processes, their actions may, over time, serve to reproduce particular institutions, but they may also serve to alter them, and, thus, to push institutionally influenced ecological dynamics along new pathways.

Seeing people-environment relations in this way raises a number of implications for development planning and practice. First, conventional approaches to community-based natural resource management are frequently centred on community organisations or representatives as the main vehicle for their activities. Yet these may be a very poor reflection of the real institutional matrix within which resources are locally used, managed, and contested. Multiple institutions are involved in resource management, and, amid this multiplicity, different people rely on different institutions to support their claims to environmental goods or services. For most activities they combine sets of claims supported by different institutions; rights to access trees for wood-fuel may be of little use to generate income unless combined with kin-based claims on labour for wood cutting and transport and trading networks for effective marketing. Equally, it is frequently combinations of institutions, acting at particular historical moments, which shape particular trajectories of environmental change. Many of these institutions are informal, and consist more in the regularised practices of particular groups of people than in any fixed set of rules. As such they are also dynamic, changing over time as social actors alter their behaviour to suit new social, political, or ecological circumstances. Introduced, formal organisations miss or may reduce this flexibility.

An understanding of social difference and the diverse institutions that support different people's endowments, entitlements, and environmental management, points towards possibilities for more strategic specificity in interventions. If certain institutions can be identified as supporting the interests of certain social actors or as contributing to desired courses of ecological change, then they can be targeted by policy in strategies of institution-building or support. This would

imply agencies are moving away from generalised community support toward far more explicit partiality, to what Mehta (1997) has termed *aggressive partisanship*.

The danger, however, is that such targeting becomes, in effect, another form of imposition of formal organisation on previously informal, dynamic arrangements, analogous to, and open to the same criticisms as, this at a generalised community level. Indeed, design-oriented responses almost inevitably gloss over complexity and dynamism, assuming that steady-states - ecological or social - are achievable and supportable. Instead, a more flexible approach may be needed; one which, as Mosse (1997) puts it strategically supports subordinate groups to enhance access to, and control over, resources by taking 'operational clues' from ongoing struggles, knowledge, and strategies (*cf.* Li 1996:515).

Given the plurality of perspectives on forest issues, it may be that consensus on the priority and directions which forest management should take is impossible to achieve; it may be partial or temporary at best, while appearances of consensus can mask the very different and conflicting 'backstage' opinions of certain groups (*cf.* Anderson *et al.* 1998:8). Recognising this, a variety of management approaches are now being developed which do not rely on achieving consensus. Techniques of communication, learning, negotiation, and mediation are instead employed to manage pluralism and conflict, and even to engage it productively (*e.g.*, see Babin and Bertrand 1998; Ramirez 1998).

However, it would clearly be naive to assume that any negotiation process takes place on a level playing field. Just as power relations pervade the institutional dynamics of everyday resource use, so they pervade negotiation processes. Different people have very different capacities to voice and stake their claims. Empowerment to subordinate groups therefore needs to accompany negotiation through approaches aimed at enhancing their access and claims-making capacity, perhaps including building their social capital and networked relationships with those sharing similar or related concerns (*e.g.*, Bebbington and Kopp 1998).

At the same time, attention to larger scale institutional transformations cannot be ignored. Participatory approaches and adaptive management at the local level may be unable to be pursued effectively if the broader legal context does not enable this. For instance as Ribot (1999:56) argues from the francophone West African context, reworking rural representation requires the dismantling of those "*disabling laws that make both 'customary' and new rural authorities extensions of the central government.*"

Yet natural resource management confronts questions of uncertainty, both social and ecological. Because institutional arrangements are dynamic and are influenced by the ongoing practices and agency of numerous social actors, as well as by contingent events in the economy and society, no man-

agement process can assume predictable outcomes - as the West African cases discussed in Part III would suggest. From this perspective, it is clear that strategic institutional changes - such as alterations of legal frameworks - do not necessarily lead to particular outcomes. Nevertheless, they can provide altered settings in which people can struggle to make their claims realised, perhaps with more chance of success.

Ecological uncertainties compound the problems already inherent in defining desirable courses of environmental change or sustainable development. The notion of environmental sustainability is problematic given the diverse, partial perspectives of different social actors: What is to be sustained and for whom? Furthermore, recent thinking and non-equilibrium perspectives in ecology question the notion that future environmental states can actually be planned. Historical conjunctures of processes and contingent ecological events can bring about quite rapid, unpredictable shifts in landscape ecology. For ecological reasons too, then, forest management may need to seek to influence processes rather than to define states, and to be adaptive rather than pre-planned.

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Summaries

Les approches de cogestion de la foresterie n'ont souvent pas pu remplir leur promesse et ont entraîné des conflits inattendus. Ceci résulte en partie du fait que leurs contextes sont plus dynamiques et différenciés sur les plans social, institutionnel et écologique qu'il n'est souvent supposé. Cet article présente et illustre les dimensions clés de ce dynamisme, expliquant de ce fait pourquoi des méthodes plus adaptatives et réflexives de gestion des forêts et des ressources naturelles peuvent s'avérer nécessaires. La première partie traite certains des intérêts et aspects dynamiques socialement divers qui existent parmi les usagers des forêts et la variabilité et l'imprévisibilité des méthodes écologiques, faisant ainsi ressortir une perspective paysagère dynamique des forêts. La deuxième partie examine en profondeur les outils analytiques pour suivre les détails de cette dynamique et traite les questions clés d'accès aux ressources et de leur contrôle. Dans ce contexte, la troisième partie illustre comment la dynamique institutionnelle peut fonctionner dans la pratique lorsque les villageois, les organismes gouvernementaux, non gouvernementaux et les bailleurs de fonds collaborent ensemble à la gestion de la foresterie communautaire. Le besoin de prendre en compte des relations de pouvoir et institutions multiples, de gérer le pluralisme plutôt que d'essayer forcément de parvenir à un consensus et d'évaluer les incertitudes sociales et écologiques porte à croire que la gestion forestière devrait chercher à influencer les processus au lieu de définir des états, et qu'elle devrait être adaptative au lieu d'être planifiée à l'avance.

Los enfoques de manejo compartido en la silvicultura a menudo no han logrado lo cometido y han dado lugar a conflictos inesperados. Esto se debe, en parte, al hecho de que sus entornos son más diferenciados y dinámicos, desde el punto de vista social, institucional y ecológico, de lo que a menudo se supone. Este artículo delinea y ejemplifica las dimensiones claves de este dinamismo, y, en consecuencia, explica por qué pueden hacer falta procesos de reflexión sobre el manejo forestal y de recursos naturales más adaptativos. La Parte I se refiere a algunos de los intereses y a la dinámica social diversa que existe entre los usuarios de los bosques y la variabilidad y lo impredecible de los procesos ecológicos, y, por lo tanto, delinea una perspectiva de paisaje dinámico en cuanto a bosques. La Parte II evalúa las herramientas analíticas usadas para realizar un seguimiento de los detalles de esta dinámica y para tratar los temas claves de acceso a los recursos y su control. En este contexto, la Parte III ejemplifica la manera en que la dinámica institucional puede funcionar en la práctica cuando los pobladores, y las agencias gubernamentales, no gubernamentales o donantes interactúan en la práctica de la silvicultura comunitaria. La necesidad de tomar en cuenta múltiples instituciones y relaciones de poder, de administrar la pluralidad en lugar de intentar lograr el consenso, y de tomar en cuenta incertidumbres sociales y ecológicas, sugiere que el manejo forestal debe buscar ejercer una influencia sobre los procesos en lugar de definir estados, y que debe ser adaptativo en lugar de ser planificado anticipadamente.

Participatory Processes and Conflict Management in Community Forestry

Katherine Warner¹

Community forestry is in the process of transforming itself. Its supporters and practitioners are reviewing its basic assumptions and goals in order to develop a strategy for the future. This paper focuses on the changes that are occurring in community forestry and the important role that participatory process and conflict management are playing in its transformation. During the last twenty years there has been a shift in community forestry initiatives from tree planting and woodlots to natural resource management within the context of wider benefit sharing and greater participation. Conflicts have and will continue to arise over what decisions should be made by whom over management, access, rights and benefits. The challenge will be to develop effective mechanisms that recognise disparities of power and support a pluralistic equitable approach in forest management.

INTRODUCTION

Communities have been effectively managing forest resources for centuries. Local/indigenous management of forest resources, especially in anthropology and human ecology, has been and continues to be a rigorous, stimulating field of study

However, **community forestry** is a relatively new area of specialisation within forestry. It emerged in the 1970s during a critical review of both forestry and development objectives. During this period it was increasingly recognised that resource management and development strategies were not succeeding in either conserving resources or supporting rural development (IUCN/UNEP/WWF, 1980). Forestry then (and admittedly in many countries now) was focused on the harvesting of primarily wood from the forest on a not always sustainable basis. Development strategies of the 1950s and 1960s often focused on industrial development and overlooked rural development, especially the needs of the rural poor. Supporting the rethinking of what should be the primary objective of natural resource management was a shift in forest policy from one that focused on products to one that was more concerned

with managing the forest as a "complex, valuable natural resource system" (Gilmour 1995).

By the end of the 1970s, international meetings, especially the 1978 World Forestry Congress with its theme of *Forests for People*, saw the World Bank shift from industrially oriented forestry to environmental protection and meeting community needs. Influential books and reports on imminent fuelwood shortages and deforestation (Eckholm 1975) led to the development of the concept of community forestry and the first programmes and projects designated as community forestry (see Arnold 1992, 1999; Fisher 1995).

PARTICIPATION

Community forestry was initially not very participatory. The objective of community forestry was often to halt deforestation rather than serving as a strategy for not only reaching

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conservation objectives but also providing direct and indirect benefits for communities that would support rural development. It was not that there was a lack of concern for the well-being of rural communities, but that the primary focus was on environmental concerns (especially in relation to destruction of agricultural areas).

Since the demand for fuelwood was linked to the deforestation and deterioration of agricultural areas and forests in Africa and Asia, community forestry during this era was primarily defined as a strategy to provide fuel for the wood energy crisis. We have the wisdom of hindsight to see that the diagnosis of the problem (*i.e.*, a shortage of fuelwood or wood energy) was often based on making long-term inferences from short observations of the communities, inadequate consultation with communities, and a naivete concerning tenure, rights and obligations. Since the problem was defined externally as a lack of fuelwood, these early community forestry initiatives were primarily afforestation projects focusing on planting trees specifically for fuel often on village/common property areas (therefore community forestry) to increase fuelwood supplies. This focus on fuelwood overlooked the local needs for trees and tree products, which were not necessarily fuelwood (Arnold 1992). Both the problem and the solution were defined not by the community, but elsewhere.

Among the many lessons learnt from these early community forestry initiatives was that households and external planners did not share a common vision of needs and priorities. There was an externally derived imposition of objectives, priorities and definition of needs that often did not reflect the needs of communities and the local realities. One of the lessons learnt was that while households might not be interested in planting trees only for fuelwood (single purpose), or planting trees in village/common property areas (where tenure/benefits questions arose), there was in fact a general interest in the planting and protection of trees. Households were planting trees to provide a wide range of benefits (including fodder and fruit) in locations they defined as suitable (Arnold 1992).

It should be noted that during this initial phase, community forestry was *not* being defined as community involvement in forest management, the focus was on *planting* trees rather than protecting/utilising forest resources.

PARTICIPATORY APPROACHES AND COMMUNITY FORESTRY

There was disappointment in the lack of achievement of these early community forestry initiatives. Trees were not planted (at least where the project designated), or if trees were planted

the survival rates were often low (especially in communal areas), and if the trees did survive they were not being used as originally planned (*i.e.*, for wood energy) (Skutsch 1983).

In response to the results (or lack of results) of these early community forestry initiatives (and other development initiatives facing similar problems), there was growing awareness that there was a need for a more in-depth understanding of local needs. And who would know better the problems and constraints (and potential opportunities) encountered than the community and its members?

A critical element of this learning process was the participation of community members in the collection of information. To aid the collection of information, methods and tools such as Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) were developed and used. These methods and tools increased the understanding of community needs as well as local resource management activities and assisted in providing a means for dialogue regarding existing constraints and potential opportunities between communities and the external agencies.

It should be noted that information gathered during RRAs and PRAs did not necessarily have any impact on project or programme activities. There was a tendency (that continues) for a PRA, for example, to be conducted, but for the results and findings not to be effectively used by the agency or project that sponsored it. A common result of a PRA was a report that was placed on a shelf and the activity '*conduct PRA*' duly checked off on the workplan.

Why were the lessons learned during the PRAs not effectively integrated into the initiatives? Common limitations included (and this still occurs) the lack of a mechanism or process (or accountability) for incorporating the findings, the lack of trained staff committed to the participatory approach, and the over-design and inflexibility of projects or initiatives so that few changes could be made, especially in the overall objectives. PRAs were primarily used to 'fine tune' previously determined project activities or to make the project more appealing to community members. Major changes and reorientation based on PRAs rarely occurred. While community-based knowledge increased, the use of it was still limited to servicing the projects' needs.

WHO MAKES THE DECISIONS?

Moving closer to the present, it can be convincingly argued that a knowledge gap of community priorities and needs still exists - that decision-makers are designing policy, implementing activities, *etc.* without the basic information needed.

But let us explore this knowledge gap from a different angle or perspective - perhaps the problem is not so much

the knowledge needed, but that the wrong people (*e.g.*, too few with a narrow set of objectives) are making the important decisions. Rather than provide the community-based information to the decision-makers, why not have communities involved in the decisions?

From this perspective, the gap is not in knowledge, but in who gets to sit round the table where decisions are made. Meaningful participation during policy formulation (which sets the objectives), implementation (where accountability and process are determined), and activity design (who does what) is still uncommon. Community-based organisations are not sitting at the table as one of the decision-makers that determine the problems, priorities, objectives, and activities.

Changes in management responsibility for forestry resources are, however, occurring. While the state continues to remain the ultimate caretaker of forest resources, the responsibility for the actual management is shifting from central to local governments. This change is the result of major trends in public administration that go far beyond the forestry sector. While it varies from country to country, the administrative changes include:

- Structural adjustment programmes that require cuts to central government spending.
- Efforts to make government more responsive to specific local or regional conditions.
- A stronger role for civil society and various public organisations in influencing the public policy agenda; and
- More vocal policy commentary by a public with increasing access to information (Tyler 1995,1999).

Yet the shift of responsibility to local government does not mean a concomitant shift in resources for implementation, nor that local government has the capacity (or interest) to assume the tasks and responsibilities. The early optimism that decentralisation would be a positive step in the local management of resources is fading, as the realities of implementation become more apparent.

COMMUNITY FORESTRY: NEW DIRECTIONS

The nature and our understanding of community forestry has been evolving over the years. While afforestation (and the relative roles implicit in afforestation activities) is still a component of some projects and activities, the emphasis is shifting from planting to management of forests by local resource users. Community forestry is, however, still carrying the 'baggage' of its previous stage and the term 'community forestry' continues to be used to describe initiatives in which trees (now providing a broader range of benefits than those

of the past) are planted by communities, often on areas designated as state, communal or village property.

There have been initiatives to improve degraded state forests, for example, in India. Under the Joint Forest Management (JFM) programme, the forests that communities are given to manage are usually degraded, with the more productive forests remaining under the control of the state. The benefits of this arrangement to the state are apparent. Degraded areas are improved with the community providing labour and protection that enables the forest to regenerate and the state to receive a revitalised forest and a large share of the potential income from the timber and other resources. For the communities the benefits are also apparent: Access to areas that were officially off limits for gathering of non-wood forest products, and a portion of the income generated from the sale of timber. However, the benefits to the community would be far greater if it received more productive mature forest, rather than severely degraded wastelands, to manage. The state strategy is little trees for little people' with the state retaining the management and benefits of the productive forests (see Banerjee 1996). The paradigm that the state should be the decision-maker for forest resources has not shifted, especially for resources that can provide major real income and benefits.

But what was the impact of JFM? In states where JFM has been formally implemented for over 10 years, remote sensing showed an improvement in the quality and area under forest in southwestern Bengal. In Gujarat, Hayana, Madhya Pradesh, and West Bengal studies have indicated improvements ... *"in the productivity and diversity of vegetation and increased returns of income..."* from non-wood forest products (NWFPs) to members of community institutions (Sarin 1995).

But is community forestry only concerned with forests on public state land or areas designated as communal/village common lands? There is a strong dynamic between access to forest resources and the planting and protection of trees outside the forests. This interrelationship between forests, trees and fields is well recognised, although difficult to assess - and effectively administer. Government/public administration is commonly compartmentalised by sectors - even if there is an overarching department or ministry (*e.g.*, Department or Minister of Interior with separate departments for forestry and agriculture). While there is a trend to have more integrated administration (*e.g.*, natural resource departments that include not only forestry, but also all other resources designated as natural), inter- or multi-sectoral approaches are lagging. With little interaction, parallel initiatives in forestry/natural resources and agriculture may be planned and implemented. The on-the-ground results are overlapping agency roles, contradictory regulations, and competing initiatives.

While this sectoral approach with its overlaps, contradictions and competition provides a good livelihood for lawyers in some societies, it prevents the development of an integrated multi-sectoral approach that strives for conservation of resources and development. And not all sectors are equal. Priorities are established and altered based on national strategies and in response to international markets and conventions.

Unlike government/public agencies, households usually are multi-sectoral in their planning and resource mobilisation. A household member considers all his/her resources and makes decisions on how best to utilise them given the need for food, income, availability of labour, *etc.* Disparities exist between, and often within, households. The poor have fewer options, fewer resources, and therefore are the most vulnerable to changes that affect their livelihood strategy.

PARTICIPATION AND DECISION-MAKING

But with decentralisation, has there not been a shift in decision-making? The process of (and decisions concerning) decentralisation has often been top-down in design and implementation, rather than the result of a participatory process. Central government has given responsibility to local peoples and communities, but often the recipients have not received the training or resources to effectively assume the responsibilities — and final authority (approval, signatures obtained) rests not at the local level, but at the central/national office.

But who makes the decisions and establishes the rules? In past and current initiatives in community forestry with the emphasis on state forests, the shift in decision-making from state to local community-based management has not widely occurred. In most initiatives, communities (or user groups as in Nepal) agree to management plans based on rules and regulations that are established by others who are often professional foresters elsewhere. The underlying assumption is that foresters have the knowledge and mandate to determine use, and communities must comply in order to have access to the forest resources.

The shift of authority, especially the authority to set the agenda and the goals, as opposed to responsibility for specified tasks (*e.g.*, planting, thinning, harvesting) continues to lag. This is understandable - enthusiasm for transferring power and authority is rare as are the tangible and intangible benefits that result from having the authority. If communities are hesitant about assuming responsibilities, and providing resources without some guarantee of benefits, it is not surprising that there is even greater reluctance from forestry staff to relinquish authority - for what do they have to gain?

In a recent article (Ramirez 1999, citing Kant and Cooke 1999) it was noted that in India forestry officials emphasised the future shortages of forest products in their discussions with the communities and did not inform them that they would also receive a share in the final timber harvest. No memorandum of understanding was drafted to specify the details of the agreement between the forest department and the forest committees - so the forestry staff were unaccountable. This resulted in communities uninformed of potential benefits and the responsibilities and obligations of forestry officials.

The sharing of information is a key issue, especially in relation to building trust and hindering exploitation. But as noted earlier, information has had a tendency to flow out of communities, not in to them. Participatory methods and tools created a new body of community-based information, but similar methods and tools were not implemented for gathering information from forestry agencies, donor agencies, and the private sector and sharing that information with communities.

CONFLICT MANAGEMENT

It has been said that natural resource management is conflict management—conflicts arise when there are resources for which decisions have to be made regarding management, access, rights and benefits. Natural resource conflict is "*not going to go away*" (Tyler 1999). There are no more 'resource frontiers'. All forest resources are 'owned', and it is to be expected that if there is a change in a forest management system, especially access and benefits, there will be conflict between those who stand to gain and those who stand to lose as a result of the changes (Tyler 1999).

Conflict management refers to a variety of collaborative approaches that seek to reach a mutually acceptable resolution of issues in a conflict through a voluntary process (Pendzich *et al.*, 1994). As with participation, conflict management has developed into a recognised field with its own methodology and tools. Buckles and Rusnak (1999) note that the field of conflict management draws many of its principles from North American experiences with alternative dispute resolution (ADR), which focus on collaborative approaches and the strategies of negotiation, conciliation and mediation (see Pendzich *et al.*, 1994). However, Buckles and Rusnak (1999) go on to note that what is considered 'alternative' in a Western context is not new and cites Castro and Ettenger's (1996) argument that "*...all legal orders... whether based on customary or state institutions, ... rely to varying extent, on the same basic procedural modes to handle disputes...avoidance, coercion, negotiation, mediation, arbitration, and adjudication.*"

What can be considered new, however, is the interest in building on the traditional practices or dispute resolution mechanisms, when traditional institutions exist and which can be modified to include the parties and context of contemporary problems (Lindsay 1998). This is possible where there is interest to link the traditional/local mechanisms to the external systems.

The general process used in conflict management is to some extent parallel to that used in the participatory approach: An assessment or appraisal (conflict management assessment [CMA]) (Warner and Jones 1998), stakeholder analysis (see Ramirez 1999), and if the process is successful, the development and implementation of a plan of action.

For our purposes, when exploring the role of conflict management in the changes occurring in community-based natural resource management, a distinction can be made between three major types of conflicts: Among or within the community, between communities, and community/community groups and outside organisations (Pendzich *et al.*, 1994; see also Warner and Jones 1998, for another classification system).

Among communities, conflicts can be further categorised as occurring among those directly involved in a particular resource (*e.g.*, a forest user group) or between those directly and indirectly involved (*e.g.*, a forest user group and non-group members entering the forest to collect fuelwood) (Warner and Jones 1998, citing Conroy *et al.*, 1998). Local community conflicts can be latent and result from basic inequities (*e.g.*, access to resources, caste, class, gender) and will require long-term commitment for change to occur where these changes are needed (*i.e.*, in the national policy and legal system which will then serve to support the changes that are needed at the local level).

Expectations are changing and redefining the once accepted roles of the members of the household, families and communities. A number of areas are important here:

- The growing access to information especially from organisations and agencies seeking to redress past inequities based on gender, caste, ethnicity, *etc.*
- Exposure to different values such as Western media, urban/rural interaction.
- Development initiatives, which often require participation of women, minorities, the disadvantaged, *etc.*; and
- The rise in the level of access to education (for women, minorities, the disadvantaged), the result of which is greater awareness of the world and the rise of new expectations.

While the pace may be quickening, conflicts within communities occurred in the past as well. In most communities there were mechanisms to deal with these conflicts. However, these mechanisms for managing conflicts reflected the societies of which they were a part, including their inequities.

Resource access, control, and benefits often mirrored the power of the elite, with the poor and disadvantaged, especially women, not able to effectively participate in the decisions concerning the conflicts. While inequities still continue, expectations are rising, support for participation and democratisation is expanding, and rights and procedures are becoming better understood.

Participation in decision-making is of central importance in natural resource management. Within the community, the dependence on forest products was and remains related to the other resources of the household members. It is common to find that it is the poorest households, with less agricultural land, livestock, labour, *etc.*, that are the predominant collectors of forest products (see Falconer 1990; Hegde and Daniel 1992; Lecup 1994; Malhotra *et al.*, 1992; Warner 1995). For these poorest of the poor households, while the actual amount of income earned from forest products may be small it may provide a large portion of household income. These are the households that are the most vulnerable to competition both within and between communities.

If an increase in internal conflicts occurs, it should not be assumed that it is an indicator of failure (*i.e.*, social collapse), but perhaps of success. The lid is off. Roles (and rules) are being redrawn, and the changes may result in a more equitable situation for many.

CONFLICTS WITH EXTERNAL AGENCIES

When disputes or conflicts arise between the community and government agencies, powerful private enterprises, or other resource users, traditional community-based mechanisms may not be effective (Buckles and Rusnak 1999). Communities and their members are at a disadvantage in conflicts with external agencies. The local/traditional mechanisms to regulate access to natural resources and the gathering of forest products are frequently not recognised by the state or state agencies. Among the mechanisms not recognised by the state are often the **rights of exclusion** whereby other communities or users can be excluded or their access regulated. Local resource management, even if supported by decentralisation, can be untenable if rights to exclusion are not granted.

The challenge will be in the development of mechanisms that build on the traditional, but are also effective in conflicts where there are disparities of power. For example, in the case of Joint Forest Management (JFM) mentioned above, the forestry officials were not accountable, but the communities were. If, for example, the state agencies do not keep to the agreement or if the community is accused of not following the agreement, what is the mechanism for managing the conflict? A similar problem has emerged in Nepal. Re-

cent studies have noted that complaints and disagreements between the forest user group and the forest department are resolved by officials, usually at headquarters, of the forest department (see Malla, 1995). The reliance on senior forest officials to solve conflicts creates a situation where communities are vulnerable to biases by the very agencies with which they are in disagreement.

With the recognition that the state is not the only stakeholder, that the perspective of other stakeholders must be included, there is a need to understand the cause of natural resource conflicts in their complexity, and to identify strategies for promoting change (Buckles and Rusnak 1999).

PARTICIPATORY FORESTRY: FROM FIELD TO POLICY AND BACK

Community forestry has shifted from tree planting to natural resource management, but the expectations as to the role of community forestry continue to evolve and expand. There has been growing frustration over the slow rate of change that is occurring in transferring forest management to local government and from local government to those who are dependent on forest resources. There is concern that if forest management is transferred to a district or municipal level, the local elite or special interests will be able to gain control. For those dependent on the resource to have a voice in the decision-making process, there must be mechanisms that link the village to the municipality or district. One of the challenges is that municipal or local governments may not have the knowledge, guidelines, personnel or other resources to support a system that enables input from local communities.

There is also a danger that initiatives will focus on the community, forest users or community groups, when decisions and planning continue to occur elsewhere. A generation of PRAs has provided a wealth of information on what is happening at the local level. Successful pilot projects have been conducted in many countries. Community forestry programmes have been implemented in a growing number of countries. Now is the time to take what was learned in the field and work to change policy.

There is a lingering problem with the term **community forestry**. It still carries connotations of tree planting, village woodlots, and a **community, a forest**. Yet community forestry is much more than this.

COLLABORATIVE MANAGEMENT

Collaborative Management is a term that is widely used and in its usage community forestry activities are often included. However, the focus of collaborative resource management on conservation and development is different from 'early' and current (see below) community forestry. Collaborative resource management has three elements (Fisher 1995):

1. Recognition of the legitimacy of values of development and conservation.
2. A view that development and conservation goals are not necessarily antagonistic; and
3. A commitment to some level of participation or collaboration in environmental management by local people.

As defined, collaborative management focuses on the externally defined goals, grants 'some level' of participation, but does not call into question who should be making the decisions. Collaborative management is too tightly linked to conservation and protected areas to be applicable on a wider scale.

A better term that is already being used by some agencies is **participatory forestry** — for it shifts attention to a continuing process that goes beyond a specific site (the community's forest) to participating in forestry decisions from policy to field and back (ODA 1996). Fisher (1995) cautions that *"the term 'participatory resource management' is not a useful term because there are many levels of participation, from a very token notion to a full role in decision-making."* However, rather than creating yet another term, I would suggest that participatory forestry be defined and used not for token but for a 'full role in decision-making.'

Participatory forest management and development if implemented as defined above would result in policy and activities that are designed, implemented, monitored, evaluated according to criteria in which the community was a partner in establishing, and revised through collaboration of the stakeholders. It is a shift from being a 'victim' of decisions made elsewhere to being a partner in forest resource management decisions (see Fisher 1995).

Success in participation does not mean coercion. Communities will differ in levels of participation in forestry activities. Sharing of forest management may not be a priority for a wide range of reasons, including the distance from the forest, degraded status of the forest, alternative source of tree and forest products *e.g.*, from a farm, or other opportunities to generate income or labour availability. Why, for example, should a community and its members assume responsibility for managing a forest area, providing policing services, if the benefits flow elsewhere, or if time spent on other activities provides more income?

CONCLUSION

While this paper has been primarily focused on communities, participatory forest management is not just about local communities, it is about a coalition of interested parties (ODA 1996; see also Anderson *et al.*, 1998). There are other stakeholders who should be involved in management of the forest resources. The concept of **pluralism** in forestry and rural development in which a "number of autonomous and independent groups with fundamentally different values, perceptions, and objectives demand a role in decision-making about natural resource management outcomes" is gaining attention as the approach of the future (Anderson *et al.*, 1998).

But is a pluralistic, participatory approach achievable? As Buckles and Rusnak (1999) note, as a result of the:

"Reduced power of governments, natural resource management decisions are increasingly influenced by resource users, who include smallholders and indigenous people as well as ranchers, large landholders, private corporations, and (hydropower) companies."

But do we have the mechanisms to do it? This is an area of major concern. The systems and mechanisms that supported the top-down central decision-maker did not work effectively if we use as the basis for evaluation forest maintenance and improvement in rural livelihoods. If the relatively simple top-down, state centered model did not work, how can the more participatory, pluralistic approach work? The participatory, pluralistic approach requires a paradigm shift on decision-making, roles, tasks and objectives. We do not have "well evolved systems to foster and support (multi-interest) stakeholders in decisions to design solutions collaboratively" (Tyler 1999).

But do we have a choice? Given the old failures and the new expectations, this should be a major focus of our efforts - to support the development of a partnership of communities, forestry agencies, the private sector and other stakeholders that will together explore and learn how to sustainably, and equitably, manage natural resources. This is the challenge.

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Summaries

La foresterie communautaire est elle-même en cours de transformation. Ses partisans et praticiens sont en train d'examiner ses hypothèses de base et ses buts afin d'élaborer une stratégie pour l'avenir. Cet article se penche sur les changements qui sont entraînés par l'intervention dans la foresterie communautaire et sur le rôle important que les méthodes participatives et la gestion des conflits jouent dans le cadre de sa transformation. Les vingt dernières années ont observé un transfert des initiatives de foresterie communautaire de la plantation d'arbres et de parcelles forestières à la gestion des ressources naturelles, en accordant une plus grande importance au partage des bénéfices et à la participation. Des conflits ont surgi et continueront de surgir sur les décisions qui devraient être prises, et par qui, en matière de gestion, d'accès, de droits et d'avantages. Le défi à relever consistera à mettre au point des mécanismes efficaces qui reconnaîtront les disparités de pouvoir et favoriseront une approche équitable pluraliste dans le cadre de la gestion forestière.

La silvicultura comunitaria está sufriendo un proceso de transformación. Sus defensores y los que la practican están revisando los supuestos básicos y las metas de esta práctica con el propósito de desarrollar una estrategia para el futuro. Este trabajo se enfoca en los cambios que están ocurriendo en la silvicultura comunitaria y el papel importante que juegan el proceso participativo y el manejo de conflictos en su transformación. Durante los últimos veinte años ha habido un cambio en las iniciativas de silvicultura comunitaria desde la plantación de árboles y bosquecillos hasta el manejo de recursos naturales dentro de un contexto que fomenta un reparto más amplio de los beneficios y una mayor participación. Han surgido, y seguirán surgiendo, conflictos en cuanto a las decisiones a tomar y quienes las deben tomar en lo que se refiere al manejo, el acceso, los derechos y los beneficios. El desafío será desarrollar mecanismos efectivos que reconozcan las disparidades de poder y que apoyen un enfoque equitativo de pluralidad en cuestiones de manejo forestal.

Adaptive Management: Potential and Limitations for Ecological Governance of Forests in a Context of Normative Pluriformity

Janice Jiggins¹ and Niels Röling²

Adaptive management is reviewed as a paradigm that addresses a widely perceived need to give more prominence to ecological imperatives. Its contribution to the management of complex problems situations is addressed with reference to the facilitation of social learning and the creation of institutions. The role of simulation modeling and ways to overcome social dilemmas are highlighted. Recent critical reflection on experience is offered with a deeper exploration of learning processes in adaptive management. Adaptive management is of particular relevance in forestry to aid forest managers to accommodate multiple interests. Community forestry and collaborative forest management provide illustrative examples of adaptive management within the forestry domain and illustrate its relevance.

INTRODUCTION

Adaptive management is short-hand for a paradigm that satisfies a widely perceived need to give more prominence to ecological imperatives, at a time when economics provides the dominant model for the future. The term 'adaptive management' was coined in 1978 by an inter-disciplinary team of biologists and systems analysts under the leadership of the Canadian ecologist Clarence Holling (Lee 1993). Adaptive management is a guiding principle for the interface between society and the biosphere:

"The release of human opportunity requires flexible, diverse and redundant regulation, monitoring that leads to corrective action, and experimental probing of the continually changing reality of the external world" (Holling 1995).

The formulation of adaptive management was based on detailed studies of complex ecosystems such as the Florida Everglades, the Columbia River, the New Brunswick spruce forests, the Baltic Sea and others in which humans play a dominant role (see for instance Gunderson *et al.* 1995; Holling and Sanderson 1996; Walters 1986; and Birkes and Folke 1998).

Adaptive management has become a dominant paradigm informing *real* attempts to manage large ecosystems in a sustainable manner. This important position is increasingly motivating critical reflection on adaptive management (see for instance Roe 1999).

Adaptive management has been gaining ground in response to a widely perceived sense of societal crisis. This perception is essentially concerned with the relations between people and their physical and biological environment, and the ways in which those relations are changing the function and capacity of the ecological processes on which human existence depends. The nature of change is seen as generating fundamentally new kinds of irreducible uncertainty. The conventional tools of risk assessment, planning and design, and the methodological and explanatory reductionism of conventional science are held to constitute an incomplete, inadequate, and an inappropriate toolbox for the construction of the future in situations in which *surprise* becomes increasingly determinant of outcome.

Various authors have described this crisis. Funtowicz and

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Ravetz (1993) speak of *post normal science* now that we are faced with great uncertainty with respect to issues for which the stakes are high. Post-normal science goes beyond *normal* (in the Kuhnian sense) problem solving science and beyond consultancy. It represents widespread involvement in, if not a total democratisation of, science. It is, therefore, built by *extended peers* and includes such *extended facts* as what people believe about an issue.

Beck (1992) has called ours a *risk society* which requires reflexive modernisation, *i.e.*, deliberate self-reflection about the future we are designing. Such deliberate social construction of the future seems the only way forward now that science is widely seen to have become part of the problem.

Lubchenco (1998) identifies the *eco-challenge* as the basis for a new social contract for science. The eco-challenge has been created by people, as a major force of nature. Human survival depends on human understanding of the impact of human activity on the biosphere and on concomitant adaptation of human activity on the basis of this understanding. For Lubchenco, science is not part of the problem but very much a source of solutions.

In his review of the state of the art of the life sciences, Capra (1996) shows how human life is inextricably part of an evolving complex web of life that sets the conditions upon which continued human survival is predicated. "*A major clash between economics and ecology derives from the fact that nature is cyclical, whereas our industrial systems are linear. ... the market gives the wrong information*" (Capra *op cit*).

It is in this context that adaptive management has come to the fore. It is an approach to the management of complex systems based on incremental, experiential learning and decision-making, buttressed by active monitoring of and feedback from the effects and outcomes of decisions. It is thought to offer three important benefits. One is that it might avert crises in conditions of uncertainty and surprise by increasing societal capacity to 'roll with the punches'. A second benefit is that it offers a social steering instrument complementary to market, fiscal, regulatory and normative measures that strengthens broad scale, multi-stakeholder engagement in the evolution of more sustainable relations between people and their environment. Thirdly, it offers a way in which universalised abstractions of science, and the technologies which flow from science, can be re-coupled with lay persons' knowledge of reality-in-context, and with the values and meanings which inspire and motivate people at local levels of interaction.

Through adaptive management, the lesson is being learned, or perhaps re-learned, that consequential actions are always and necessarily specific, and embedded in the historical causalities of particular contexts. Adaptive management translates essential ecological understanding based on

extended studies of complex ecological systems into localised implications for human society, and more specifically for human (social) learning and institutional change in a context. It is this promise that gives adaptive management its policy impact and influence.

This article analyses basic ideas behind adaptive management, reviews the credibility of its promise, and applies adaptive management to the field of forestry.

ADAPTIVE MANAGEMENT'S PROMISE: THE MANAGEMENT OF COMPLEXITY

Adaptive management addresses the *management of complex systems*. Complexity is seen as arising in open, non-linear systems. While basic understanding of complexity is increasing, it would appear by definition impossible to build a body of scientific knowledge that allows prediction and control. We can map and model single, or even multiple relationships, but not a total set of evolving interactions (Waldrop 1992). Secondly, complexity refers to emergence, *i.e.*, the fact that relatively simple events at the micro level may lead to the emergence of complex phenomena at the macro level. In other words, properties emerge at system levels that cannot be predicted by knowledge of lower level components and their interaction (Holland 1995). The focus of attention shifts from the components and their relationships, to structural dynamics.

Unfortunately, human beings do not seem to be very good at making decisions that produce desired effects in complex problem situations. Their tendency demonstrably is to isolate and treat specific aspects (components) of a problem, and to become hooked into commitments to particular courses of action, which typically *solve* local or partial dilemmas while making systemic and long-term outcomes more problematic. Dörner has called this "*the logic of failure*" (Dörner 1996).

Adaptive management offers an umbrella under which new approaches to dealing with complexity can be profiled and related to each other. We shall focus on two: Social learning and institutions.

Social learning, recognised as a key ingredient of adaptive management (Parson and Clark 1995), is usually seen as learning by a collective. That is, groups, communities, or organisations can collectively learn on the basis of shared perception of problems, their causes and solutions, and agreement on goals and take concerted action. As part of a complex evolving system, human communities that rely only on bodies of tradition or inherited knowledge are vulnerable to surprise. Many studies show societies in fact to be capable of rapid social learning, that is, of evolving new knowledge ("*effective action in the domain of existence*" [Maturana and

Varela 1992]), even if that means discarding cherished traditions. However, studies of societies that have collapsed show that people are also perfectly capable of persisting in entrenched ways long after environmental feedback has shown these to be no longer sustainable (Pain 1993). One of the risk factors is the role of elites who use their access to resources, power and privileges to maintain life-styles long after the imprudence of doing so has become evident. In this respect, George Bush's remark at UNCED 1992 that "*the American life style is not negotiable*" is a reminder that such mechanisms are also operative today.

Given the importance of breaking through entrenched ways, and the desirability of optimising ways in which societies are sensitive and responsive to environmental feedback, it is small wonder that social learning, and the facilitating of learning, have become hot topics of research (see for example Maarleveld in prep.). Of particular interest are the factors involved in turning around the reliance on the free market as the best model for society, since the market fails in bringing about adaptive management of natural resources and ecological services (Rölling and Maarleveld 1999³).

The facilitation of social learning within the framework of adaptive management typically emphasises two approaches. One is the development by system stakeholders of *visions* or pictures of future states, which they consider desirable (Weber 1995). The envisioning process can be both formal, relying on high tech simulation of future scenarios derived from objective data (see for example Gilbert and Triotzsch 1999), and informal, incorporating values and frameworks of meaning. A variety of back-casting techniques then allow, within transparent procedural processes, the sketching of the steps necessary to shift the system toward a desired future state.

The second approach to facilitation of social learning, and one which has become a core of adaptive management, is the interactive use of simulation models of such complex systems as the Everglades (Gunderson *et al.* 1998) the Upper Mississippi Catchment (Light *et al.* 1998), or the Balinese water temples (Lansing 1991). These models are used with groups of decision-makers and stakeholders in the complex ecosystem as a basis for understanding those systems and for taking decisions to regenerate them. Interactive simulation modelling seems exceptionally promising for social learning of complexity management, and is going through very rapid development, but so far, no clear results have been achieved (see also the next section: A Critique). In addition

to conventional simulation models based on differential equations built around objective values and coefficients, multi-agent simulation is rapidly emerging because it allows model situations in which the outcomes are determined by the interaction of autonomous cognitive agents such as human stakeholders (Jennings *et al.* 1998; see also Gilbert and Triotzsch 1999 and Rölling in press⁴). Multi-agent simulation is in a very early stage of development and so far only a few efforts have been made to use it interactively.

Institutions are another complex of ideas that are explored under the umbrella of adaptive management. This exploration emphasises the role of institutions as the mechanism that couples people to their environment. This institutional strand has received considerable publicity, largely through the work of Elinor Ostrom (Ostrom 1990, 1991, 1992, 1998; Ostrom and Schlater 1996; Ostrom *et al.* 1994) and of Fikrit Birkes and Carl Folke (Birkes and Folke 1998). They have taken two somewhat different although strongly complementary paths. Ostrom and her group of international researchers examined in great detail common pool resources, and the principles of common property resource management. They have complemented their field studies with laboratory experiments, based on Game Theory, to elucidate further the conditions and principles identified in field studies. This work addresses the pervasive issue of social dilemmas, for example, the tendency for people to continue to destroy their environment because they expect others to do so too and are reluctant to change their ways unless reciprocity can be depended upon. Ostrom and her colleagues address this issue by analysing the institutional conditions under which such selfish choices can be turned around into situations in which people feel they can afford to make co-operative choices and engage in concerted action. Uphoff (1992) describes how facilitation of institutional development in an irrigation project could lead to such a turn around. The results of such studies provide deep insight and clarity at the principle level; however it is not as yet clear how useful these will prove to be as guidelines for action and institutional design elsewhere, since one of the clear lessons is that history and context matter. The specific ways in which principles are mixed and operationalised lead to great diversity, not to simple transferable models. Antecedents and environment are causative; the dynamic is evolutionary and not designable (in any blueprint fashion at least).

Birkes and Folke and their colleagues have explored the achieved and potential role of institutions in matching socio-

³ *In which we argue for interactive effectiveness. This paper was produced for a Panel Session on Multiple-use CPRs, Collective Action and Platforms for Resource Use Negotiation. 'Crossing Boundaries', 7th Conference of the International Association for the Study of Common Property Vancouver, Canada, June 10-14, 1998.*

⁴ *Specifically chapter by Leeuwis et al.*

economic dynamics more closely to ecological dynamics, taking Holling's "lazy eight" description of system states (exploitation, conservation, release and reorganisation; Holling 1995) as one of their starting points. Their work offers the potential for guided institutional reform and evolution coupled with greater sensitivity to ecological process. One of their key questions is the extent to which institutional diversity confers resilience and, if so, at which system level(s). Another concern is the extent to which it is possible, or even desirable in the cause of conserving ecological resilience, to articulate institutional relations across different temporal and spatial scales in ways that match the varying cycles of ecological dynamics.

Researchers working on the institutional aspects of adaptive management have been particularly influential in the United States, where large-scale adaptive management, for example with respect to the Everglades (Gunderson *et al.* 1998); the Columbia River (Lee 1993) or the Upper Catchment of the Mississippi River (Light *et al.* 1998), has produced important lessons (for further information see the next section: A Critique).

International bodies of evolving practice, such as watershed management, nature conservation, community forestry and landcare, with their emphasis on stakeholder learning, and concerted action through institutional development, offer promise of the feasibility of adaptive management.

In all, adaptive management is a promising idea in a world starved of good news. It is an umbrella that gives added meaning to a number of important intellectual developments in recent years. Adaptive management elaborates the observations of the Chilean biologists Maturana and Varela (Maturana *et al.* 1992) with respect to organisms operating as cognitive systems in their environment. According to the Santiago School of Biology and Capra (1996)⁵, organisms can not perceive "the real world out there". There is no way by which the external world could be projected onto the nervous systems of organisms, nor do other mechanisms exist by which they could receive objective information. In fact, organisms are *informationally closed* because the mechanisms in the outside world (*e.g.*, light and sound waves) are totally different from those operating in the nervous systems (neurological processes). However, changes in the outside world can trigger changes in the nervous system. Thus organisms bring forth a world. But it is not any world. Through their mutual perturbation, organisms and environment maintain vital structural coupling. Hence, organisms must bring forth a world that allows them to engage in effective action in their domain of existence. Adaptive management elaborates on these general insights of modern biology for

the case of human society and language-based social learning.

A CRITIQUE

Although generating numerous success stories, the last decade of adaptive management has also given rise to more critical reflections. These might be summarised under the following six headings.

THE POLITICIANS' DILEMMA

Politicians and bureaucrats asked to invest in, and support, adaptive management as experiential learning, have become somewhat sceptical. Experiential learning at the scale of major ecosystems such as the Everglades is (very) costly and takes considerable time. The outcomes of such learning are basically 'unfinished' in that they always require further experiments and seldom lead to conclusively cut-and-dried answers that politicians need. They reasonably ask, when does the experimentation provide results that can form the basis of policy formulation? When such results would become available, they would still need to be translated from the ecology/society interface into political decisions. (Roe 1999).

UNWARRANTED EXTENSION

Emery Roe (*op cit*) has pointed to the growing tendency to claim adaptive management as *the* approach to the management of societal change, rather than as *one* approach, apt for certain problem situations, but not for all. He identifies four characteristic states, of which only one (the second) would suggest an adaptive management application. Briefly the four states are:

1. Situations in which human activity has a low impact with evolution of environmental quality driven largely still by ecological processes;
2. Situations in which environmental change is driven by high impact human activity, which threatens to undermine essential ecological functions and capacity;
3. Heavily history-rich, context-laden situations which must be addressed as unique cases; and
4. Situations already in crisis, in which there is contest and confrontation over socio-economic and environmental futures.

The challenge then becomes to match the approach to the situation and, perhaps also, to develop ways in which situation

⁵Specifically the final chapter which provides a descriptive overview.

4 might be modulated into situations 3 and 2.

SCENARIOS AND MODELS AS TRAPS

As we said earlier, the interactive use of computer-supported simulation models has become an important and promising tool for adaptive management. However, three problems have emerged with respect to the interactive use of complex simulation models. In the first place, typically the models are too complex to be easily understood by stakeholders themselves and require highly skilled mediation that does not add to the transparency of the modelling. In this respect, simple models constructed by stakeholders themselves rather than by experts, such as the physical clay models of irrigation schemes used by CARE in Bangladesh, are more effective. In the second place, scientists' tendency to try to develop *true* models interferes with interactive learning (Frost in press). Thirdly, it has proved hard to translate the understanding gained through modelling into political action. Much work remains to be done in these areas. Interactive tools which allow interrogation of diverse scenarios, gaming simulations that admit the messy human interactions of real life, and multi-agent modelling are three interesting lines of exploration.

CROSS-SCALE PROBLEMS

Spatial scale issues in adaptive management have begun to yield to innovative mixes of methodology and process. For example, the combined use of participatory resource inventories and maps, global positioning systems technology, and a computer-based Geographic Information System (GIS), allow the visualisation of spatial dynamics at various scales, and qualitative assessments of state variables and trend values which are based on local knowledge and which are *owned* by local stakeholders (see Powell 1999; Gonzalez 1999; and Campbell 1994). Such mixed methodologies allow stake-holders to envisage their environment in a systemic way and to become aware of how their own immediate surroundings fit into a larger picture that affects other stakeholders. Such methodologies are, therefore, a necessary basis for building platforms for resource use negotiation (see for example Röling 1994, 1995; Röling and Jiggins 1998; Steins

1999). Temporal scale problems have proved to be more intractable. A typical example is provided by inter-generational differences in future equity stakes, as present generations discount the value of a healthy environment for future generations. The articulation of action among different scale levels, and of cascades or pulses of action among nested hierarchies, are proving similarly intractable. Solving problems at one level does not automatically add up to solving problems at another system level with different emergent properties. For example, pushing local advantage might undermine the development of a larger unit, and vice versa. Similarly, the very fact that simple and innocuous activities at the micro level might lead to the emergence of complex and undesirable phenomena at the macro level means that it is difficult to convincingly work back from the macro to the micro level. Thus, it is difficult to demonstrate that desired change at the micro level leads to desired change at the macro level. One innovative attempt by Sylvio Funtowicz and his group interactively uses computer models in small groups to create awareness of the larger ecological footprint and the emergent effects of everyday household activities.

BOUNDARY PROBLEMS

The theory of holarchy⁶ (see Capra 1996) implies that adaptive management is possible only within a defined system boundary. There is no objective way to establish boundaries in socio-economies; to the extent that boundaries exist, they do so as a result of historical processes of negotiation and use of power. Adaptive management approaches must thus embrace "*soft system thinking*" (Checkland and Scholes 1990) and procedures which assist stakeholders in a situation *defined by someone as problematic* in order to negotiate the definitions of the boundary they propose to manage adaptively. Adaptive management, in fact, is possible *only* within a boundary, even if that boundary encompasses the entire biosphere. In fact, problems such as the depletion of the ozone layer can only be tackled successfully at the global level. This does not repudiate the need for that boundary to be agreed upon and for concerted action to address the system agreed upon. The theory of holarchy also necessarily assumes that the rate of external change is relatively stable, as is the nature and intensity of change. This may pose a fundamental limitation to the applicability of adaptive management. The mounting evidence from a whole range of

⁶The theory, coined by Koestler (1967), suggests that systems are whole, evolving, emergent, and nested. Every system can be considered both an integral part of a larger system (looking up') and an autonomous entity (looking down'). A holon therefore faces the dilemma of choosing between integration and self-assertion. A holarchy comprises nested systems. Since systems are human constructs, their boundaries are always arbitrary and often negotiated. Management of ecosystems is inconceivable without the stakeholders in those systems agreeing on the boundaries of the nested systems with which they are trying to deal.

measures is that the rate of change is exponential, and that the nature and intensity of change is producing unpleasant surprises.

THE FEASIBILITY OF LARGE-SCALE CONCERTED ACTION

A key assumption of adaptive management is that social learning will lead to concerted action at the scale of the ecosystem being managed. In the case of such ecosystems as the Everglades or the Baltic Sea, for which it has so far been difficult to establish effective management regimes, this scale is many times larger than the scales at which common property regimes have been successfully established. Common property regimes are those in which stakeholders (Grimble and Wellard 1996) agree to act in the common interest because institutional arrangements have been created which give confidence that others will reciprocate, especially with respect to *taking less* from the common pool resource, or *giving more* to the public good. So far, common property regimes seem to be successful at scales at which personal interaction and inter-subjective agreement are possible. This raises the question whether social learning involving larger ecosystems can be translated into concerted action. Decentralisation of adaptive management to area-based or community-based approaches, though advocated by, for example, the eco-regional approach (see for example Dore and Woodhill 1999) would run into cross-scale problems mentioned above⁷. As problems of, for example, reducing global warming demonstrate⁸, the need to take large-scale action is not just an abstract problem affecting adaptive management theoretically, but a very real survival problem for humans and most other species also. The key issue is the willingness of people to adapt their desired life styles and economies to agreed-upon outcomes instead of the other way around. Large-scale concerted action to regenerate the biosphere is relatively easy wherever it is possible to do so without compromising the socially constructed life-styles and economies of the time (*e.g.*, agreement on ozone depletion). Though among the most ephemeral, most socially constructed factors in social change, standards of living, life styles and other expressions of human intentionality seem to be the most intractable problem in achieving a sustainable soci-

ety. So far, adaptive management has not addressed the issue of how human ends can be adapted to ecological means.

HELPFUL PERSPECTIVES

This section reviews important ideas current in studies of learning, adaptation, and intelligence.

EVOLUTIONARY PSYCHOLOGY

Empirical research and theoretical developments have deepened understanding of how "*nurture has nature*"⁹ (Plotkin 1997). The evolutionary variation, selection, and retention of constrained intelligence in humans are nested in embodied structures with potential for learning. While the specific mechanisms for learning remain unclear, important clarifications are emerging. One is that learning mechanisms function to facilitate goal-directed interactions with the features of the world for which the learning is adaptive, *i.e.*, learning is both the originator and the adaptive solution to the constructed world. Learning always has an adaptive outcome (Clark 1997). A second clarification is that biological organisms, including humans, do not have access to an indefinitely large search space or a number of search paths. They are constrained by their antecedent evolution and the scope of the senses by which they are structurally coupled to the world (Maturana and Varela 1987). A third clarification is that, since our intelligence is biologically constrained, we can learn about the world only by acting upon it. Thus what we need in adaptive management is an agreed and declared, systematic procedure for socially constructing reality in agreement with empirical adequacy (Van Fraassen 1980). Finally, our evolved minds seem to have an inherited capacity to recognise both physical and social causation (Plotkin 1997). Research has so far not searched for evidence of a similar ability with respect to ecological causation. It would seem plausible that the millions of years during which humankind's ancestors depended on their ability to capture opportunity from complex ecosystems would have led to a human mind with a fine sensitivity to ecological dynamics.

⁷ *Common property management scholars suggest that it is nevertheless better to manage large scale ecosystems by decentralising to levels with which human management can cope. For further information see Ostrom 1998.*

⁸ *The agreements made in Kyoto to implement control of global warming have not been met. In fact, carbon dioxide emissions seem to be a function more of economic growth (*e.g.*, Russia for the case of declining emissions and the Netherlands and Australia for rapidly increasing emissions) than of international agreements.*

⁹ *One of the key issues evolutionary psychology addresses is evolved nature of mind. For a long time psychologists (especially behaviourists) assumed that people were born (nature) with a mind that could be called a 'tabula rasa', an unwritten sheet of paper that would be filled by socialisation and experience (nurture). According to evolutionary psychology, it seems highly unlikely that the thousands of years that people have lived as hunter/gatherers has not affected the evolution of the mind and its capacities.*

INSTITUTIONS

Human beings have developed unique additional capacities operative in the social rather than the biological realm. One of these is the creation and use of institutions, which both define the scope for, and constrain the search space and pathways of goal-directed behaviour¹⁰. In so far as the effects of human behaviour upon our environment appear to threaten continued human enjoyment of life-giving resources, our behavioural goals must change, and thus also must our institutions be purposively recreated.

CULTURE

Another human capacity is culture, here understood as the shared knowledge and beliefs through which we socially construct value and meaning. Our cultural artefacts, too, have causal power: A dollar bill is physically nothing but a piece of printed paper, but the money markets through which it is exchanged decide the quality of life each of us enjoys. In so far as we seek to adapt our culture to be less predatory on our environment, then we must examine afresh the processes by which knowledge and meaning are generated and shared, and the use to which we put our cultural artefacts.

LANGUAGE

The aspect of language that concerns us here is as a mechanism for bringing forth institutional and cultural change, *i.e.*, its power for communicative action. This concept, invented by Jürgen Habermas (Habermas 1984, 1987), has generated immense hope and optimism because it posits an alternative to the more familiar instrumental action (using physical causation to gain control) and strategic action (using social causation to win). In fact, according to Habermas, communicative action can counter the invasion of the life world by the economic and technical systems we have created, in that human beings can agree to do things differently. In that sense, language can be seen as an artefact for self-willed social causation, a concept not dissimilar to Beck's "*reflexive modernisation*" (Beck 1994).

We believe that taken together, the emerging perspectives on evolutionary psychology, the biology of the mind, and the role of institutions, culture and language in adapted change, greatly strengthen our ability to design management proc-

esses that underpin sustainability. We will illustrate this briefly with reference to Community Forestry and Collaborative Forest Management.

ADAPTIVE MANAGEMENT IN FORESTRY: A LEARNING PERSPECTIVE

As discussed above, originally the adaptive management approach was developed for concerted action at the level of large-scale ecosystems such as the Everglades or Baltic Sea. Gradually increased attention is also being given to apply this approach for smaller-scale ecosystems such as forest ecosystems. For instance, the newly evolving *Ecosystem Management* approach in the USA involves the principles of adaptive management (Grumbine 1994). Indeed, adaptive management seems to hold a major promise for forest management. Due to the multi-functional character of forests, forest managers are faced with a variety of demands by various stakeholder groups concerning forest use. During the last decade it has become increasingly clear, that various stakeholders have, and probably will have, different, and often conflicting, experiences, positions and opinions as regards forest management (Anderson *et al.* 1998). Consequently, there is no single, absolute and permanent solution to what should be considered as the most rational approach to forest management. In viewing this normative pluriformity surrounding forest management, it is no longer possible for forest managers to base activities on standardised technical measures derived from the objective of the forest owner. Rather, they have now to conceive of forest managers as providing social values to various groups of forest owners. As the required social values of different stakeholders do not necessarily coincide, and even may conflict, this means that a major task of forest managers should be to act as engaged customer facilitators and negotiators (Kennedy *et al.* 1998).

In view of the normative complexity regarding forest management, it is increasingly recognised that exclusive management by a single, professional entity does often not ensure sustainable forest management (Vira *et al.* 1998). There is a growing consensus that without basic agreement amongst the local stakeholders about what, and for what, purpose the forest resources should be maintained, sustainable forest management cannot be achieved and forest degradation will continue. Consequently much attention is now being given to the principle of involving local stakeholders in forest conservation and management. This can be accom-

¹⁰ *Institutional economists, such as North (1990) look upon institutions as ways by which people solve the problem of imperfect information or bounded rationality, a term first coined by Herbert Simon.*

plished by either allowing local communities to establish their own forest management systems (= community forest management), or by basing forest management on shared government and community authority (= collaborative forest management) (Fisher 1995 and Wiersum 1999a).

When stimulating community involvement in forest management, conflicting perspectives as to the global ecological imperatives and community-level livelihood imperatives frequently emerge. Moreover, local communities and professionals have often radically different values, perceptions and objectives in forest management (Wiersum (1999b). Consequently, an adaptive approach to forest management is of particular importance in community and collaborative forest management. This experimental approach to learning and decision-making, which involves all relevant stakeholders in the process, should be able to accommodate the pluriform interests of stakeholders and allow establishment of sustainable agreements that serve both human and environmental needs (Babin and Bertrand 1998).

adaptive management practices to large-scale system management, rather than seeking creative, decentralised opportunities and ways of linking these.

Finally, there remains the challenge of linking understanding of complex anthropogenic change back to feasible political action.

CONCLUSION

This article has reviewed adaptive management as a powerful idea that brings together numerous strands of disciplinary theory, research and practice. It consolidates these within a normative frame for the management of complex problem situations, the key concern of our time. Our review, however, suggests there are four areas which merit further theoretical development and experimentation.

The first is lifestyles, better covered by the more general term 'human intentionality'. Of the three essential elements in (collective) cognitive systems, perception, action, and intentionality (Maturana and Varela 1987 and Capra 1996¹¹), current work in adaptive management, through its focus on social learning for collective action, seems to address mainly the first two while leaving intentionality untouched. This leaves learning vulnerable to the introduction of substitute *quick fixes*, which do not necessarily address the principle that local people are experts regarding their own livelihood conditions', or the need to bring farmers' and society's objectives in line with ecological imperatives.

The second concerns the point at which learning occurs. The evidence so far suggests that the impact will be greater when learning processes are devolved and dispersed among citizens rather than largely confined to officials, experts, and interest groups.

The third is the unwarranted limitation of many present

¹¹Specifically the final chapter.

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Summaries

La gestion adaptative est examinée comme un paradigme qui aborde le besoin largement perçu d'accorder une plus grande importance aux impératifs écologiques. Sa contribution à la gestion de situations problématiques complexes est abordée dans le cadre de la vulgarisation des connaissances sociales et la création d'institutions. Le rôle de la modélisation dans la simulation et des moyens de surmonter les dilemmes sociaux sont mis en valeur. Des réflexions critiques récentes sur l'expérience sont offertes avec un examen plus approfondi des méthodes d'acquisition de connaissances en gestion adaptative. La gestion adaptative est d'une importance particulière dans la foresterie afin d'aider les gestionnaires de forêt à prendre en compte des intérêts multiples. La foresterie communautaire et la gestion collaborative des forêts fournissent des exemples caractéristiques de la gestion adaptative dans le domaine de la foresterie et illustrent son utilité.

El manejo adaptativo es analizado como un paradigma que abarca la necesidad ampliamente percibida de dar mayor importancia a imperativos ecológicos. Su contribución al manejo de situaciones problemáticas complejas es tratada haciendo referencia a la facilitación del aprendizaje social y a la creación de instituciones. Se destaca el papel del modelado de simulaciones y de las formas de superar los dilemas sociales. La reflexión crítica reciente sobre la experiencia se ofrece con una exploración más profunda de los procesos de aprendizaje en el manejo adaptativo. El manejo adaptativo es de importancia particular en la forestación para ayudar a los administradores de recursos forestales a tomar en cuenta intereses múltiples. La forestación comunitaria y el manejo forestal colaborativo constituyen ejemplos de manejo adaptativo dentro del campo del manejo forestal y ejemplifican su importancia.

Adaptive Management: A Learning-approach to Decision-making in Forestry

K.F. Wiersum¹ and R.J. de Hoogh²

Adaptive management and collaborative management emerged as new approaches in forest management in highly-industrialised nations and tropical nations respectively. A basic understanding of adaptive management is that the interface between large-scale natural resource systems and social systems is often characterised by uncertainty and surprising developments regarding both the ecological and social aspects. In order to address such uncertainty a social learning approach is needed based on a process of experiential decision-making and monitoring. A basic understanding in collaborative management is that national forest interests should be combined with the interests of local communities regarding forest resources. This demands the recognition of pluriform world-views and cultural values, and the specificity of global and local interests. It is a challenge to combine the two approaches and to decentralise adaptive management to include the community-based approaches of collaborative management. This requires new planning and monitoring techniques, in which specific attention is given to negotiating interests and mediating conflicts.

INTRODUCTION

During the last two decades much attention has focused on developing new approaches to forest management. These developments originated relatively independently in the highly-industrialised nations in Europe and North America and in the lesser-developed tropical countries. In the industrialised countries these developments emerged in response to the changing social values of forests. Firstly, due to the growth in welfare and mobility, the recreational values of forests were increasingly appreciated. Secondly, due to the growing concerns about pollution and environmental degradation, appreciation for the biodiversity value of forests gained in importance. And thirdly, due to the general trend in democratisation, forest users increasingly voiced their concerns about the state of the forests and their management. Consequently, forestry underwent a rapid

and deep-seated change (Gordon 1994) which profoundly affected the process of decision-making about forest management. The increased emancipation of various stakeholders means that it is no longer possible for forest managers to base their activities on standardised technical measures, derived from the objectives of the forest owner.

Rather, forest managers need to conceive of forest management as providing for social values, and pay attention to how the quality of delivered products and services are perceived by various groups of forest users (Kennedy *et al.* 1998). Moreover, the increased appreciation of the ecological and biodiversity values of forests means that increased attention has to be given to conceive of forests as ecosystems rather than as resources (Bengston 1994; Callicott and Mumford 1997).

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In the tropical countries an independent, but similar process of change in ideas concerning forest management took place (Wiersum 1999). These changes were predicated on the finding that the traditional approach to forest management based on professional management of mostly state controlled forest lands had not been successful in controlling deforestation and forest degradation, while providing essential forest products and services to forest-dependent local communities. In response, new approaches to forest management were developed which emphasised the need to involve local communities in forest management (Arnold 1991; Wells *et al.* 1992; Fisher 1995). This community forestry approach requires that not only national interest in forest management (revenue earning through timber production and watershed protection) should be considered, but also local level interests (forest foods, fuelwood, cultural values). In many cases, the national and local demands for forest products and services conflict with each other. Consequently, in tropical forest management it has become necessary to search for ways to accommodate conflicting demands (Anderson *et al.* 1998).

ADAPTIVE MANAGEMENT AND COLLABORATIVE MANAGEMENT

As a result of these developments, two major new approaches to forest management were identified in the 1990s: Adaptive management and collaborative management. As described in the articles of Jiggins and Röling, and Lescuyer in this publication, the term adaptive management was originally coined in the late 1970s in an affluent society, where social concerns regarding the need to maintain natural ecological processes were strong. Adaptive management specifically addresses the uncertainties involved in the functioning of large-scale and complex ecosystems (Jiggins and Röling in this publication). Adaptive management partly builds upon emerging new concepts in ecology about non-stationary systems and the role of unpredictable events. Moreover, it adds to the notion that natural systems and social systems co-evolve: A change in the natural environment has an influence on the way resources are used and *wiceversa* (Lescuyer in this publication). Thus, newly emerging ecological understanding has implications for environmental management. A basic guiding principle is that management should be based on *"incremental, experiential decision making, buttressed by active monitoring of and feedback from the effects and outcomes of decisions"* (Jiggins and Röling in this publication) in order to be able to deal with conditions of uncertainty and surprise which often characterise the interface between society and the biosphere.

Collaborative forest management builds on the community forestry approach that evolved in tropical countries. The community forestry approach focuses specifically on the roles of forests in the local livelihood systems and the manner in which local communities have been, or can be organised to successfully manage forest resources themselves (Wamer in this publication). The concept was originally developed to emphasise the need for improved management of forest resources on village and private farmlands. But gradually attention also became focused on community involvement in managing state forests and other protected areas. This approach is often characterised by terms such as Joint Forest Management or Collaborative Forest Management (Fisher 1995). They are based on the guiding principle that the management of protected areas is best assured by official state control coupled with active involvement of local villagers in managing these forests. Thus, official ownership, as well as overall responsibility for the formulation and executing of management plans rests with the public administration, with a major part of the responsibility delegated to local community groups that receive (long-term) forest occupancy or forest utilisation permits.

In both community forestry and collaborative forest management it is taken for granted that various stakeholders have different perceptions concerning the importance of the multiple outputs of forests. Thus, much attention is given to the decision-making processes involved in forest management and the resolution of conflicts inherent in the use of forest resources (Anderson and Leach in this publication).

Due to the differences in the socio-economic and environmental context in which the concepts of adaptive management and joint/collaborative management emerged, there are some important differences in their features. This is illustrated in Table 1, which compares some characteristic features of adaptive forest management in North America and joint forest management in India.

As indicated by Jiggins and Röling (this publication), it is a challenge to combine the two approaches, to decentralise adaptive forest management, and to include community-based approaches. This challenge is now being addressed in new efforts to develop local-level adaptive management systems, such as Adaptive Collaborative Management (CIFOR 1998).

PLURIFORM WORLD-VIEWS AS A STARTING POINT FOR LOCAL-LEVEL ADAPTIVE MANAGEMENT

Forest management has been defined as the process of making and implementing decisions about the use and maintenance of forest resources and the organisation of related ac-

	Adaptive Forest Management	Joint Forest Management
Basic consideration	Eco-challenge based	Livelihood-challenge based
General objectives	Involving local communities in ecosystem management should assist in achieving conservation objectives and sustain forest communities	Involving local communities in forest management should contribute towards both community empowerment and forest conservation
Environmental aim	Maintain ecological processes	Rehabilitate degraded lands
Aim of production	Adaptation of commercial timber management	Basic-needs forest products
Scale	Eco-zone 400 - 1000km ² (40,000 - 100,000ha)	Communal/group managed forest areas up to 4km ² (400ha)
Interpretation of community	Administrative village	Specific forest-user groups
Boundary setting	Forest Department	Jointly decided by Forest Department and user groups

Table 1: Comparison of Adaptive Forest Management in North America (Danks in this publication) with Joint Forest Management in India (Hobley 1996).

tivities (Duerr *et al.* 1979). As indicated by this definition, decision-making is an essential ingredient of forest management. Often it is assumed that the main focus of decision-making in forest management concerns the selection of silvicultural practices. However, in reality a much wider array of decisions has to be made *i.e.*, on the precise objectives for forest management, on the socially-acceptable distribution of forest products, and on the most effective way to organise forest management. As discussed above, originally it was assumed that such decision-making could best proceed within the framework of a government administration with decisions being based on professional judgements. However, in adaptive management a much wider array of opinions needs to be taken into account.

In trying to accommodate the various interests of different stakeholder groups one is confronted with the fact that quite diverse perceptions concerning the value of forests and its resources exist (Colby 1990). While some people do conceive forests primarily as resources for providing utilitarian and environmental services to the human society, other people incorporate forests into their cultural and religious value systems. Thus, forests are endowed with both resource and emotional values, and perceptions about the nature of forests are pluriform.

In planning local-level adaptive management, these pluriform world-views need to be taken into account (FAO 1999). Especially in tropical countries, but also in countries in temperate regions such as Canada and New Zealand, many projects endeavouring to introduce local-level adaptive man-

agement are carried out in co-operation with tribal groups. In such cases, important discrepancies in world-views do exist between the local communities and the members of the external development organisations. Much care needs then to be taken to ensure that the cultural values of the local communities are taken seriously and that they are duly incorporated into the process of decision-making.

In this volume Dankelman describes the various features of indigenous (locally evolved) world-views (or cosmovisions). This paper illustrates the importance of the need to recognise the specific nature of the value systems of local communities, and tries to reconcile such local values with the global values, which (supposedly) underlie the external interventions to stimulate local-level adaptive management.

MANAGEMENT AS A SOCIAL LEARNING PROCESS

As indicated earlier, a basic feature of adaptive management is that management is considered an evolving process of incremental and experiential decision-making, as well as active monitoring and evaluation of the effects and outcomes of those decisions. This means that social learning is a key ingredient of adaptive management (Daniel and Walker 1996; Jiggins and Röling in this publication). Originally, the social learning approach to adaptive management was focused specifically on the uncertainties and surprises associ-

ated with basically unpredictable environmental results of the interactions between social and ecological systems. In contrast, in collaborative management terms, much attention has been focused on the need to carefully consider social and institutional aspects regarding forest management. Consequently, the collaborative management approach places much more emphasis on a social learning process regarding uncertainties and surprises associated with social processes. Obviously, both the ecological and social dimensions of the social learning process are important, and adaptive management should incorporate both dimensions.

A major feature of local-level adaptive forest management is that it involves different stakeholders often having different perspectives or even world-views concerning the objectives and operational features for locally relevant forest management systems. In order to be able to reconcile these different perspectives, it is essential that an effective network of communication be established. These networks should enable stakeholders to equally share information for:

- Sensitising the various social actors as to what is at stake.
- Decision-making on the most appropriate management level; and
- Monitoring and evaluation of management outcomes.

Two aspects need to be considered in establishing such communication networks:

1. Which stakeholders should be represented in them (Borrini-Feyerabend 1996)?
2. Which process of communication is most effective?

As demonstrated in the article by Lescuyer in this volume, the selection of which stakeholders to involve in the communication networks and the decision of how to communicate with the various groups are important when setting up communication networks. In many cases a professional bias still exists. The bias for example can derive from which ecological or technical experts, acting in the supposed global or national interest, decide what shape forest management should take.

Fortunately, examples of successful collaborative management exist (Fisher 1995). It should be noted, however, that most of these examples concern forest reserves or protected areas, in which conservation and/or rehabilitation are major concerns. These forests are subject to use pressures from local communities, but in most cases they are not subjected to strong external pressures from the commercial exploitation of forest products. A major challenge still exists to develop adaptive and collaborative forest management systems for large-scale, industrially-oriented production forests. The articles of Lescuyer and Danks in this publication describe some recent efforts to develop appropriate communi-

cation platforms for such conditions.

An interesting new development in arranging communication networks is the availability of new communication tools. Lescuyer and Gonzalez (in this publication) describe two innovative efforts to adapt computer-based Geographic Information Systems (GIS) as a tool for joint learning. Originally, GIS systems were developed as expert-systems serving the needs of professionals. Lescuyer describes an effort to use GIS-based information as a tool for preparing different future scenarios. These scenarios are subsequently used as a basis for the joint decision-making process on the most appropriate local scenario. Gonzalez's approach goes some steps further. The purpose of the GIS-assisted joint learning system being developed by Gonzalez is not only to provide information for decision-making on what kind of management practices to apply. It is also to provide information that can assist in sensitising the local communities to the need to further modify their traditional, culturally embedded, resource management systems to the evolving social and ecological conditions. Moreover, the system can also be used for joint monitoring and evaluation activities.

CONCLUSION

A basic understanding of the concept of adaptive natural resource management is that the interface between natural resource systems and social systems is often characterised by uncertainty and surprising developments. In order to address such uncertainty, a social learning approach is needed in which management is considered a process of gradual decision-making and decisions, with decisions being based on experiences gained from careful monitoring and evaluation of the effects and outcomes of prior decisions. In order to effectuate such an approach much attention needs to be given to increasing the social capital of the actors involved. This demands the recognition of pluriform world-views and cultural values, and the specificity of global and local interests.. These pluriform values and interests should be reconciled through a process of negotiating interests and mediating conflicts. In order to operationalise these principles, new planning and monitoring techniques need to be developed.

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Summaries

La gestion adaptative et la gestion collaborative sont apparues comme de nouvelles approches en gestion forestière dans les nations fortement industrialisées et les nations tropicales respectivement. Un principe de base de la gestion adaptative est que le rapport entre les systèmes de ressources naturelles à grande échelle et les systèmes sociaux se caractérisent souvent par des incertitudes et des éléments nouveaux surprenants concernant les aspects tant écologiques que sociaux. Pour résoudre ces incertitudes, une approche d'acquisition de connaissances sociales est nécessaire, reposant sur un processus de prise de décisions et de suivi appuyant sur l'expérience. Un principe de base de la gestion collaborative est que les intérêts des forêts nationales devraient s'associer aux intérêts des communautés locales concernant les ressources forestières. Ceci nécessite la reconnaissance de vues mondiales et valeurs culturelles multiformes et la spécificité des intérêts mondiaux et locaux. La combinaison des deux approches et la décentralisation de la gestion adaptative pour inclure des approches de gestion collaborative au niveau communautaire constituent un défi. Pour relever ce défi, il faut de nouvelles techniques de planification et de suivi, accordant une importance particulière à la négociation des intérêts et la médiation des conflits.

El manejo adaptativo y el manejo colaborativo emergen como enfoques nuevos al manejo forestal en países altamente industrializados y en países tropicales, respectivamente. Un supuesto básico del manejo adaptativo es que la interfase entre sistemas de recursos naturales a gran escala y los sistemas sociales se caracteriza a menudo por la incertidumbre y eventos inesperados con respecto a aspectos tanto ecológicos como sociales. Para hacer frente a tal incertidumbre se requiere un enfoque de aprendizaje social fundamentado en un proceso de toma de decisiones y monitoreo basado en la experiencia. Un supuesto básico del manejo colaborativo es que los intereses de los bosques nacionales deben combinarse con los intereses de las comunidades locales en lo que se refiere a recursos forestales. Esto exige el reconocimiento de visiones mundiales y valores culturales pluriformes, y la especificidad de intereses globales y locales. Es un desafío combinar ambos enfoques y descentralizar el manejo adaptativo para que incluya enfoques al manejo colaborativo con base en la comunidad. Esto requiere nuevas técnicas de planificación y monitoreo, en las que se presta atención específica a la negociación de intereses y a la mediación de conflictos.

Role of Communities in Adaptive Management: A Case from North America

Cecilia Danks¹

Adaptive management involves planning to learn while doing. Forest communities can play important roles in adaptive management at all stages: By initiating innovative management practices, collecting and evaluating information, and incorporating findings into decision-making processes. In the Northwest forests of the United States, adaptive management is being adopted to assist with the difficult task of integrating biological and social needs in ecosystem management. This paper describes conditions in US forest communities and community participation in forest management. It then describes an experiment in adaptive management in the Pacific Northwest, and in particular the case of Trinity County, California. Experience from these projects suggests that both high level policy and local initiative are required to implement adaptive management. The benefits derived from community involvement in these cases of adaptive management indicate the potential benefits of community forestry to both forests and forest communities in the US.

INTRODUCTION

Adaptive management is not just learning from the past, but planning to learn while doing. It requires identifying data needs, collecting and evaluating information about management practices, and then inserting those findings into the decision-making processes. Adaptive management is the only way to approach difficult tasks such as ecosystem management: Managing for the functional integrity of an ecosystem while retaining viable populations of species and integrating socio-economic goals. As scientific as it sounds, adaptive management is not the exclusive domain of forestry professionals or technical specialists. Forest communities can play important roles in implementing adaptive management. In fact, in the examples described here, community groups have played decisive roles in initiating and carrying out adaptive management projects. The roles that US communities have demonstrated in adaptive management has brought them one step closer to community forestry as practiced in other parts of the world.

FOREST COMMUNITIES IN THE UNITED STATES

Because forest communities in the US are diverse, it is hard to make general statements about them. On average, forest communities that have been dependent on surrounding forests are relatively poor and have little control over the forests that surround them (Fortmann and Kusel 1991; Hoffmann and Fortmann 1996). One forest community, however, can differ greatly from another in terms of both socio-economic factors and the natural environment. They are also internally diverse, with residents who differ in the way they use and view the surrounding forests. Some forest communities are shrinking due to declining forest industries, while others are swelling in size with urban refugees seeking a higher quality of life at low prices. Because of their diversity, not in spite of it, communities can make good partners with government agencies in forest management.

What do forestry issues of communities in tropical, developing countries have in common with those in a large, temperate, industrial country? The forest-dependent communities in many

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parts of the US, such as Trinity County, California, share several characteristics with many of the forest dependent communities abroad that are exploring community forestry options. These characteristics include:

- Relatively poor:
 - high poverty
 - high unemployment
 - little local capital
- Lack of control over forest resources:
 - government control of most forest land
 - external ownership of private timber land and sawmills
- Degraded forest resources:
 - due to extraction for export to urban centres
 - little reinvestment in the land and local communities
- Physically isolated.
- Politically and economically weak.
- Dependent on the local forest in diverse ways (not just for commodities)
- Strong identity with the place.
- Deep concern over the fate of the local forests.
- Deep concern about local socio-economic conditions.
- Diversity among residents; and
- History of conflict over resource use:
 - between the community and the national government

- over forest management
 - between interest groups and the government over forest management
 - among local user groups.

Residents in forest communities such as Hayfork, California have been grappling with these issues for years and have often referred to themselves and their Trinity region as a colony. Of course, the technology and resource use patterns of an advanced industrialised country, the sophisticated land management bureaucracies, and the financial resources of one of the richest countries in the world are among the factors that set Trinity County apart from developing country counterparts. Nevertheless, visitors and local residents familiar with community forestry abroad have noted similarities between the position of Trinity County residents and those of marginalised forest communities abroad (Danks 1996/97).

HAYFORK AND TRINITY COUNTY

Hayfork is located in the middle of Trinity County and the Trinity National Forest in Northern California. Trinity County is mountainous with rich, mixed coniferous forests as well

	Adaptive Forest Management	Joint Forest Management
Basic consideration	Eco-challenge based	Livelihood-challenge based
General objectives	Involving local communities in eco-system management should assist in achieving conservation objectives and sustain forest communities	Involving local communities in forest management should contribute towards both community empowerment and forest conservation
Environmental aim	Maintain ecological processes	Rehabilitate degraded lands
Aim of production	Adaptation of commercial timber management	Basic-needs forest products
Scale	Eco-zone 400km ² - 1000km ²	Communal/group-managed forest areas up to 4km ²
Interpretation of community	Administrative village	Specific forest-user groups
Boundary setting	Forest Department	Jointly decided by Forest Department and user groups

Table 1: Comparison of Adaptive Forest Management in North America (Danks, this paper) with Joint Forest Management in India (Hobley, 1996).

as some oak woodlands and grasslands. Trinity is a rural county of about 8,100km² hectares (two million acres) and 13,000 people. Weaverville, the county seat, has a population of 3,200, and Hayfork, the second largest town, has a population of 2,500. The only local government is the Trinity County Board of Supervisors. There are no incorporated towns, no mayors, and no town councils. Most communities are fairly isolated with large tracts of undeveloped land (mostly public) between them. There are no traffic lights in Trinity County.

More than 70% of the land area in Trinity County is controlled by the federal government, primarily the US Forest Service². In 1996, 99.2% of private timber land in Trinity County was held by out-of-county owners (County Assessor Maps 1996). Over the past 150 years, mining, grazing, logging, roads, fire suppression, dams, and catastrophic fire have altered the natural landscape of Trinity County, leaving a degraded environment compared to the abundance of the past. While heavily affected by the extraction of minerals, trees, and water, the small population in this remote area still lives amidst a fairly rich forest resource.

The timber and recreation industries are the core sectors of the economy, making Trinity County one of the most forest dependent areas in the Pacific Northwest.³ Other than local commercial and support services (*e.g.*, stores, schools, government services), there is relatively little economic activity, public or private, that is not directly related to National Forest management (*e.g.*, logging, lumber mills, recreation, tourism, reforestation, watershed management, fire management). Agricultural and mining income is now negligible, although they were among the dominant economic sectors before World War II.

More than 30% of employment wages in Trinity County were related to the timber industry alone in the late 1980s (Greber 1994). Seventy percent of the homes in Trinity County are heated with wood; in some communities about 90% are wood-heated (USDC Bureau of the Census 1993) (Figure 1). The only remaining sawmill in the county is located in

Weaverville. In the spring of 1996, the sawmill in Hayfork closed. It was formerly the major employer in the community and the largest business in the county.

Even before the mill closure, 30% of individuals and nearly 50% of children in Hayfork lived in poverty in 1989 (USDC Bureau of the Census 1993). Countywide, 18.5% of all residents and 27.2% of children lived below the poverty level⁴ in 1989, compared to 12.5% of Californians and 17.8% of Californian children (USDC Bureau of the Census 1992). Three Trinity communities had 1989 poverty rates that were 250% of the average rate for California (Figure 2). Between the 1980 and 1990 censuses, the poverty rate in Trinity County increased 62%, by far the largest increase in poverty of any California county. Poverty has continued to increase since the 1990 census. Participation in the free and reduced lunch programme, a proxy for low-income families with children, has increased since 1989. Currently more than half of the County's school children are from low-income families that qualify for this programme. In 1998, 80% of Hayfork Elementary School students were in the free and reduced lunch programme, up from 52% in 1989 (Trinity County Office of Education 1999) (Figure 3).

For more than a decade, the annual unemployment rates in Trinity County have been about twice that of the state of California. Analysis of monthly unemployment (Figure 4) shows that unemployment is highly seasonal in Trinity County, with very high winter unemployment and summer unemployment dropping to near the statewide averages in the best years. Forest dependence, on both timber and recreation, contributes to this strong seasonality. Trinity County has not shared in the economic growth of the mid- to late-1990s experienced by much of the rest of California and the United States. In 1998, the unemployment rate was 13.0% in Trinity County, while it was 5.9% statewide in California (California Employment Development Department 1999).

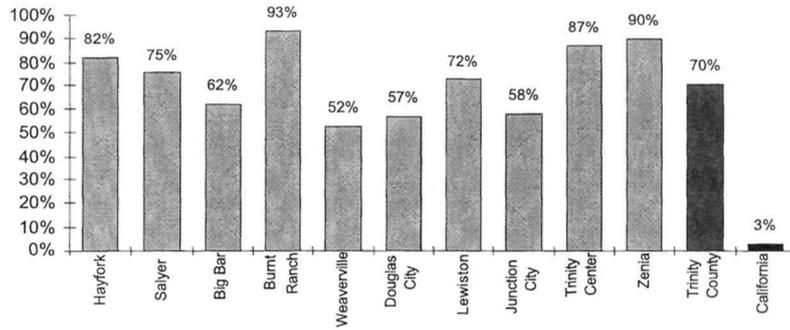
Despite a clear economic dependence on the surrounding national forests, measures of local well-being do not correlate well with timber harvest levels. Poverty, as measured

² 'Public' land, federal' land, and 'national forests' all connote land controlled by the national government. The Forest Service is a federal agency that manages national forests. The Bureau of Land Management (BLM) is another federal land management agency that controls some land in Trinity County. Both the Forest Service and BLM manage to produce commodities, as well as recreation and other outputs. Both are different in mission from the National Park Service, which manages land primarily for recreation and protection.

³ Normally the community - not the county - is the appropriate unit to analyze forest dependence, even though more data are available at the county levels. However, the absence of significant agricultural, industrial (other than timber), and urban sectors in Trinity County makes it more like a forest dependent community than an economically diverse California county.

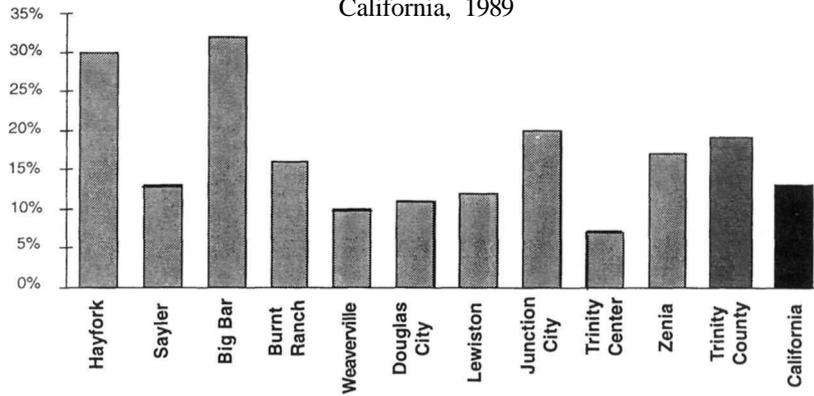
⁴ According to the Census Bureau, people living in poverty are those whose incomes are not adequate to provide the least costly nutritionally adequate diet plus basic living expenses. The poverty level varies for families of different sizes, *e.g.*, the threshold annual income for a single individual is USD6,310 and for a family of four is USD12,674 (US Census 1992).

Figure 1
Percent of Homes Heated with Wood,
 Trinity County Communities, Trinity County and California,
 1990



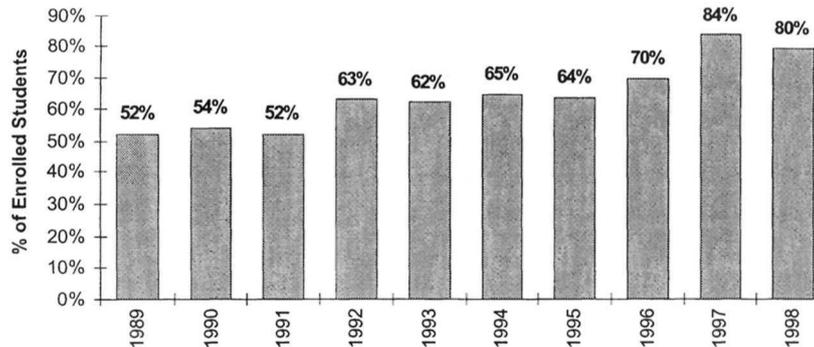
Source: U.S. Dept. of Commerce, 1990 Census STF3B

Figure 2
Percentage of Individuals Below Poverty,
 Trinity County Communities, Trinity County and
 California, 1989



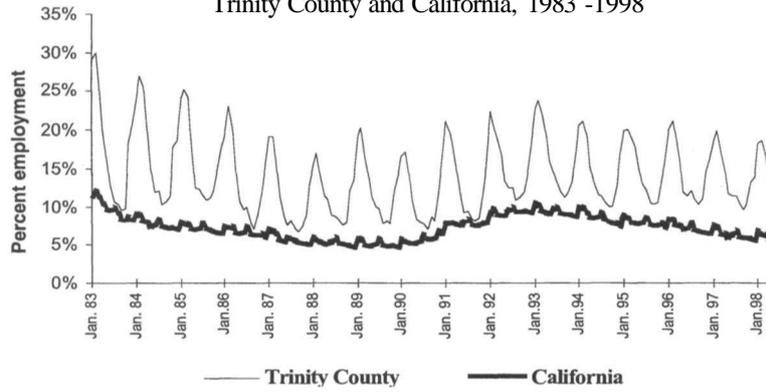
Source: U.S. Census 1990, STF3B

Figure 3
Percentage of Students in
Free & Reduced Lunch Program,
 Hayfork Elementary School, 1989-1998



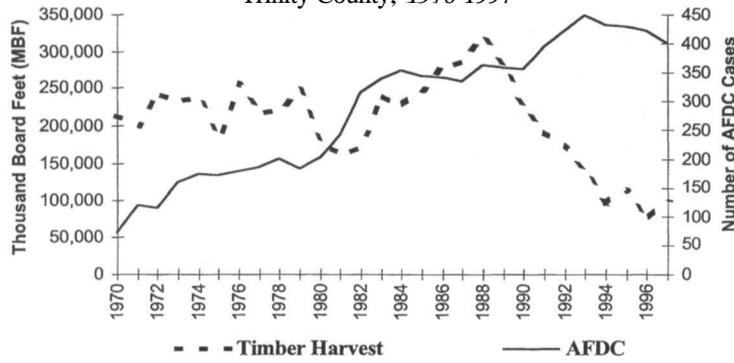
Source: Mountain Valley Unified School District and Trinity County Office of Education

Figure 4
Monthly Unemployment Rates,
 Trinity County and California, 1983 -1998



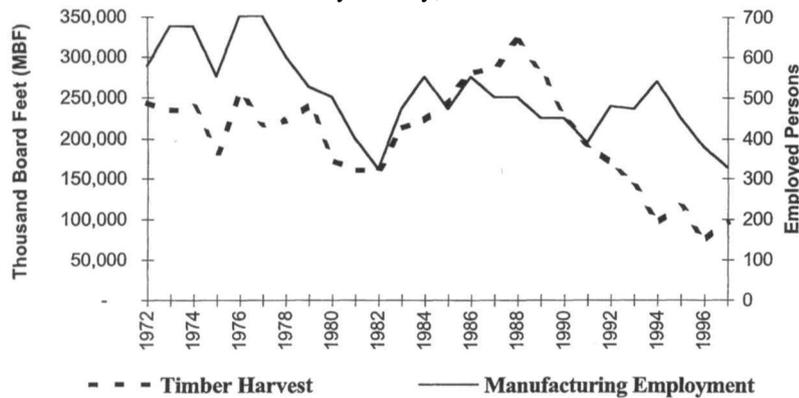
Source: California Employment Development Divison, Labor Market Information

Figure 5
Timber Harvest and AFDC Cases,
 Trinity County, 1970-1997



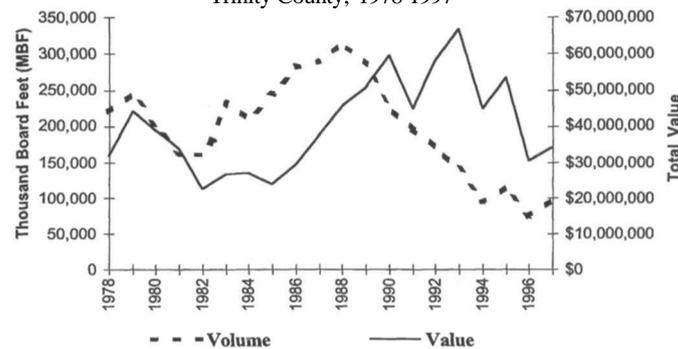
Sources: California State Board of Equalization and California Department of Social Services

Figure 6
Timber Harvest and Manufacturing Employment,
 Trinity County, 1972-1997



Sources: California State Board of Equalization and California Employment Development Division

Figure 7
Volume and Value of Timber Harvest,
 Trinity County, 1978-1997



Source: California State Board of Equalization

by the number of families on welfare (*i.e.*, AFDC cases - Aid to Families with Dependent Children), has generally gone up, despite fluctuations in the timber harvest (Figure 5). Although 90% of manufacturing employment in Trinity County is in the timber industry, the number of jobs in the manufacturing sector has not been correlated with timber harvest levels over the past 15 years (Figure 6). Although timber volume has declined in the 1990s, the value of timber has reached all time highs, despite the reduced volume (Figure 7). Stumpage prices rose dramatically in the early 1990s due to a number of factors including reduced supply. However, this higher value has not led to a decrease in poverty or an increase in jobs. Most of that value is exported outside the county with the logs.

COMMUNITY PARTICIPATION IN FOREST MANAGEMENT IN THE UNITED STATES

Community forestry, as opposed to state-controlled forestry, refers to an institutional arrangement in which local communities proximate to a forest area have a share in the benefits from, and a voice in decision-making regarding, nearby forests. In addition, community members contribute to the labour and expertise required for forest management. In practice, the role of communities' *vis-à-vis* the state varies widely around the world. In some places, communities have complete control over management and benefits of a forested area. In other areas, perhaps even in the same country, a state bureaucracy manages the forest for the economic and political benefit of the central government. Many different institutional arrangements exist, mixing community and central government control.

The United States Department of Agriculture's Forest Service manages 570,000km² million (140 million acres) of land, called 'national forests'. Revenue generated from national

forest management and recreational activities is returned to the federal treasury. In the United States, communities of place have had a fairly limited role in national forest management. Regarding benefits, local counties have been given 25% of national forest receipts for schools and roads. Local communities are thought to benefit from employment opportunities associated with forest activities, especially timber cutting. Political arguments for the sustained yield of timber include the 'community stability' afforded by timber jobs. Regarding a voice in decision-making, nearby communities have no formal role. Community members are considered part of the general public, which is allowed to provide feedback on options presented in planning documents during the public comment period - after many basic choices have already been made. The expertise and much of the labour involved in management is provided by federal land management agencies, primarily the US Forest Service. Many community members, however, are employed or contracted by the Forest Service.

Several layers of authority affect the US Forest Service, which is part of the Department of Agriculture. The budget is determined by Congress while the President and his appointee, the Chief of the Forest Service, are responsible for administrative direction. The Forest Service itself is a somewhat decentralised bureaucracy that must deal with the tension between maintaining the flexibility for locally appropriate, site-specific decisions, and maintaining compliance with national laws and allegiance to the agency. National forests are divided into a number of districts, each headed by a District Ranger, the person closest to the ground with decision-making authority. Community members are most likely to deal with District Rangers. However, their ability to respond to community concerns is constrained by higher levels.

Many observers feel that institutions developed for community forestry abroad are much more sophisticated than in the US. Indeed, the US Government's approach to forest communities has been simply to offer a steady amount of

timber for sale, which was thought to promote community stability (Dana and Fairfax 1980:82,332).

NORTHWEST FOREST PLAN AND ADAPTIVE MANAGEMENT AREAS

Timber has been harvested heavily in the forests of Northern California, especially in the late 1980s (Figure 8). Heavy timber harvesting, especially clear-cutting and associated roads, fire suppression (extinguishing forest fires), and conversion of forestland to non-forest uses have altered the forest ecosystem in the Pacific Northwest. The resulting changes have put a number of species at risk of extinction. In 1991, a federal court decision halted all timber sales on public land in the territory of one such species, the Northern Spotted Owl, an animal chosen as an 'indicator species' of the health of old growth forests. The territory of the Northern Spotted Owl included the forests of western Washington, western Oregon and northwestern California. If the Spotted Owl was failing, the health of the forest ecosystem was failing. The court ordered the federal government to come up with a comprehensive management plan that would protect all species before the government could sell any more timber.

That decision hit timber-dependent communities hard. Many residents feared that a decline in timber sales would worsen local economic conditions. The timber industry supported local rallies and lobbied Congress. The environmental groups held demonstrations and worked through the legal system. The residents of small forest communities, as well as government agencies, were caught in between.

The Clinton Administration understood that the impasse in the Pacific Northwest forests was not just a legal or scientific problem, but asocial problem as well. President Clinton's first step was to invite key scientists, environmental activists, industry representatives, tribal representatives, agency personnel, and community leaders to a Forest Conference in Portland, Oregon in April 1993. The Conference was an explicit attempt to set the tone for collaborative approaches and to begin to develop the social capital needed to work out a resolution.

Following the Forest Conference, a multi-agency, multi-disciplinary team of scientists, the Forest Ecosystem Man-

agement Assessment Team (FEMAT), laboured for over two months to assess the environmental and socio-economic conditions and problems. The Team developed and compared 10 management options for federal forestlands in the Spotted Owl region. The FEMAT (1993) report was an extraordinary compilation of the latest scientific understandings of old growth forest ecosystems and it incorporated innovative approaches to assessing forest communities.

Because the FEMAT scientists knew that even their best knowledge was woefully inadequate to manage ecosystems for natural and social goals, they called for an adaptive management approach to ecosystem management. In adaptive management, forest managers plan to learn from manage-

ment activities so that they can modify future actions to better achieve overall goals. Adaptive management requires identifying information gaps in the planning stage, monitoring the outcomes of management activities, evaluating new information and experiences, and inserting lessons learned into the deci-

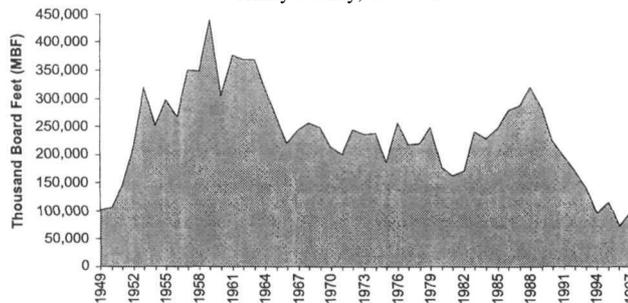
sion-making process.

FEMAT (1993) formed the basis for the Record of Decision (ROD) which directed how the Forest Service and Bureau of Land Management would manage forests for late successional habitat in the range of the Northern Spotted Owl. The ROD met the criteria required for lifting the injunctions and instituted ecosystem management across the region. The ROD addressed not only measures needed to promote the survival of the Northern Spotted Owl, but also the overall integrity of late successional terrestrial and aquatic habitat, while achieving sustainable levels of timber production. Achieving these ecosystem goals required a dramatic decline in timber harvest compared to the historically high harvest levels of the late 1980s.

The forest management standards and guidelines outlined in the ROD formed the central piece of the Clinton Administration's two-part Northwest Forest Plan (NWFP). The second part of the Northwest Forest Plan was the Economic Adjustment Initiative to provide job retraining and economic development assistance to displaced timber workers and communities affected by the decline in timber harvests.

In both the forest management directives of the ROD and in the Economic Adjustment Initiative, the Northwest Forest Plan put special emphasis on forest communities and gave

Figure 8
Timber Harvest,
Trinity County, 1949 - 1997



Source: California State Board of Equalization

specific direction to federal agencies to work with communities. The Plan demonstrated a strong concern for the effect of reduced timber harvests on timber communities. However, communities were not involved in the development of either the new forest management plan (ROD) or of the Economic Adjustment Initiative, and it was unclear what role they could play in their implementation.

In part to assist struggling timber-dependent areas, the Northwest Forest Plan created 10 Adaptive Management Areas (AMAs), ranging in size from 370km² to over 1,620km² (92,000 to 400,000 acres), totalling approximately 6% of the Plan area. The AMAs were areas of existing federal land designated as "... landscape units designed to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives" (ROD 1994:D-1). The AMAs were to provide a geographical focus for the practice of adaptive management.

Both agency personnel and community members see AMAs as places where local communities should have greater input, and activities should have greater benefits for communities than other national forest areas. Thus, AMAs are important because they provide a potential land base for community forest management. Even in AMAs, however, there are no clear institutional arrangements for community input.

The need for such an institutional arrangement that allows diverse local responses to general objectives was expressed clearly in the Northwest Forest Plan (ROD 1994:D-1):

"The overall objective for Adaptive Management Areas is to learn how to manage on an ecosystem basis in terms of both technical and social challenges, and in a manner consistent with applicable laws. It is hoped that localised, idiosyncratic approaches that may achieve the conservation objectives of these standards and guidelines can be pursued. These approaches rely on the experience and ingenuity of resource managers and communities rather than traditionally derived and tightly prescriptive approaches that are generally applied in management of forests."

The social objectives of AMAs focus on community participation and well-being. The ROD (1994:D-4) explicitly calls for collaboration among community groups and government agencies for the benefit of forest communities:

"These areas [AMAs] should provide opportunities for land managing and regulatory agencies, other government entities, non-governmental organisations, local groups, landowners, communities, and citizens to work together to develop innovative management approaches. Broadly, Adaptive Management Areas are intended to be prototypes of how forest communities might be sustained."

It is in the last sentence above that many forest communities saw the potential of adaptive management areas as the land base for community forestry on public land.

In recognition of Trinity County's historical dependence on the timber industry, the Forest Service designated 1,620km² (400,000 acres) of national forest as the Hayfork Adaptive Management Area - the largest AMA in the US. It was intended as a place to experiment with innovative forestry activities that would benefit Hayfork and 15 neighbouring communities. Unfortunately, there was little funding allocated to AMA activities and the Forest Service had no clear idea of how to implement AMA objectives.

ROLE OF COMMUNITIES IN ADAPTIVE MANAGEMENT - EXAMPLES FROM HAYFORK

The local communities had lots of ideas of what to try in their new AMA. Ecosystem management, instead of industrial timber production, means that different kinds of forestry work are undertaken. In any transition, some groups can be left behind. Local communities wanted to make sure that they benefited in this new shift to ecosystem management.

The Watershed Research and Training Center, a community-based, non-governmental organisation in Hayfork, emerged about the same time as the NWFP and helped provide the organisational capacity needed for the community to partner with the government on these activities. The Watershed Center was an important community partner in most of the adaptive management activities in the Hayfork AMA. They proposed many of the projects to the Forest Service and provided much of the manpower. The Forest Service's response to these proposals was typically, "Well, we don't normally work that way. But this is an AMA and we are supposed to be innovative and learn from our actions here - so okay, let's give it a try!"

Example 1: Ecosystem Management Technician Training Program: Helping Local Workers Make the Transition

As part of President Clinton's 1994 Northwest Forest Plan, federal agencies made a commitment to fund job retraining and other activities to help dislocated workers and forest communities. While traditional timber jobs are in decline, United States Forest Service management plans suggest that new work opportunities will be available in the future for people with an understanding of ecosystems and a diversity of technical skills. The Ecosystem Management Technician Training Program (EMTTP) began in Trinity County in 1995 as a collaborative effort to retrain dislocated workers and long-term unemployed persons for jobs in the emerging field of Ecosystem Management. This innovative training programme integrated on-the-job training with class work in

accredited college courses.

Ecosystem management requires more information, assessment, and ecological friendly technologies, as well as a whole new orientation towards forest management. Therefore, ecosystem management work requires skills in diverse inventory techniques, data collection protocols, and the use of global positioning units and geographical information systems. Ecosystem management technicians must also have experience in techniques for wildlife habitat restoration, erosion control, and fire hazard reduction. To work sensitively and intelligently in the woods, workers also need a broad understanding of ecosystem processes and functions. The training programme sought to provide these kinds of skills and knowledge to local workers so that they could compete successfully for new jobs associated with the transition to ecosystem management.

An important goal of the EMTP was to provide retraining opportunities that allowed Trinity residents to retrain and hopefully find work without having to leave the county. However, Trinity County has no accredited retraining facilities and poor job prospects. If funding designated to assist Trinity County's displaced timber workers was spent sending them out of the county, Trinity County would lose in several ways. If trainees had to leave the area for training, they would be unavailable, at least temporarily, for many of their family and community commitments. If Trinity workers were retrained outside the county, they would more than likely be placed in jobs outside of Trinity County due to the local nature of professional networks that assist in placing graduates of any training institution. Wages supporting both trainees and trainers would more than likely be spent in stores and on services outside of Trinity County. And, any capacity building accomplished with the funds would accrue to organisations outside of the county. Thus, without a local training programme, funds that are supposed to assist Trinity County in dealing with the economic hardships resulting from the declining timber harvest could end up:

- Promoting the out migration of formerly employed community members; and
- Assuring that the many benefits of a retraining programme would accrue to entities outside of Trinity County.

To avoid the loss of local workers, the Watershed Center set up a training programme and designed the programme so that graduates could find work locally in ecosystem management. If they had not, well-meaning government efforts to help communities adjust to the declining timber harvest would have actually hurt the local communities even more. The Forest Service was an important partner because it provided and partially paid for most of the work projects used for training. The training programme pioneered in the Hayfork AMA became a prototype for a number of other ecosys-

tem management technician training programmes in California and Oregon.

Example 2: Chopsticks: What to do with Small Diameter Trees that Present a Fire Hazard

The Chopsticks Administrative Study conducted by the Watershed Center and the Hayfork Ranger District is a good case of adaptive management led by the community. Three to eight inch diameter plantation pine and suppressed Douglas fir are common by-products of thinning in the Trinity area, but have little market value. In the past, the Forest Service had to pay someone to undertake these thinnings in order to increase stand vigour and reduce fuel loading. The resulting wood was usually piled and burned on site or, depending on the market, sold as chips. The Watershed Center was interested in developing a higher value for this wood, which would help make the thinnings more economical for both the Forest Service and local contractors, and could provide wood locally for value-added processing.

After discussing how they could experiment with such small diameter wood, the Watershed Center agreed to conduct an Administrative Study with the Forest Service in which they:

- Developed and demonstrated new extraction technologies.
- Experimented with milling, drying, secondary processing, and marketing of extracted material (primarily Douglas fir 3" to 10" diameter at breast height).
- Set up a log sort yard.
- Monitored ecological effects.
- Monitored production inputs, costs, and receipts; and
- Trained dislocated workers in ecosystem management.

The Forest Service benefited in that it received information on how to better measure the volume of small diameter trees and write appropriate prescriptions and contract specifications. The information generated by the Chopsticks Administrative Study also allowed the Forest Service to better estimate the value of small diameter trees and potential markets. Such information can help the Forest Service turn costly service contracts to treat fuel hazards into income generating timber sales. This study was featured in other publications (Little 1998; Durning 1999) and has formed the basis for subsequent work on small diameter utilisation.

Chopsticks is an excellent case of adaptive management in practice. Chopsticks addressed both social and biological issues of forest management, involved agency and community, planned what data to collect beforehand, monitored the implementation and outcomes, produced a report, and disseminated information that has had an impact on subsequent management activities. It is also clearly a case that

demonstrates the value of community-government co-operation in adaptive management. Neither the Watershed Center nor the local Forest Service could have done this work alone due to issues of organisational capacity and authority

Example 3: Stewardship: Restoring the Forest and Forest Communities

While the new government mandate for ecosystem management is changing the type of forestry work that is undertaken, communities would also like to see changes in how that work is done. Specifically, they would like local people to have more opportunities to work as stewards of the land rather than as resource extractors for the benefit of corporations. There is widespread support for some form of local stewardship, not only because it would increase benefits to local communities, but also because it should result in better management and healthier forests.

Local stewardship can potentially improve ecosystem health by drawing on local knowledge of specific sites, increasing the effectiveness of limited dollars, and linking the workers more closely to the desired outcomes. An example of the inefficiency of the current system is the service contract work intended to restore forests after fires or logging. Service work is offered in discreet short-term packages, usually lasting a few weeks with separate contracts for different jobs on the same site even in the same year. For example, on one site, one crew will pile brush after a logging job and another crew will burn it. Next year, a different contractor will plant trees and later, a fourth will add plastic seedling protectors. In later years, a fifth contractor will measure seedling survival, a sixth crew will replant, and a seventh will set-up seedling protectors. Each job must be done within a short window of time and inspected by the Forest Service. None of the work crews is ultimately responsible for the successful regeneration of the site. A stewardship contract could make one local contractor responsible for all of these stages, as well as the logging and roadwork. It would allow the contractor to spread the work out over the year and implement it in a fashion that made sense economically and ecologically. Moreover, the Forest Service could have more work completed for less money if they had fewer contracts to prepare, bid, and administer.

The Grassy Flats Stewardship Project grew out of discussions of the Stewardship Group, a loose collection of community members who began meeting in February 1997. The Watershed Center provided staff support. Forest Service AMA coordinators participated in the Stewardship Group and developed a local pilot stewardship project with group input. The Stewardship Group chose a project site in which the community had already contributed to the definition of management goals through a separate community participation

process. The AMA coordinators submitted the project for special funding and awards that brought in money both to the US Forest Service for project implementation and to the Stewardship Group and Watershed Center for supporting activities. The Grassy Flats Stewardship Project was featured as a successful agency-community partnership at the National Forest Partnership Fair in July 1998. The Grassy Flats project was selected as one of 23 national pilot projects in stewardship contracting and was ranked number one in the region due to its history of collaboration.

The Grassy Flats Stewardship Project provided both a contract for real work put out for open bidding and an experiment in contracting itself. A Monitoring and Evaluation Team has been set up to collect data on project implementation and outcomes. The Team consists of three Forest Service employees and eight members of the community, including environmentalists, a sawmill manager, businessmen, and a County Supervisor. The Team will evaluate the project and make recommendations for future stewardship contracts. Thus, the Grassy Flats project is another good example of planning to learn while doing, *i.e.*, adaptive management.

Example 4: All-party Monitoring

Monitoring is essential for adaptive management and in the Trinity County area, communities have played a key role. To adapt, managers need to observe processes and collect information to determine what to do differently next time. The Forest Service has a mandate to monitor, but no time and little money to do it. They have turned to the community and asked for 'third party monitoring', which tends to be watchdog monitoring by outsiders. Outside monitoring provides no assurance that efforts will have an effect on future management activities because it is not tied to the decision-making process. Communities, in turn, have proposed and attempted all-party monitoring, which includes government agencies as well as diverse community members, including agencies, technical specialists, and interest group activists. They look at monitoring as an opportunity for learning to see how to do it better next time, not to judge current efforts as good or bad. If government agencies are included in collecting and interpreting data, monitoring results are more likely to affect government practices.

The monitoring of the Grassy Flats Stewardship Project described above is being conducted as an exercise in all-party monitoring. It is linked to other community-based monitoring efforts in the forests of California and Oregon. Comparing the processes and results of multiple monitoring efforts will help improve future monitoring and develop the political and financial support for future all-party monitoring efforts. Because it plans to learn by doing, this all-party monitoring programme can be considered an adaptive

management approach to monitoring. More importantly, it provides a model for implementing the monitoring needed to make adaptive management of forest resources successful, despite limited government funds.

The specific roles of communities in all-party monitoring correspond to the earlier description of the roles of communities in community forestry. Communities, in co-operation with the agency, share the following roles in monitoring:

- Defining criteria (based on a community's concern for diverse benefits).
- Data collection (through a community's role in the implementation of activities).
- Data interpretation (based on local knowledge of community members); and
- Incorporation of learning into modifying future plans (through a community's role in decision-making).

By participating in all of these steps, communities contribute to successful adaptive management. By showing the value of community involvement in achieving forest management goals, this kind of community leadership in monitoring can lay the basis for community forestry in the US.

ADAPTING TO ADAPTIVE MANAGEMENT

A new role for communities is emerging in the US: The role of partner with government agencies in adaptive management of forestland. Adaptive management is still in an incipient phase, but it shows great promise for improving the health of forest ecosystems and forest communities. Together, communities and agencies have the best chance of learning to manage complex forest ecosystems to meet a wide range of local and national concerns. The capacities that local communities bring to adaptive management suggest the broad benefits to greater community involvement in forest management - involvement that maybe similar to community forestry programmes abroad.

Communities have similar roles in both community forestry and adaptive management, not just as beneficiaries or in decision-making, but also in implementing and learning from implementation. These roles are shared with government agencies that have technical capacities and protect national interests. Communities can bring organisational capacity, longevity, and local knowledge to complement the expertise of government agencies. Community members offer unique perspectives as both forest workers and as the people who must live with the consequences of forest management. Still missing, however, are enduring institutional arrangements that achieve productive complementarity (coproduction) between communities and agencies in the

adaptive management of forest ecosystems. Adaptive management still depends on the willingness of individuals to try something new. As with community forestry efforts throughout the world, the challenge of how to institutionalise adaptive management in a pluralistic society without creating additional marginalisation and conflict remains.

In all of the cases described above, community groups were responsible for initiating and implementing activities. Their efforts, however, were sparked and aided by policy directives at the highest levels that suggested that federal agencies work with local communities in Adaptive Management Areas. Adaptive management represents a new opportunity to include communities in a meaningful way in forest management in the United States. The experiences in the Hayfork Adaptive Management Area suggest that:

- Policy changes must create opportunity; and
- Managers and communities must utilise that opportunity.

Similar to models of community forestry abroad, adaptive management practices may start with a number of successful grassroots examples, before they receive nationwide support.

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Summaries

La gestion adaptative comporte des activités de planification pour apprendre par l'action. Les communautés forestières peuvent jouer un rôle important dans la gestion adaptative, à tous les niveaux : en lançant des techniques de gestion novatrices, en recueillant et en évaluant des informations et en incorporant les résultats aux processus de décision. Dans les forêts du nord-ouest des Etats-Unis, des essais de gestion adaptative sont actuellement pratiqués pour faciliter la tâche difficile de l'intégration des besoins biologiques et sociaux dans la gestion des écosystèmes. Ce rapport commence par une description générale des conditions des communautés forestières des Etats-Unis et de la participation communautaire à la gestion des forêts. Puis il décrit une expérience de gestion adaptative menée dans le nord-ouest de la région bordant le Pacifique et en particulier le cas du Trinity County, en Californie. L'expérience de ces projets suggère que la politique de haut niveau et l'initiative locale sont nécessaires pour mettre en oeuvre la gestion adaptative. Les avantages tirés de la participation communautaire à ces cas de gestion adaptative indiquent les avantages possibles de la foresterie communautaire et tant pour les forêts que pour les communautés forestières des Etats-Unis.

El manejo adaptativo contempla el aprendizaje a lo largo de su implementación. Las comunidades forestales pueden desempeñar un papel importante en todas las etapas del manejo adaptativo al iniciar prácticas innovadoras de manejo, recopilar y evaluar información e incorporar los resultados a los procesos de toma de decisiones. En los bosques del noroeste de los Estados Unidos se está probando el uso del manejo adaptativo para ayudar con la difícil tarea de integrar necesidades biológicas y sociales en el manejo de un ecosistema. Este trabajo describe, en términos generales, las condiciones de las comunidades forestales de los Estados Unidos y la participación de la comunidad en el manejo forestal. Posteriormente, describe un experimento de manejo adaptativo en la costa del Pacífico al noroeste de los Estados Unidos y, en particular, el caso del Condado de Trinity en California. La experiencia derivada de estos proyectos sugiere que se requieren tanto políticas a nivel superior como iniciativas locales para implementar el manejo adaptativo.

Ruta Condor: An Indigenous-led Cooperative Model for Conserving Culture, Nature, and Agrobiodiversity in the South American Andes

Alejandro Argumedo¹ and Katy Mamer²

This paper discusses the Ruta Condor, an innovative and holistic conservation strategy driven by the indigenous people in the Andean region of South America. The Ruta Condor concept consists of a network of community-based protected areas linking hotspots of significant cultural, historical, ecological, and agricultural value. This strategy is a response to deteriorating ecological and cultural integrity in the Andes, brought on by modernisation and economic globalisation trends. The Ruta Condor is a unique, large-scale, community-based initiative, which will employ an ecosystem-based, adaptive management regime derived from traditional practices and beliefs. The route will be modelled around the ancient Wiracocha Route, a pre-Hispanic sacred path that linked Andean landscapes, and will serve to empower and educate traditional communities along those landscapes. By integrating concerns of conservation, sustainable agriculture, economy, education, intellectual property, and indigenous peoples' self-determination, this project provides a holistic, community-based conservation-development strategy.

INTRODUCTION

The Andean region presents one of the most biologically and culturally diverse regions in the world. The Andes contain two important biodiversity hotspots (Meyers 1996), one quarter of the recognised important centres of origin (Vavilov Centres) of major cultivated species, more than half of South America's World Heritage Sites, and over two hundred languages (Summer Institute of Linguistics 1996). This great diversity is deteriorating rapidly, however, and current conservation approaches in the region are deficient in that they have failed to comprehensively address socio-economic, cultural, political, and institutional challenges.

The Andes mountain system comprises 7,250 km of mountain formations, and covers a continuous area of over two million km² stretching from the Caribbean coast of Venezuela and Colombia (11°N) to Chile's Tierra del Fuego (55°S). The Andes' north-south orientation, extreme altitudinal variability, and geomorphological scope have contributed to an extraordinary level of biological diversity. Further, for more than 30,000 years, the Andes have been populated by peoples whose creativity and innovation has nurtured a wealth of cultural and biological diversity. An-

dean peoples, perhaps the most renowned of whom were the Incas, possessed complex social structures based on their deep knowledge of, and spiritual connection with, the mountain ecosystems they inhabited.

Traditional Andean societies were based on principles of ecological, productive, and social sustainability which had at their core a profound respect for Mother Earth (*Pacha Mama*) and reverence for the power and fragility of the mountains (*Apus*). These principles have been integrated into landscape conservation strategies that combine the management of agricultural spaces with natural and culturally important areas in a holistic management system. The management approach of traditional agriculture is ecosystem-based, and provides a nurturing environment for creating diversity and maintaining the health of domesticated and wild plant and animal species, as well as diverse ecological formations. These societies employed integrated management and land-use planning systems which maintained mosaics of land-use types, including agriculture and natural areas, and which maintained border habitats for wildlife.

The multiple functions of traditional agriculture in the

¹Indigenous Peoples' Biodiversity Network

²Asociación ANDES.

Andes continue to extend beyond the production of food, fibre, and other goods (such as medicines and timber) for immediate benefit. Additional functions include food security, environmental sustainability, development, and social and economic well-being. Further, agriculture is an important cultural element in Andean societies. Forests and water sources (*Pakarinas*), for example, possessed a special protection status for religious and agricultural purposes.

Fortunately, regions where indigenous peoples inhabit the Andes mountains have been the last places where development has been concentrated, since these areas do not adhere to the Western concept of productive areas. The region is therefore relatively intact biologically and culturally. In this context, traditional agriculture and related land use continue to define a great deal of Andean landscapes, exerting great influence on the environment, economy, society, and culture of the mountains.

The new millennium poses a challenge to the conservation of mountain ecosystems in the Andes. Governments in the region face increasing difficulty in managing land and public services, and growing demands to feed and improve the quality of life of citizens. Migration to urban centres is rising and the region's population is increasingly becoming alienated from its environment. The influences of economic globalisation, along with communication and information technologies, are far-reaching. The resulting profound impact on traditional ways of life in turn threatens ecological integrity. Forces such as climate change, pollution, and direct manipulation of nature at the genetic level also contribute to the accelerating deterioration of Andean ecology. The maintenance and long-term conservation of Andean biological diversity and fragile mountain ecosystems would thus appear to depend on the implementation of innovative and holistic conservation approaches based on local traditional culture.

LOCAL COMMUNITIES AND PROTECTED AREA MANAGEMENT IN THE ANDES

Until quite recently, approaches toward protected area management in the Andean countries have tended to adopt a conventional model in which the preservation of large areas of unspoiled nature tend to exclude local peoples from planning and implementation processes. The employment of Western conservation science and practices, and the involvement of formally trained experts have been emphasised, while the valuable knowledge and practices of indigenous peoples have largely been ignored in the process. According to the IUCN Protected Areas Programme: "...a 'protectionist' mentality persists in the management of protected areas in

South America, and successful work with local communities has seldom been achieved. Systematic methodologies to bring about the efficient participation of local people have not yet been developed." (McNeely *et al.* 1994:365).

In the last decade, recognition of the importance of involving park residents and neighbours in protected areas management has evolved out of the lack of success of conventional approaches. It is acknowledged that the expropriation and exclusion of local communities has led to grave social and ecological impacts in many countries (Pimbert and Pretty 1995:5). Attempts to involve citizens in protected areas management have usually been limited to information transfer, and at best have consisted of five levels: Information gathering, consultation, participation in decision-making, initiating action, and evaluation (Wells and Brandon 1992).

RECENT INDIGENOUS CONSERVATION EFFORTS IN THE ANDES

In the last few years, indigenous peoples in the Andes have been active in promoting social, economic, cultural, and environmental cooperation between traditional communities living in different countries in the region. To date, joint programmes have included community development and capacity building, and have proven to be valuable and successful. Traditional peoples, such as Kechuas and Aymaras, are eager to work in partnership with other communities that share the same history and vision in solving common problems, creating capacity, and sharing knowledge and resources. International cooperation among indigenous peoples and traditional communities is a growing trend in the area, because it helps indigenous peoples and traditional communities to gain autonomy and control over their own activities, and limits the often pervasive control and intervention from governments. These participative and self-help efforts on the part of indigenous peoples are being extended to the conservation of their ancestral territories, and form part of a recent struggle to reconstitute the broken historical links among Andean peoples. In countries such as Peru, Andean indigenous peoples are developing innovative strategies to ensure food security, maintain the integrity of their environment, and revitalise their cultures. These efforts have taken shape in grassroots conservation models, an innovative example being the traditional agricultural programme of the Confederation of Indigenous Nationalities of Ecuador (CONAIE). Indigenous peoples have also implemented protected area initiatives to conserve agrobiodiversity and Andean camelids (ANDES 1999).

Building on this momentum, a network of indigenous

peoples from seven countries is developing a pioneer approach to the conservation of Andean landscapes and cultures. This concept, the Ruta Condor, proposes a community-based management regime of Andean montane ecosystems intended to regenerate and conserve its cultural and biological diversity. By moving from strict nature protection to multi-purpose protection that embraces nature, culture, spiritual place, historical sites, and areas of origin and diversity of native crops, the foundations for sustainable and biologically - and culturally - rich Andean landscapes can be built.

in nature conservation (Box 2 - see over). The route will follow a network of traditional agricultural protected working landscapes throughout the Andes mountains⁴. These traditional agricultural landscapes will act to link focal points along the route. Focal points will consist of conservation areas that have already been established, as well as other culturally and biologically rich areas that require conservation.

The Ruta Condor's focal points will include, among others:

- Micro centres of crop origin and diversity (particularly Vavilov centres and areas of crop diversity).

General Objective:

Develop a regional strategy for the conservation of the biological and cultural diversity and ecology of the Andean mountains while addressing the sustainable development needs of the region.

Specific Objectives:

1. Conserve centres of origin of crops important to global food security.
2. Conserve the variety of native plant and animals in the Andes mountains.
3. Conserve areas of cultural importance to indigenous peoples.
4. Establish an agricultural zone free of genetically modified organisms.
5. Promote sustainable communities in the Andes by appropriate economic development and sustainable livelihoods.
6. Empower indigenous peoples and local communities in the conservation and management of agrobiodiversity, landscapes, biodiversity, and cultural sites.
7. Promote and protect indigenous knowledge, practices, and innovation systems.
8. Promote international cooperation and partnerships among indigenous peoples of the Andes and support their goals of reconstituting their ancestral cultural links.

Box 1: Objectives of the Ruta Condor Initiative.

THE RUTA CONDOR

Incorporating the diverse ecosystems of the Andes, which are linked historically and ecologically, an international route which includes Colombia, Ecuador, Peru, Bolivia, and Argentina, and which is based on the ancient Wiracocha Route³, is being developed. The Ruta Condor will consist of a patchwork of protected/managed areas with management regimes suited to the objectives of particular sites. The Ruta Condor's objectives are outlined in Box 1.

The Ruta Condor assumes a multi-pronged approach that recognises the role of social, cultural, and economic factors

- Areas of high biological diversity (including hot spots and critical and vulnerable areas).
- Outstanding mountain ecosystems (including high mountain wetlands, native forests, and grasslands).
- Cultural areas (including sacred sites, archaeological centres, World Heritage sites, and other cultural landmarks, such as places with a strong craft tradition such as pottery and weaving); and
- Protected natural areas (including national parks, nature reserves, biosphere reserves, etc).

³ *Wiracocha Route (la Ruta de Wiracocha) is a pre-Hispanic route which linked culturally and biological important points in the Andes, including sacred sites, cities, areas of high biodiversity, ceremonial centers, etc. It was devised by Wiracocha, a Pre-Hispanic wiseman, who used Andean scientific principles to establish a sacred route which extended from Colombia to Argentina (Milla 1989).*

⁴ *The protected working landscapes will be established under IUCN Category V principles.*

Integrated Landscape Management:

1. Biodiversity conservation and sustainable use.
2. Watershed management.
3. Agricultural borders for wildlife.
4. Traditional agriculture and ecosystem management.

Sustainable Agriculture and Agrobiodiversity Management:

1. Adaptive management.
2. Traditional technologies and productivity.
3. Under-utilised crops.
4. Crop improvement.
5. Organic farming.

Sustainable Communities:

1. Indigenous Tourism.
2. Community planning of living and productive spaces.
3. Marketing of native crops.
4. Strengthening local markets.
5. Traditional mapping.

Cultural Heritage:

1. Archaeological sites.
2. Hot spots of traditional crafts and arts.
3. Sacred sites.
4. Points of origin of native tribes/cultures.
5. Prophesy sites.

Co-management of Protected Areas:

1. Co-management agreements for national parks, biospheres, reserves, *etc.*
2. Guidelines for local participation in the management of protected areas.
3. Models of community-based adaptive management regimes.

Traditional Resource Rights:

1. Intellectual property.
2. Access to genetic resources.
3. Community protocols.
4. Land rights.

Box 2: Preliminary Project Focus Areas.

Agricultural protected landscapes and new focal points making up the route will be managed adaptively, based on the traditions and knowledge of the native peoples. Linkages with the focal points will be promoted in collaboration with conservation authorities in the given country and arrangements will include strategies to ensure effective participation of the local people in the management of focal points that have already been established.

The route, or corridor, framework is intended to empower local communities and indigenous peoples and support them

in their conservation efforts by bringing them together in various fora to share experiences and ideas, obtain resources, and construct successful conservation initiatives (McNeely *et al.* 1994). A further goal is identifying strategic actions required to strengthen protected areas in South America. This includes the use of participatory research and planning techniques, as well as training programmes that emphasise participatory processes, conflict resolution, and harmonisation of interests. The Ruta Condor strategy is based on these principles, and given its geographic scope, will go a long way to

strengthen *in situ* conservation objectives on the continent. Additionally, the implementation of the route will provide an opportunity for native people in the Andes to work together to create opportunities to conserve, protect, and benefit from their knowledge, practices, and innovation systems. Issues of intellectual property and benefit sharing will therefore be an integral part of the project.

The Ruta Condor will link landscapes that developed organically and were intimately tied in the early history of the Andes. The Spanish invasion violated the harmony and connectivity of the landscape and marginalised the indigenous peoples who helped to create the region's richness and diversity. The Ruta Condor is, therefore, also an attempt to revitalise native peoples' common identity. To this end, the Ruta Condor will emphasise the incorporation of culturally important sites to help native peoples strengthen their cultural identity and sense of belonging. The incorporation of sacred sites is also important from a conservation standpoint, since they usually possess high biological diversity as a result of their long-standing traditional protection status.

The project will take proper account of the general goals of equity and poverty reduction of the indigenous peoples along the Ruta Condor. An ecotourism and indigenous tourism plan will be developed as part of a framework to provide economic incentives for conservation. Ecotourism activities will be promoted within the framework of the 2002 UN Year of Ecotourism and Year of the Mountains.

MANAGEMENT OF THE RUTA CONDOR

The Ruta Condor presents a new paradigm of protected area management: One in which local indigenous communities not only participate in protected areas, but form the very core of protected area establishment and management in a regime that aims to conserve biological and cultural diversity through a more integrated, bottom-up approach. Indigenous people along the route recognise the importance of initiating conservation measures to ensure their own survival in the long-term and are ready to self-mobilise in order to create change. The wealth of local ecological, agricultural, and cultural knowledge is crucial to the maintenance of the complex biophysical systems. Indeed, it is this knowledge and these knowledge systems that form the basis of the Ruta Condor's approach and philosophy. The establishment of the Ruta Condor will engage indigenous and traditional communities along the route, and will require and strive for effective mechanisms to co-ordinate actions and make decisions, seeking the collaboration of other conservation and development actors at the local and regional level, and from national and international sources. Direct participation and control of the project by local communities will ensure that the views

of the indigenous peoples and their construction of local reality will be the basis of the intervention. This will also guarantee that landscape conservation activities will be tailored to local realities and ensure the project's acceptance and success. The project strategy will promote the use of traditional knowledge and will benefit from its shared ownership, adaptive nature, and Earth-based 'cosmovision' (see Irene Dankleman's paper in this volume). Further, the initiative will bring experience and ideas to the international forum and encourage policy reform.

In addition to a philosophy of adaptive management based on traditional knowledge systems, the Ruta Condor will aim for an integrated ecosystem approach. Ecosystem management of protected areas is characterised as a way to:

- Integrate parks and protected areas into their surrounding landscapes so that parks do not function as isolated islands.
- Account for the range of interactions that occur at spatial and temporal scales beyond the traditional scales used in park management; and
- Incorporate a range of human values into the protection and use of the landscape.

The integrated ecosystem approach that will be employed is key to the effective conservation of each element in the Route since the protection of biological and cultural diversity are interdependent. This holistic approach will provide an enabling environment for the conservation and sustainable use of biological diversity, including the maintenance of ecosystem functioning and resilience, wildlife populations and habitats, and biological diversity important to food and agriculture, including landraces and wild relatives of domesticated plants and animals. Finally, the route will endeavour to be kept free of genetically modified organisms (GMOs) in order to maintain the Andes as an important reserve of strategic plant genetic resources and ensure critical ecological services for the region's increasing population.

CONCLUSION

The Ruta Condor initiative is an important first step in dealing with various complex problems that indigenous peoples face in their efforts to co-exist as traditional societies in the fast-paced global community. The project will serve as a model for locally-driven sustainable development in the region, as well as on the global scale, ensuring appropriate community development processes and the sustainable management of mountain resources. This is the first case in the region of a protected landscape initiative of such scale established by indigenous peoples and is likely the first initiative of its kind in the world.

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Summaries

Cerapport examine le modèle Ruta Condor, stratégie de conservation globale novatrice dirigée par les populations locales de la région des Andes de l'Amérique du sud. Le modèle Ruta Condor se compose d'un réseau d'aires protégées gérées par les communautés qui relient des points sensibles d'une valeur culturelle, historique, écologique et agricole importante. Cette stratégie répond à la détérioration de l'intégrité écologique et culturelle des Andes, provoquée par les tendances de modernisation et mondialisation économique. Le modèle Ruta Condor est une initiative communautaire de grande échelle, unique en son genre, qui utilisera un régime de gestion adaptative, prenant en compte l'écosystème, tiré de pratiques et croyances traditionnelles. L'itinéraire utilisera comme modèle l'ancienne route Wiracocha, un chemin sacré datant d'avant l'arrivée des Espagnols qui reliait les paysages des Andes et il servira à éduquer et développer le sens de l'initiative des communautés traditionnelles vivant le long de ces paysages. En intégrant les soucis de conservation, d'agriculture durable, d'économie, d'éducation, de propriété intellectuelle et d'autodétermination des populations, ce projet fournit une stratégie globale de conservation et de développement s'appuyant sur les communautés.

Estetrabajo analiza la Ruta Cóndor, una estrategia de conservación holística impulsada por los indígenas de la región andina de América del Sur. El concepto de la Ruta Cóndor consiste de una red de áreas protegidas con base en la comunidad que enlazan lugares de importancia en cuanto a su valor cultural, histórico, ecológico y agrícola. Esta estrategia es una respuesta al deterioro de la integridad ecológica y cultural de los Andes, resultante de la modernización y las tendencias a la globalización económica. La Ruta Cóndor es una iniciativa singular, a gran escala, con base en la comunidad, que utilizará un régimen de manejo adaptativo basado en ecosistemas y derivado de prácticas y creencias tradicionales. La ruta será modelada según la antigua Ruta Wiracocha, un sendero sagrado prehispánico que enlazaba los paisajes andinos y servirá para dar poder y educar a las comunidades tradicionales a lo largo de estos paisajes. Al integrar temas relacionados a la conservación, la agricultura sostenible, la economía, la educación y la propiedad intelectual y la autodeterminación de los pueblos indígenas, este proyecto constituye una estrategia holística de desarrollo conservacionista con base en la comunidad.

Appropriate Social Units of Analysis in the CAMPFIRE Programme in Zimbabwe

Bev Sithole¹ and P.G.H. Frost²

Broad-scale social units typified by nation states or economic regions are clearly of a different order from local-scale groupings organised at the tribal, village, or family level. Ecological and socio-economic interactions occur at various spatial scales across these social units. This paper suggests that adaptive management which involves people operating in different social arenas and pursuing different interests is best understood when the analysis is multi-layered and incorporates different, interlinked social units functioning at a range of scales. The right questions about adaptive management need to be asked. This paper considers a number of key questions that have been asked of the Communal Areas Management Programme For Indigenous Resources (CAMPFIRE) programme in Zimbabwe and highlights how using wrong analytical units misinforms current discourse on the success of the programme.

INTRODUCTION

The literature on common property and community-based management is unanimous in its advocacy for local-level management by local communities (McCay and Acheson 1990). In much of the literature, 'local-level' refers to a wide variety of social units including community, tribe, village, local people, or in the case of Zimbabwe, the smallest level in an administrative hierarchy. Lewis (1991) finds that most of the varied terms used to label constituent units of humankind prove to be problematic. Most of these terms are employed at widely ranging geographic scales. While the literature vacillates between the use of community or village as the smallest social unit, more recent literature suggests that the household is a more appropriate unit of analysis (Preston 1992). The need to clarify appropriate units of reference or analysis at the local-level is therefore evident.

The term 'local-level' has wide applications, yet what it defines is rarely specified, especially when one is dealing with issues that have global relevance. Two arguments are often used to justify the local-level as the entry point for

research. The first, quoted in *The Ecologist*, argues that one reason why local control is important is because the "environment itself is local; nature diversifies to make niches, enmeshing each locale in its own intricate web. Insofar as this holds, enduring human adaptations must also be local." (O'Connor, cited in *The Ecologist* 1993:16). The second argument, presented in the *Principles of Sustainable Use Within an Ecosystem Approach*, is that "the closer management is to the ecosystem, the greater the responsibility, accountability, participation and use of local knowledge." (UNEP 1999). That is, people with a more immediate stake in a resource are likely to manage it better because their livelihoods are tied to its continued existence. Our paper examines the various local-level social units identified in the literature to assess their appropriateness as social units of analysis in adaptive management, and these are contrasted with examples from the Communal Areas Management Programme For Indigenous Resources (CAMPFIRE) in Zimbabwe.

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CAMPFIRE IN ZIMBABWE

CAMPFIRE was introduced in Zimbabwe as a framework for management in which proprietorship over wildlife was to be given to the smallest accountable unit at the sub-district level (Murombedzi 1992). To date, however, conferment of proprietorship has been to the district councils, not to the sub-district structures (Murphree 1991). Devolution of control is seen as a way of increasing wildlife benefits and decision-making at the local-level, under the assumption that this devolution will enhance the sustainability of resource use while simultaneously benefiting the people who live with the wildlife (Hasler 1993). But have local people benefited? Can district councils serve as genuine and effective stewards of natural resources (Murombedzi 1999)? Hasler (1993) suggests that the unit of analysis in CAMPFIRE should be thought of as an interlinked political and economic process operating at various levels of social organisation, ranging from global, national, district, ward, and village levels, to households and individuals. Being realistic about the rights and vested interests in wildlife at different levels leads to an appreciation of the political ecologies of scale (Abel and Blaikie 1986; Hasler 1993). CAMPFIRE in Zimbabwe is an appropriate example with which to illustrate some of the complexities of identifying appropriate social units for natural resource management.

Though there is overwhelming support in the literature and in official documents of the suitability of community as the appropriate social unit for the management of wildlife, the inherent ambiguities and problems related to this social unit are known and acknowledged (Agrawal and Gibson 1999; Madzudo 1999). Who precisely constitutes 'the community' is seldom clearly defined. It is often assumed that 'community' corresponds to one of the sub-district administrative units, but opinions vary as to which of these is most appropriate. For example, in the context of adaptive management in CAMPFIRE, we have advocates of "*communities producing or affected by wildlife*" (Scoones and Matose 1993), "*smaller units of proprietorship such as a traditional village*" (Campbell *et al.* 1998), and "*smaller more accountable units such as wards and villages*" (B.A. Child 1995). These statements clearly reflect variation in opinion regarding the most appropriate social units for adaptive management in CAMPFIRE. These units are themselves not homogeneous, but comprise individuals with different origins, ethnicities, interests, preferences, livelihoods, socio-economic status, and levels of power and influence. These attributes in turn vary across a range of scales, from ethnic groups and clans, to villages, household clusters, family groupings inside these clusters, and even within families (Frost and Mandondo 1999).

The existence of these different levels of social organisation suggests that one must make choices and clarify exactly what the social unit of interest is. There is "*no correct scale for investigation, but there is an appropriate one for answering different questions*" (Blaikie and Brookfield 1987:68). Although the spatial scale is usually defined by the unit of analysis, there is seldom a neat one-to-one correspondence between space and the level of decision-making. Consequently, the scale at which the analysis is undertaken tends to affect the type of explanation given (Blaikie and Brookfield 1987). In this paper we review some of the questions often raised about CAMPFIRE and try to identify the social units that need to be analysed to answer them.

Many commentators on Community-Based Natural Resources Management (CBNRM) believe that CAMPFIRE is a shining success story (G. Child 1995; Getz *et al.* 1999). But how accurate are these assessments? What constitutes 'success' and what unit of analysis can usefully determine whether or not CAMPFIRE is a successful management programme? Questions related to the success of CAMPFIRE include the following:

1. Who participates in CAMPFIRE?
2. Who is the producer community?
3. What are the perceptions of local people on incentives for wildlife management?
4. What is the relationship between people and wildlife in CAMPFIRE areas?
5. What is the level of damage caused by wildlife? Precisely who in communities is affected by it? How are they affected?
6. How are the benefits and costs shared within and between producer communities?

This paper draws on existing literature on the CAMPFIRE programme in Zimbabwe to examine the social units suitable for answering these and other questions about CAMPFIRE. Before we consider these questions, however, it is important to consider and define the notion of adaptive management in the context of CAMPFIRE.

ADAPTIVE MANAGEMENT IN THE CAMPFIRE CONTEXT

In every programme the wheels fall off at one time or another, in the sense that problems inevitably occur which, if not addressed, will inhibit further progress (Murphree pers. comm.). Adaptive management occurs when communities develop mechanisms either to put the wheels back on or to refine the programme by dropping non-essential components. For adaptive management to become an integral part

of CBNRM, there has to be both monitoring of social and environmental conditions to measure progress towards the programme's goals, and the willingness and capacity to adjust activities and actions to effect the necessary changes to achieve these. For this to happen, there must be sufficient incentive for people, individually and collectively, to bear the opportunity and transaction costs of the programme. In this context, CAMPFIRE is an evolving programme that comprises a range of initiatives being played out in a variety of biophysical and socio-economic environments. As a result, not all initiatives are at the same stage of development, and few can be considered to be mature. Mukamuri and Mavedzenge (1998:10) quote some villagers who describe CAMPFIRE thus:

"to us CAMPFIRE is like a child who is growing up. During the early stages the child is looked after by parents. The parents clothe and feed the child. Eventually the child grows up and marries. This is how officials should view CAMPFIRE. It is now grown up and officials must now leave communities to run their own affairs."

Mukamuri and Mavedzenge (1998) add that CAMPFIRE should be regarded as a programme that is locally constructed within the totality of the livelihood systems prevailing in a given location. Overall, CAMPFIRE is best regarded as an experiment in progress.

McLain and Lee (1996) describe adaptive management as a continual learning process that involves learning from experience or learning by doing. In the context of CBNRM research, it is pertinent to ask: Who is doing and who is learning? In many cases in the past, alien concepts and ideologies rather than local experience determined how natural resources were used. Even where the value of local experience is acknowledged, many academics and policy makers are still reluctant to incorporate this local knowledge. In the context of what Scoones and Thompson (1994) call *Ecopolitism* adaptive management becomes an accommodative process of moving incrementally towards a people-determined and people-moderated programme in which the goal does not have to be fixed or precisely defined but can change with time. Therefore, within CAMPFIRE there is a need to understand what the goals are and who is setting them.

Existing studies suggest that there are many stakeholders and that their interests are often different, though they may converge at particular levels (Abel and Blaikie 1986; Murombedzi 1992). Hasler (1993) and Murombedzi (1992) both suggest that goals are largely externally determined and that the locus of decision-making has never been truly local. The external stakeholders frequently jostle for control and their interests are not always representative of local interests. Yet even within the constraints imposed by higher-level institutional frameworks, local people have been able to evolve their own brands of adaptive management. In some situations, this adaptive man-

agement is more visible than in others, suggesting a need to be context specific.

PARTICIPATION IN CAMPFIRE AND POSSIBILITIES FOR ADAPTIVE MANAGEMENT

Preston (1992) regrets that, in his research on people and their environments, he spent so much time interviewing people without knowing either their agendas or their positions in the local community. He describes how recording activities of individuals within the household provides opportunities to reveal empirical and real changes. Freudenberger and Freudenberger (1992) find that the individual user makes the least formal, apparently mundane decisions that are nevertheless critical. This level of analysis is significant because it underscores the role of the individual in the household. It is at this level that women's views, activities, and biases become visible.

Preston (1992) nonetheless recommends that research should focus on the smallest unit within which individuals are organised - the household. He finds that households "*produce conglomerates of interests, resources, [and] social categories*" (Preston 1992:16). He admits that using the household as a social unit of analysis is like opening a can of worms in the sense that the amount of data that can be collected is immense and complex. While accepting the value of the household as the smallest social unit of analysis, it is important to recognise the unequal distribution of power between members, especially with respect to different age groups and gender. The idea that the household acts to fulfil some joint utility function therefore needs to be contested. To the contrary, different individuals often pursue separate interests, even though in many instances these are subject to negotiation.

Where CAMPFIRE exists, it is incorporated into a broader strategy of livelihood diversification pursued by the household, the elements of which are negotiated by household members. Participation in CAMPFIRE is therefore weighed in relation to other components of the household's strategy. As a result, differences may exist among household members in their attitudes to CAMPFIRE, depending on their other commitments. These attitudes can change in response to changing contexts. Whereas when dividends (money derived from hunting and other CAMPFIRE related activities) are given to a household, it is usually the male members that receive them. How the money is spent generally tends to be negotiated within the households, although when the dividend is low, men will monopolise the income without consulting other members of the household (Sitholee *et al.* 1999). Men seem to be lured by CAMPFIRE dividends more than

women, tending to view these payments as free money for which one does not have to work. Therefore, even when the amounts received by the household are insignificant, men still support the programme (Mukamuri and Mavedzenge 1998). Locke *et al.* (1998) suggest that, in general, negotiations between members of the household involve regular and highly dynamic bargaining, even when these bargaining processes are not obvious. Little is known about these transactions or the nature of consent among individuals within the household, though such knowledge would greatly enhance our broader understanding of participation in and support for CAMPFIRE by different members of the household.

ANIMAL DAMAGE AND COMPENSATION: SMALL ANIMALS AND INVISIBLE DAMAGE

Another issue that differentiates attitudes among members of the household to CAMPFIRE is that of animal damage to crops and livestock. Depending on the social unit of analysis used, opinions will differ on whether animal damage by wildlife is important or not. The degree of damage tends to be viewed more seriously, and as having more impact, at the household level when compared to that at the district council level where statistics regarding damage are viewed in relation to the overall district population or land area. But to understand clearly the impact of wildlife on livelihood strategies, one's analysis must be located at the smallest level of assessment - the individual.

In some parts of Zimbabwe, people encounter animals on a daily basis and have developed strategies and practices to cope with them (Mukamuri and Mavedzenge 1998). Ethnic groups like the Shangaan in the southeast and the San in the southwest of Zimbabwe perform rituals to minimise wildlife damage. There are also technologies and practices that have been developed to deal with wildlife problems. Since the introduction of CAMPFIRE, however, wildlife damage has tended to be viewed as an issue of Problem Animal Control (PAC) to be dealt with by the Department of National Parks and Wild Life Management or sometimes by hunters operating within a region.

Problem animals tend to be thought of as big animals, never the smaller animals that also negatively impact crops, especially those grown by women (Mukamuri and Mavedzenge 1998). External assessments of the costs of wildlife damage tend to be aggregated at a household level regardless of ownership of a specific unit of livestock or piece of land. In most cases, records of animals killed by predators do not specify who owned the animals. (Although domestic animals are penned together, they are owned by individu-

als.) Likewise, the records fail to distinguish the level of damage to crops on the *tseu*, the woman's field, from damage to crops more generally. Damage to a woman's *tseu* remains invisible both because the women are not given a chance to document it and because the crops on these pieces of land are regarded as domestic and therefore of lesser value to overall household production. Men may be aware of this damage but may not think it sufficiently important to highlight in meetings. Over time, local people, especially women, have also evolved practices and methods of dealing with these small problem animals. This raises the issue of frequency of damage. Damage from small animals is frequent and so tends to be regarded as normal. As such, it is easily dismissed. When the traditional male domains of the big field or the livestock pen are damaged, however, it ceases to be normal. It is recorded as household damage.

Wildlife damage can therefore be visible or invisible, depending on who is affected and how, with the costs not necessarily being borne equally among household members (Mukamuri and Mavedzenge 1998). Subordinate members may be particularly adversely affected. Do these individuals receive parity or priority when dividends are shared? Who really benefits from the dividends and who loses? What do these inequalities mean in terms of local support for and participation in CAMPFIRE? Once we begin to recognise differentiated positive and negative impacts at the individual level, we will see more clearly the reality underlying the processes, participation, and outcomes related to CAMPFIRE. Only then can we explain apparent ambiguities, such as support for CAMPFIRE in the face of high predation or in spite of low and intermittent receipt of dividends. Such paradoxes emphasise the need for household-level analysis.

LOCAL PERCEPTIONS OF INCENTIVES TO NATURAL RESOURCE MANAGEMENT

Many key decisions concerning investment in and exploitation of natural resources are taken by individuals who both manage privately held resources and contribute to the management of common pool resources (Freudenberger and Freudenberger 1992). Hence, individuals exercise control over many land-use and management decisions. Decision-making about resource use and management occurs primarily within households and this is the level where the patterns observed at higher levels of spatial aggregation, such as landscapes, originate (Scoones 1998). For example, in the context of CAMPFIRE, the success of incentives can be assessed in relation to the incidence of local poaching. Who is poaching and why? In some districts that have established CAMPFIRE programmes, occurrences of poaching are asso-

ciated with outsiders, but in many of these areas local people also poach. It is important, therefore, to understand why people would poach resources that belong to them and from which they supposedly derive economic benefits.

Outsiders frequently stereotype individuals or households involved in poaching, and little effort is made to understand why, when, or how often poaching occurs. The occurrence of poaching has rarely, if ever, been linked to the issue of animal damage and compensation. While CAMPFIRE is intended to provide economic incentives for managing wildlife through the payment of dividends, specific compensation for any damage caused is not paid; households may be listed for compensation, but few actually receive any Dividend payments are meant to cover this but the costs of damage generally far exceed the payments received.

The frequency and extent of damage from wildlife varies markedly between communities and among households within communities (Madzudzo 1996). In a study of eight wards in southern Zimbabwe, which had been designated as producer communities under the provisions of CAMPFIRE, only one experienced wildlife damage and predation, yet the households in that community received the same dividend as those in the other wards (Madzudzo 1999). Clearly, if some households bear a higher cost than others, but do not receive a correspondingly higher dividend so that the net benefits are more-or-less equally distributed, the goals of CAMPFIRE risk being undermined. Sithole (1998) found that the households located on the fringes of settlement areas in the Zambezi River valley experienced higher incidences of damage and acted as a buffer to households settled away from the woodland edge. Most of the poacher households are located in this frontier zone. These households explain their poaching as a means of recouping damages from wildlife because they know that they will not receive compensation from the government or the district council. They suggest that their recourse to poaching depends on the frequency of predation or damage. As Sithole (1998) found out, households see it as *"ndinenge ndichitevera donje rangu ka, radyiwa"* (translation: *"I would be following my cotton which is in its [the animal's] belly; is that poaching?"*). In such communities, therefore, hunting problem animals is not viewed as poaching. Nevertheless, assessment of animal damage and the degree of sympathy felt for those experiencing such damage is determined within a broader social context that takes into account the level of vigilance by the household, or the soundness of infrastructure around a field. Many instances of poaching are also associated with survival, particularly during drought periods. Traditionally, hunting was allowed under such circumstances, but now it is prohibited and viewed as 'poaching'. So, while producer communities are willing to risk losing CAMPFIRE revenue due to poaching, they are unwilling to weaken their overall livelihood strategies.

LOCAL PEOPLE'S RELATIONSHIPS AND ATTITUDES TO WILDLIFE

Case studies focusing on ethnicity have generally highlighted the tendency for subordinate groups or migrants to carry a disproportionate level of the cost of living with wildlife relative to the benefits that they receive. Such households experience a higher frequency of predation and crop damage. In some communities, subordinate groups are said to be targeted because they disregard the rules, norms, and religious controls of the area. In the context of CAMPFIRE, migrants are therefore seen as targets for problem animals that are believed to be sacred by the local community. As quoted in Mukamuri and Mavedzenge (1998:11):

"The people who come into this area from other parts have brought us lots of troubles. In the past supplicating to our ancestral spirits could control the animals. These days the spirits have run away because too many people do not want to supplicate to them. It is the old habits and customs that we want back. Immigrants should meet the traditional obligations they agreed to when they were looking for places to settle. They must obey the laws of the land. Animals are easy to control. This can only be achieved by living harmoniously with the spirits of the land."

Thus, at an ethnic level, problem animals become spirit animals (*mhondoro*) to be revered and not destroyed; animals sent by ancestors to punish individuals or groups that are not observing the law (*mhiko*) of the land. The incidence of animal damage is taken to reflect the degree to which the people concerned disregard rules, norms, and other pragmatic social controls. Nonetheless, minority groups in the Zambezi River valley are settled in peripheral areas where they serve as buffers for others who have been residents in the area for many years (Sithole 1998). The higher incidence of crop damage and predation experienced by these minorities is therefore not unexpected.

Studies of communities in the Zambezi and Limpopo River valleys show that attitudes to wildlife vary among different ethnic groups. For example, in the Zambezi valley the Doma and the Korekore are more tolerant of wildlife compared to other ethnic groups. Similarly, along the Limpopo valley, the Shangaan are tolerant of wildlife yet they are against CAMPFIRE. Why? Though CAMPFIRE, as a community-based programme, is aimed at transferring control over wildlife to the people, this is not how local people view it. Instead, CAMPFIRE is seen as a programme that has dispossessed some ethnic groups, such as the Shangaan, of their subsistence entitlements to wildlife (Mukamuri and Mavedzenge 1998). In seeking to regain these entitlements, some of these tribes resort to poaching. Viewed from the per-

spective of the ethnic group as the social unit of analysis, questions of devolution, empowerment, and equity are still unresolved.

THE DISTRICT COUNCIL AS A PRODUCER COMMUNITY?

Dzingirai (1995) found that some communities were saying, *"Take back your CAMPFIRE!"* The communities to which Dzingirai refers are communities embedded within a larger legally designated 'community', the district. In another report published in a local newspaper, Chenge (1999) found that other communities were seeking to secede from their rural district councils. These findings highlight the presence of conflicts between the district councils and the producer communities over CAMPFIRE. Many researchers have questioned the designation of the district as the smallest accountable unit of management and suggest that power and control over wildlife should be devolved further to wards or villages.

Madzudzo (1996) found varying interpretations among district councils about which communities should benefit from dividend payments. Some councils, such as Guruve in northern Zimbabwe, pay dividends only to those wards in which animals were shot, in proportion to the revenues received. This leads to suspicion among the non-beneficiary villages that some wards are forming bands of young people who drive animals into their areas to be hunted, or that that safari hunters are selective about the wards in which they hunt (Sithole 1998; Mukamuri and Mavedzenge 1998). In other districts, notably in Matebeleland South province, benefits are shared equally among all the wards involved in CAMPFIRE (Madzudzo 1996). In such districts, questions are raised about the congruence between the benefits and costs of living with wildlife: *"Even those that have never seen an elephant benefit just because they are members of the ward"* (Madzudzo 1996:6). In yet other districts, the communities comprise a mix of tribes who have differential access to the benefits derived from CAMPFIRE. Minority or subordinate groups, though readily admitted into the producer communities, are marginalised when it comes to the allocation of projects funded by CAMPFIRE. For example, in Madzudzo's (1996) study area, the San, who gave up rights to use the area now set aside for CAMPFIRE, are not receiving any benefits. As discussed earlier, these inequities are compounded when the marginalised groups also have to bear a disproportionate amount of the cost of living with wildlife, through animal damage. To understand this dimension of wildlife-people interactions, one must use the ethnic group or tribe as the unit of analysis.

Most rural district councils do not properly represent those

of their communities involved in managing wildlife. They usually control, and are responsible for, areas that are much larger than the CAMPFIRE area in their districts. Some CAMPFIRE communities resent supporting district council bureaucracies and subsidising projects for which the government ought to be responsible. Most councils are estranged from the people and have instead assumed the traditional roles of the state as policeman and natural resource manager. Officials from the Department of National Parks and Wild Life Management have been replaced, not always successfully, by 'CAMPFIRE' monitors employed by district councils. As Mukamuri and Mavedzenge (1998:13) report:

"Our children whom we sent for training as monitors (anti-poaching units) only came back with button sticks and handcuffs. We do not know whether these are meant for buffaloes and elephants. This is what taught us that we were being cheated by the project. CAMPFIRE is just a lie."

Liberal interpreted therefore, we argue that CAMPFIRE has created conditions whereby communities have become disenfranchised with respect to the benefits previously derived from wildlife. One spirit medium asked: *"How can CAMPFIRE give you something that already belonged to you, they stole the animals from us, now they say you can have them, they are like children who want what they do not have and as soon as they have it they loose interest in it?"* (Sithole 1998:21). In another conversation a respondent stated:

"CAMPFIRE is now ransoming everything we have. First it was the animals. We no longer are allowed to kill animals. Now it is our land. How will we be able to survive without land? CAMPFIRE will not look after us. But as for this... let it be known that if they [the safari operator and the Council] do not want to put the fence where we want to put the fence, then we do not want their fencing including their CAMPFIRE" (Dzingirai 1995:7).

One elderly respondent argued that the only difference between CAMPFIRE and the previous lock-out policies is that, under CAMPFIRE, the community is informed about the programme and given just enough to make them think that they are benefiting: *"Vanotinanzvisa kunge vana vadiki"* (translation *"A lick of the goodies to wet their expectations,"* (Sithole 1998)). Dzingirai (1995) describes a similar perception among the villages in Binga district, where one respondent stated:

"We realised that once the fence had been put in place, he would not allow us to have access. He was creating his own farm, his own national parks in which even dogs would not be allowed to pass" (Dzingirai 1995:7).

In these statements the district council is seen to be indivisible from the government even though it purports to represent the community. One reason that makes district councils a questionable social unit for CAMPFIRE is that, gener-

ally, they have not devolved power to lower levels as required in the guidelines for the programme. Thus in many cases, non-functioning ghost committees exist at the lower level. The Chief Executive Officer for one of the CAMPFIRE districts in south-eastern Zimbabwe disclosed that some committees never meet unless the CAMPFIRE officer or a district council official visits an area.

Committee members, especially councillors, are frequently estranged from the communities they supposedly represent. They not only fail to represent the needs of the communities, but they are not accountable to them either (Mukamuri and Mavedzenge 1998). For example, Sithole (1998:26) found that councillors are accused of *"bringing outsiders who bring programmes that undermine our livelihoods because they put their signatures without consulting the constituency."* The councillors themselves state that programmes like CAMPFIRE are brought in from outside: *"These kinds of programmes are implemented by the government, we don't have any power over that"* (Sithole 1998:27). Because people view CAMPFIRE as an externally initiated programme, their attitudes to the programme are both accommodating and conflicting (Madzudzo 1999). Madzudzo provides examples of people stealing fences that were purchased with CAMPFIRE money because they did not believe it was their money. Similarly, there are examples from south-eastern Zimbabwe in which projects intended to benefit households and financed by CAMPFIRE revenue were, nevertheless, still regarded as government-owned projects (Sithole *et al.* 1999). Given the upwardly-directed allegiances of many district councils (linked to government) and their CAMPFIRE committees (linked to the regional district councils), relying on these organisations as sources of information will bias the perspective in favour of external rather than local viewpoints. Likewise, solutions proposed at these levels to the problems of CAMPFIRE will be influenced more by external ideas than by local knowledge and understanding.

A related issue that emerges in CBNRM discussions is the focus on accountability to the users of decision-making levels. For example, rural district councils in many parts of Zimbabwe have often shown themselves to be wholly insensitive to demands from the producer communities (Madzudzo 1999). Madzudzo gives an example of how one rural district council reacted to a request from a community to come and investigate the case of a stolen fence. The council officials did not come. The community then raised the bus fares needed to cover the travelling expenses of the officials concerned, but still no one came. Eventually the community collected money to go and consult a traditional healer who would punish and kill the thief. Only then did a district council official arrive and try to placate the villagers. The fence was eventually replaced by the regional district council us-

ing money from CAMPFIRE revenues. This process occurred over many months.

A similar case is described in Sithole *et al.* (1999) in which a request by a CAMPFIRE committee in the Limpopo River valley to fence off an irrigation scheme received no response from the council for many months, even though people were prepared to use their proceeds from the CAMPFIRE project to fund the fence. There was no consultation between the rural district council and the community. Poles arrived a year later, without the people knowing from where they had come. There was much speculation about the source of the poles and the donor, who was thought to have supplied the fence. Neither the district council nor the government was perceived as the donor. Even the CAMPFIRE committee did not know about the fence until the rural district council came to organise the villagers to put it up. The whole process took more than a year. The time lag between decisions and actions at the level of the district council highlights the reasons why this social unit is not the appropriate one for promoting adaptive management. Detailed analysis of these and other cases of district council-community relations suggests that regional district councils more often constrain adaptive management than facilitate it.

BENEFIT AND COST SHARING IN CAMPFIRE

Another important question related to CAMPFIRE is the issue of benefits and cost sharing between the community and the district council. In terms of the conditions under which they are granted appropriate authority over wildlife, district councils can retain up to 50% of CAMPFIRE revenues; the rest is shared between the wards (B.A. Child 1995). Seventy percent of the revenue retained by the regional district council (35% of the total) is supposed to be used for wildlife management, though this seldom happens. In reality, councils retain more than 50% of CAMPFIRE revenues, or greatly delay payments to communities. Villagers increasingly resent both the proportion of money retained by the district councils and the ways the money is spent (Mukamuri and Mavedzenge 1998). Not only do the councils retain a substantial proportion of revenue, but they also take the money intended for disbursement to households away from communities. Within the Limpopo River valley, where the dividends are pitifully low, the CAMPFIRE committees often decide how the money should be used at the community level, often using the money for community projects, rather than paying out household dividends (Sithole *et al.* 1999). It can be argued that the often low returns from CAMPFIRE are better aggregated and spent on such projects rather than being disbursed in insignificant amounts among households.

Nevertheless, when CAMPFIRE dividends are appropriated to fund community projects (schools, dip tanks, and even clinics) that are really the responsibility of the council or central government, the wrong message is being sent to communities and the incentive to retain wildlife as a beneficial resource is weakened.

Even when CAMPFIRE proceeds are used for community projects, members of the relevant producer community are often not aware of this. This raises the question of whether households receive any direct benefits from CAMPFIRE. While the economic benefits of CAMPFIRE may be apparent at the council level, the extent and visibility of the benefits at lower levels declines rapidly as one moves down to individual households. If the regional district councils continue to manoeuvre the CAMPFIRE committees to fund community projects without adequately consulting and securing the agreement of communities, serious questions will have to be raised about the sustainability of the programme. If the trend continues, CAMPFIRE risks being seen as no more than a thinly-veiled enterprise to fund government projects under the guise of CBNRM.

the generalised and sweeping statements frequently made about communities as the appropriate units for natural resource management are likely to be both presumptuous and misleading. And, to paraphrase Lewis (1990, most of the terms used to label the supposed constituent units in such societies turn out to be questionable.

REFLECTIONS ON APPROPRIATE SOCIAL UNITS

The foregoing examples highlight the importance of asking the right questions at different levels and answering them at the appropriate scales. Certain ambiguities are explained better at the household level than they are at the council level. For example, the issues of benefit sharing and the attitudes to CAMPFIRE are more clearly articulated at the household level than at a higher level. Dealing with households, however, is hugely complex, not only in the many subtle and difficult to discern interactions among household members, but also in the variability that exists among households. Even social units at this level are seldom what they seem, often being nested within larger and similarly complex social units. But if sustainable use involves dealing with differences and embracing both ecological and social complexity then research will need to be grounded in the daily experiences and decisions of individuals (Rocheleau 1992). This paper has also indicated, however, that individuals operate in a socially defined context where decision-making is frequently influenced by decisions made by others, at the same and other levels. Any research framework must, therefore, provide a scaled approach with multiple levels through which broad investigation leads progressively to finer levels of detail (Bradley 1991). Examining issues at levels other than the community reveals additional complexity that brings home the need to understand the interfaces between different units nested within bigger units. Such studies clearly show that

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Summaries

Les unités sociales de grande ampleur qui caractérisent les pays ou les régions économiques sont clairement d'un ordre de grandeur différent que les groupements d'échelle locale organisés au niveau tribal, villageois ou familial. Des interactions écologiques et socio-économiques se produisent à diverses échelles spatiales entre ces unités sociales. Ce rapport suggère que la gestion adaptative qui regroupe des individus intervenant dans différents domaines sociaux et poursuivant des intérêts différents est le mieux comprise lorsque l'analyse se fait à plusieurs niveaux et incorpore différentes unités sociales reliées entre elles et fonctionnant à diverses échelles. Il faut se poser les bonnes questions sur la gestion adaptative. Ce rapport examine un certain nombre de bonnes questions qui ont été posées dans le cadre du Programme de gestion des ressources indigènes dans les terres communales (CAMPFIRE), au Zimbabwe et souligne comment l'utilisation d'unités d'analyse inappropriées renseigne mal l'examen actuel sur le succès du programme.

Unidades sociales a gran escala representadas por naciones o regiones económicas pertenecen claramente a una escala diferente a la de las agrupaciones a escala local organizadas a nivel de tribu, aldea o familia. Las interacciones ecológicas y socioeconómicas ocurren a varias escalas espaciales a lo largo de estas unidades sociales. Este trabajo sugiere que el manejo adaptativo que involucra a personas que operan en diferentes entornos sociales y con diferentes intereses se entiende mejor cuando el análisis se realiza a múltiples niveles e incorpora unidades sociales diferentes ligadas entre sí que funcionan en un rango de escalas. Se deben hacer las preguntas correctas sobre el manejo adaptativo. Este trabajo toma en consideración una cantidad de preguntas claves que han sido hechas al Programa de Manejo de Áreas Comunes para Recursos Indígenas (CAMPFIRE) en Zimbabwe y destaca como el uso de unidades analíticas incorrectas da lugar a información incorrecta respecto de éxito del programa.

Transboundary Protected Areas and Adaptive Management

Arun Agrawal¹

Adaptive management for transboundary protected areas offers hope for a more careful assessment of ecological conditions within the protected areas. By paying greater attention to the interactions of animal-plant species across national boundaries, and the rhythms of the different interactive processes, adaptive management may constitute the fruition of some recent trends in protected area management. Traditional management options aimed at accurate predictions and short-term system equilibrium through top-down policies of control and exclusion. Adaptive management strategies rely on experience or on collecting greater amounts of information for predictions, and try to satisfy long-term objectives that may include equilibrium changes. Relying on secondary sources, the paper uses the description of a Polish/Belarusian reserve in Eastern Europe as a way to examine some of the arguments about adaptive management in the context of transboundary parks.

INTRODUCTION

In examining the transboundary implications of adaptive management, this paper focuses on protected areas (PA)². Protected areas are one of the most important elements in the conservation strategies of nation states and international nature conservation agencies (Alpert 1993; Butynski and Kalina 1993; IUCN 1998; Lucas 1992; McNeely 1995; McNeely and Miller 1984; Van Osten 1972; West and Brechin 1991). Currently covering nearly 6% of the planet's land surface, more than 8,500 protected areas constitute one of the most visible symbols of concern for nature (WRI 1994). If marine areas are included, the number increases to over 10,000, and the area under protection in different forms to nearly 9% of the planet's surface (Brandon Redford and Sanderson 1998).

The number of protected areas and their total acreage has increased enormously over the last 100 years. Since the 1980s, it may also be argued that the principles of their man-

agement have undergone a tremendous transformation. The chief direction along which this transformation has occurred can be characterised as a movement from exclusion to participation. In addition, the rate at which new territory is being included in protected areas has diminished since the mid-1980s. The establishment of any new protected area has therefore become a major undertaking. This is especially so in the tropics where much of the world's biodiversity and population resides.

Adaptive management for transboundary protected areas offers hope for a more careful assessment of ecological conditions within the protected areas. By paying greater attention to the interactions of animal/plant species across national boundaries, and the rhythms of the different interactive processes, adaptive management may bring to fruition some of the more recent trends in protected area management.

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²The IUCN classifies protected areas into 10 categories to allow countries to fine tune their conservation objectives. These are: 1. scientific/strict nature reserve; 2. national park; 3. natural monument/natural landmark; 4. nature conservation reserve/managed nature reserve/wildlife sanctuary; 5. protected landscape; 6. resource reserve; 7. natural biotic area/anthropological reserve; 8. multiple use management area/managed resource area; 9. biosphere reserve, and 10. world heritage site. For each of these categories, the IUCN also lists the criteria that must be met (IUCN 1994).

Conventional management of PAs often relies on hopes of accurate predictions and assumes short-term system equilibria. Top-down policies of control and exclusion are based on assumed models of predictable ecosystem functioning (Gunderson 1999). In the case of PAs, these aspects of conventional management translate into predictive models of linear growth of flora and fauna that inform strategies oriented to limit use and harvesting levels.

In contrast, adaptive management relies on learning from long-term experience, treating policy interventions as quasi-experiments, and collecting and analyzing significant amounts of information about ecosystem responses (Holling 1973; 1978). Adaptive management strategies emphasise the importance of learning and feedback, and accept that it may not be possible to build predictive models of ecosystem function and behavior. In the case of PAs, these features of adaptive management imply greater attention to interactions among key species, involvement of local populations in the collection of information about PA resources, and experimenting with different levels of use to infer how best to enhance benefits from protection (Walters 1986).

In some ways, adaptive management has the potential to complement the recent trend in protected area management where it has become common to involve local residents and community members in protection. Involvement of local populations can be crucial in generating the long-term information necessary for adaptive management techniques to work. This paper, in considering the transboundary implications of adaptive management, adopts a normative tone for the most part. Relying on secondary sources, the paper uses the description of a Polish/Belarusian reserve in Eastern Europe as a way to examine some of the arguments about adaptive management in the context of transboundary parks.

COMMUNITY-BASED CONSERVATION

Early strategies for the creation of protected areas visualised them as islands of nature, surrounded by a rising tide of development. For a number of reasons it has become difficult to adhere to the exclusionary policies prior to and including the 1970s. Among the reasons is the growing recognition that humans have often shaped even what is seen as virginal nature. The louder rhetoric surrounding such allied concepts as community, civil society, participation, democracy, grass-roots, and local interests has also made it difficult for state actors to high-handedly dismiss the claims of excluded groups. But perhaps the most important reasons are practical. Protected area managers have neither the capacity nor the resources to continue with preservationist policies that demand strict separation of humans and nature. The poli-

tics of development, of democratisation, and of community and civil society make such options impossible. Factors related to the growing influence of market-related solutions to natural resource conservation, and the fiscal crises of most nation states in developing countries also make this separation difficult.

The solutions for protected area management that have emerged in the past decade have been based on ideas embodied in buffer-zone management or integrated conservation and development projects. These strategies treat local resident populations as potential partners in protection, and combine the goals of conservation and development. Drawing in part on insights from theories of property rights, collective action, and social mobilisation, and in part on apopulist turn in the rhetoric of resource use, local residents are visualised not just as users of resources, but also as effective managers. Indeed, in many regions of the world, local populations had lived in territories that are home to environmentally key ecosystems, processes, and species.

Three key assumptions about the relationship of protected area management with local participation, devolution of property rights, and high levels of poverty undergird the new turn in protected area management, they are that:

1. Greater involvement of local communities will promote better conservation.
2. Greater devolution of property rights will lead to better conservation; and
3. Improving the incomes of local residents will lead to better conservation because the poor are forced, despite themselves, to overuse resources.

Each of these three assumptions, a wealth of new research has begun to show, is either difficult to use as the basis for protected area management, or is questionable.

Thus, for example, the form and nature of the community, and how it is to be involved in community-based conservation is still disputed. Several popular conceptualisations of the idea of community, especially those that see communities as small, bounded, fixed, harmonious, collections of agents with similar goals and norms, are inappropriate as the basis for management (Agrawal and Gibson 1999). Equally vexed is the nature of participation. Even if participation is interpreted narrowly in terms of the property rights over resources that local residents come to exercise, it has occurred only to a limited extent (Agrawal and Yadama 1997). There has been a significant advocacy of the devolution of property rights to communities, but in practice such devolution has been difficult or minimal. The incommensurable spatial scales of communities and protected areas, and the political costs of transferring authority to existing state actors have been only two of the reasons preventing change in resource ownership and management status (Naughton-

Treves and Sanderson 1997). Finally, the involvement of local populations in income-enhancing programmes is based on the assumption that the poor are more likely to degrade resources. Once their incomes rise, they would become less dependent on resources within protected areas. In practice, this assumption may prove inappropriate as the rich can exercise greater control and therefore use local resources in parks even more intensively than the poor (Agrawal 1999).

However, the role of communities in protected area management remains critical because of the potential gains from such involvement. Of the different actors interested in protection, many members of communities are likely to have among the longest time horizons in relation to the resources on which they depend. Devolution of authority to accountable organisations of communities can create actors who are large enough to negotiate with state or other external actors. Finally, careful design of institutions can address stratification within communities so that allocation of benefits from managed resources is not skewed (Agrawal and Ostrom 1999).

PROBLEMS OF TRANSBOUNDARY PROTECTED AREAS MANAGEMENT

If the number of issues that provoke obstacles to careful management of national parks within the nation state is large, it multiplies in complexity where transnational protected areas are concerned. That is to say, if there is only an inadequate understanding of the issues and management questions at the level of the community or the region, political negotiations and international relations are even less theorised in relation to transboundary protected area management. In the environmental arena, international politics surrounding the allocation of externalities becomes critical because of the absence, vagueness, or unenforceability of transfrontier laws. In the region which this paper focuses on the primary reason is the tension between the sovereignty of nation states enshrined and consolidated since the Treaty of Westphalia in 1648, and the interests that several nation states can have in the same territory, its resources, their use, or the externalities that result from use. Additionally, the emergence of competing concepts such as the common heritage of mankind, human rights, and the growing interdependence of the global economy create difficulties in unambiguous practical application of the idea of sovereignty

The planet is divided into about 200 nation states (Westing 1998). The sovereignty of each of these states has three complimentary interpretations. Internal or territorial sovereignty implies that a nation state has exclusive domestic jurisdiction over all resources and people within its boundaries. External sovereignty means that in the international

arena, no other state can subject a state to its will. External sovereignty is limited by international laws that are well explicated in some spheres, and only emerging in others. Sovereign equality says that all states are juridically equal (Schrijver 1997:57). These implications of national sovereignty, in the arena of environmental goods, are inscribed in the concept of 'permanent sovereignty over natural resources,' itself an outcome of the interest that most developing countries had in control over their territories in the wake of decolonisation and independence from European imperial nations.

Although the concept of permanent sovereignty of states over their natural resources creates rights that each state exercises to manage its resources, over the last three decades the concept has also come to mean reciprocal obligations or duties since all states are supposed to enjoy this right (ILA 1986; UNGA 1962). This principle is especially important because many resources such as wildlife, fisheries, oil and gas, water, and atmospheric air are hard to partition on the basis of national territorial boundaries. A number of bilateral and regional treaties and agreements on natural resources have been negotiated using criteria of prior use, historic rights, proportionality, and relative needs.

As it has become clearer that many natural resources cannot be protected without inter-state cooperation, at least three principles for the use of transboundary resources seem to have emerged to form the basis of international treaties. The first involves sharing of information and suggests that states will consult relevant parties on the use of transboundary resources. The second implies equitable sharing of transboundary resources. Finally, the third principle relies on not doing harm to another state as a result of activities within the boundaries of one (Westing 1998). The concept of common heritage for certain resources, especially space and deep sea mineral resources, implies the above three principles of sharing of information with relevant parties, but also suggests the reservation of these resources for the future, and some sharing of benefits.

In the context of transfrontier protected areas where wildlife movements and ecosystem protection are at issue, the relevant issues of joint management, mutual assistance, and mutual access to administrative and judicial proceedings require closer collaboration and negotiations. Although there are important benefits to be gained from closer collaboration, the issues are far more political, and hence, cooperation is more difficult. In many cases, changes in the *status quo* will threaten the interests of important stakeholders, and therefore, it is even more difficult to promote effective management where transboundary protected areas are concerned.

At a minimum, there is an increase in the number of implicit and explicit objectives of management. Because of the presence of a larger number of actors, there is greater

difficulty in generating the information needed for making decisions. As a result of the combination of these two factors, dimensions along which tensions can exist among those involved are enhanced. These concerns become critical in relation to adaptive management of transboundary protected areas because of the emphasis in adaptive management to pay attention to the dynamics of systemic change, and the relationship of management to system behaviour.

NEED FOR TRANSBOUNDARY ADAPTIVE MANAGEMENT

However, there are important justifications that favour transboundary protected area management. Perhaps the most important justification is based on ecological theories and arguments about distribution and representation of ecosystems in the protected area network. Environmental security, several scholars have argued, depends among other things on checking the continuing erosion of biodiversity and protection of ecosystems, landscapes, and keystone species and processes through protected areas. If one surveys the distribution of protected areas around the world, it will be found that they are distributed in a manner that ill represents some of the most important biomes and countries. The chief rationale for transfrontier reserves, then, is that many areas that should ideally be a part of the conservation network are situated along the political boundaries of the nation states. Typically, the political boundaries of nation states are distant from the major centres of development, and in consequence these areas often bear the smallest imprint of human activities. Westing (1993a) estimates that nearly a third of the world's high-priority natural habitats with significant levels of biodiversity covets some part of the 220,000 km of international boundaries between nation states. The overlap of bioregions and their overlap with international boundaries creates the need for transboundary protected areas.

According to Westing (1998:93), protected areas can also play an important political role in inter-state relations. In some cases, they can safeguard and improve existing friendly relations between neighbouring states. But even where relations between states are not friendly, it is possible to use protected areas across borders as a mechanism to make existing territorial disputes less intense, or even irrelevant (McManus 1994; Westing 1993b), or to ease the reunification of divided states.

Even apart from the management of resources, transfrontier collaboration occurs among sovereign nation states where the interests of these states can be resolved without recourse to arms. Such collaboration has led to shared maritime zones among nation states along 33% of the possible 420 maritime boundaries (Blake 1993). Most of these

are bilateral agreements and several have been in existence for more than 20 years. Apart from maritime zones, interstate collaboration that requires substantially more give and take than exchange of information or consultation is also necessary where neutral zones, buffer zones, rights of transit, regional economic cooperation, watershed cooperation, and sharing of land resources, such as minerals, are concerned. These last two perhaps require the greatest coordination and cooperation administratively, while rights of transit and economic cooperation entail substantial interactions on economic matters.

Given the importance of collaboration on protected areas, it is not surprising that despite all the difficulties in their creation, there are nearly 70 instances of different degrees of collaboration over the management of protected areas and nature reserves as well. The first international peace reserve was established when the Waterton Lakes National Park in Canada, established in 1911, and the Glacier National Park in the USA, were joined together symbolically in 1932. Since then, several such protected areas with a high level of collaboration between the neighbouring countries have been established in Europe and Africa, which together have nearly 45 paired reserves, and South America and Asia, with 20 reserves between them. Given that many protected areas are on national boundaries, the figure of 70 paired transboundary protected areas is small, especially in comparison to the figure of 8,500 recognised protected natural areas of one kind or another.

The existence of adjacent protected areas across international boundaries is accompanied by different levels of cooperation among the governments of the states within whose boundaries the protected areas lie. It is possible that adjacent reserves will exist to protect ecosystems and species on different sides of international borders without any coordination among the states or the protected area bureaucracies. In some cases, where there are border tensions between the neighbouring states, the boundaries may be militarised, preventing even local contacts across the border. A second situation is where there is little coordination at the level of the nation state, but local park bureaucracies and resident populations have some interactions across the border. A third level of cooperation will be achieved when the countries establish their reserves so that they conform to international plans and share information, but continue to manage the areas independently. These three levels of cooperation can be seen as varying degrees of independent management, with a potential to lead toward joint management.

It is primarily beyond this level of cooperation that adaptive management techniques become feasible.

CONVENTIONAL	ADAPTIVE
<ul style="list-style-type: none"> • Seek precision in predictions. • Build models based on detailed. • Promote scientific consensus. • Emphasise short-term objectives. • Seek certainty and control. • Seek productive equilibrium. 	<ul style="list-style-type: none"> • Elucidate range of possibilities. • Model from experience, and understanding aggregate responses. • Highlight alternatives and trade-offs. • Promote longer-run goals. • Emphasise learning and feedback. • Learn from interactions; expect change and emergent properties.

Table 1. Conventional versus Adaptive Management Objectives of Policy Analysis.

Source: Adapted from Walters (1986).

Given the objectives of adaptive management, trying to follow related strategies will certainly necessitate greater sharing of information in the context of protected areas, so as to create the type of knowledge base on which management options can be devised. But adaptive management also requires cooperation that extends beyond information exchange. Because the rationale for adjacent transboundary protected areas is the joint protection of ecosystems that are arbitrarily divided by political lines, it follows that independent management of neighbouring protected areas is unlikely to allow much gain from adaptive management. At least two additional levels of cooperation that will facilitate adaptive management can be envisaged. In the first, the countries continue to own their territories, but in addition to exchanging information, they also carry out joint implementation of protection measures including approval of travel across the border for surveys, anti-poaching measures, fire management, creation of buffer zones, and administration of buffer zone programmes. In such situations, local populations can be involved closely in the management of the protected areas. Allocation of funds for creating alternative sources of incomes for local populations can take place jointly as well. The greatest level of cooperation would take place when the land that would come under the protected areas is made part of an international reserve managed under a single agreed upon management authority that includes staff from each country that has contributed land to the reserve (see also MacKinnon 1993:83). These levels can be called cooperation for adaptive management.

Although one can visualise the greatest benefits flowing from transboundary protected area adaptive management from higher levels of cooperation, it is precisely this form of cooperation that is economically and politically the most difficult. Even in terms of economics, there are significant limits on the amount of finances available to undertake transboundary management. But in considering the feasi-

bility of adaptive management for transboundary protected areas, three sets of questions need attention: Environmental, political, and economic. The first question is whether a transboundary protected area is feasible on environmental grounds? That is to say, is it necessary to have a reserve on more than one side of a border? Secondly, what are the political factors that facilitate or hinder the formation of a transfrontier protected area? Finally, one must consider whether adaptive management techniques provide greater insights or benefits related to park management in comparison to traditional strategies of protection. Adaptive management techniques can improve the management of even those protected areas that aim only to provide suitable habitats for ecosystem and species protection. After all, a protected area does not imply the lack of any human intervention at all. But adaptive management techniques are more likely to be considered and adopted when the protected areas are used for some additional benefits or where there is some significant level of human use of the protected area. Such uses can be tourism or limited harvesting of fodder or firewood from the protected area buffer zones for local residents.

Some of the points made above can be clarified with the help of the following examples showing actual or proposed transboundary protected areas, and the feasibility of adaptive management in such locations.

THE BIALOWIEZA NATIONAL PARK AND BIOSPHERE RESERVE IN POLAND AND BELARUS

The Bialowieza reserves comprise nearly 1,500km² (150,000ha) on the two sides of the Polish (625km²/62,500ha) and Belarusian (875km²/87,500ha) frontier. Its history of protection, like many parks around the world, started as a royal hunting reserve. Since 1977, the reserve on

the Polish side has been declared a Biosphere Reserve and a World Heritage Site. The Belarusian side was declared a site of the Man and Biosphere programme (MAB) in 1993 with three protection zones. With a level of biodiversity that is still not fully investigated and is among the highest in Europe, this reserve is one of the earliest examples of transboundary protected areas in Europe. Different parts of the reserve on both sides of the border are under different management categories, from strict protection to managed forestry

Most of the tree stands in the strictly protected part of the park on the Polish side are composed of deciduous species, while on the Belarusian side, the natural dominant tree stands are those of mixed conifers and oak. The Polish part has witnessed a much higher intensity of exploitation and plantation in comparison to the Belarusian forests. The average level of timber harvest is more than four times in the Polish area. In terms of the wildlife species, the Polish part has a high density of ungulates such as red deer, moose, roe deer, and wild boar, and their hunting is permitted. The numbers of European bison are kept in check through culling, but recently there have been some claims about their numbers being too high and that this is leading to damage to tree stands (Okarma *et al.* 1996).

Although a great deal of research has been carried out on the reserve, only a very limited amount of work, which has been carried out in the past few years with funding from the Global Environment Facility (GEF), has attempted to examine the transfrontier interactions between wildlife species (both ungulates and carnivores), and different varieties of plants. Parks on each side of the frontier have their own research establishment and bureaucracies, and until 1993 there was little cooperation across the frontier. Earlier research across the frontier is also hard to compare owing to the different methods that have been used. A two metre high fence still continues to divide the parks along the national borders, which acts as an artificial barrier for animal movements. Since 1993, however, a cooperative investigation has been launched to investigate the migration and range of wolves and lynxes. A protocol also permits park employees to visit either part of the park without border passes (GEF 1992a, 1992b).

We see that the general arguments about transnational protected areas are represented in this case study in a number of ways. The sovereignty of the two nation states prevented cooperation before 1993. Even the movement of animals across a habitat that constituted a single ecosystem was restricted owing to national boundaries. In terms of cooperation, whether the question was one of data collection, or of joint management, the park services of the two countries operated more or less independently. Their different management strategies are reflected in varying densities of different plant species and wild animals, and types of interactions

among the different animal and plant species.

However, the existence of a transboundary reserve is certainly justifiable on environmental grounds. The amount of land set aside for core level of protection is limited on either side of the frontier. By allowing animals to range over the extent of the strictly protected areas in the reserve, it would be possible to allow a larger undisturbed habitat for carnivorous animals such as the wolf and the lynx. Over the past few years, through aid from the GEF, it has also become possible to undertake some cooperation in the arena of data collection and the movement of park officials across the national boundary that divides the reserve. However, for adaptive management techniques to be adopted in the reserve, more data and analyses are necessary. The standard arguments for better management of the reserve call for further exclusion of local residents from the protected area, and planting of new stands of trees (Breymer and Noble 1998). But for adaptive management, it may be more useful to gather information from local residents around the park, and to gain a better understanding of carnivore-ungulate-plant interactions, rather than advocate either new plantations, or to call for limiting the number of wild animals. The costs of such data collection can be drastically reduced through the involvement of local populations. Further, because local populations have a long-term interest in the sustainable management of resources in the protected areas, their meaningful involvement would also help local officials gain a longer-term view of park management. Clearly, one of the primary factors that affects the feasibility of using adaptive management techniques is the extent of articulation of the different levels of administration that are involved in the management of the reserve: From the top management to the local consumers.

CONCLUSIONS

The major argument of this paper relates to the need for greater attention to be drawn to how various levels of management in a given system articulate with the aims of adaptive management. While nation states and regional actors can make decisions concerning the spatial scale along which transboundary protected area management can be effective, their temporal horizons are far more limited than the typical time span over which returns from management can be expected. On the other hand, local residents are far more likely to have the kind of long-term horizons that are necessary for adaptive management. It is imperative then, to design institutional arrangements that have space for local residents and their representatives to contribute to management objectives, implementation, and enforcement.

A second inference of this paper is that promotion of adap-

tive management depends upon and furthers the likelihood of greater collaboration among the nation states that own the parks in their territories. Much of the existing work on transboundary nature conservation remarks on how such initiatives can further international cooperation. This paper suggests that adopting the principles of adaptive management is likely to impress upon the collaborating parties that independent management of adjacent protected areas is insufficient to gain the greatest possible benefits from protection. It is only by building management models of processual interactions in the ecosystems that comprise transboundary protected areas, by taking into account the information gathered by the different sides across the borders, jointly implementing the implications derived from these models, and involving local communities in these sets of activities, that we can begin to realise the full potential of adaptive management for transboundary protection of resources.

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Summaries

La gestion adaptative des aires protégées transfrontalières offre des espoirs d'évaluer avec plus de soin les conditions écologiques à l'intérieur de ces aires. En accordant une plus grande attention aux interactions des espèces végétales et animales au-delà des frontières nationales et aux rythmes des différents processus interactifs, la gestion adaptative peut se concrétiser par certaines tendances récentes dans la gestion des aires protégées. Les options de gestion traditionnelle visaient à obtenir des prédictions précises et un équilibre à court terme des systèmes par l'application de politiques du sommet à la base axées sur le contrôle et l'exclusion. Les stratégies de la gestion adaptative s'appuient sur l'expérience ou sur le rassemblement de plus grandes quantités d'information pour établir des prédictions et elles essaient de répondre aux objectifs à long terme qui peuvent inclure des changements dans l'équilibre. En s'appuyant sur des sources secondaires, ce rapport se sert de la description d'une réserve polonaise/biélorusse en Europe de l'est pour examiner certaines des discussions sur la gestion adaptative dans le contexte des parcs transfrontaliers.

El manejo adaptativo de áreas protegidas transnacionales ofrece la esperanza de una evaluación más cuidadosa de las condiciones ecológicas dentro de áreas protegidas. Al prestar mayor atención a las interacciones entre especies de plantas y animales a través de fronteras nacionales y a los ritmos de los distintos procesos interactivos, el manejo adaptativo podrá constituir el cumplimiento de algunas tendencias recientes en el manejo de áreas protegidas. Las opciones tradicionales de manejo se dirigían a obtener predicciones precisas y el equilibrio de sistemas a corto plazo mediante la imposición de políticas de control y exclusión de arriba hacia abajo. Las estrategias de manejo adaptativo dependen de la experiencia y de la recolección de mayor cantidad de información para predicciones y tratan de satisfacer objetivos a largo plazo que puedan incluir cambios de equilibrio. Contando con fuentes secundarias, este trabajo utiliza la descripción de una reserva Polaca/Bielorusa en el este de Europa como la forma de examinar algunos de los argumentos sobre el manejo adaptativo dentro del contexto de los parques que atraviesan fronteras nacionales.

Ecoregion Scale Conservation - Planning, Joint Learning, and Action

Cordon H. Orians¹

Ecoregion-Based Conservation (ERBC) recognises that effective conservation requires thinking and planning at the spatial and temporal scales of the processes that generate and maintain biodiversity. Ecoregions are large areas that have relatively uniform biotas and climates. ERBC typically proceeds by means of a series of stages, the first of which is a 'reconnaissance' during which the major features of the ecoregion and its potential for ERBC are outlined. The next stage is to develop a Biodiversity Vision, a picture of what success would look like in 50 years. The Vision is the template against which all specific actions are judged. The Situation Analysis analyses the socio-economic and cultural processes that help or hinder biodiversity preservation and identifies the ways in which incentives might foster behaviour that helps to preserve biodiversity in the ecoregion. The Ecoregion Plan, which is based on the Biodiversity Vision and the Situation Analysis, identifies partners and the components; it has budgets and timetables. All these preliminaries help to focus action and realise the vision. To date the full process has not been completed for any ecoregion, but already ERBC is helping conservationists to think strategically.

INTRODUCTION

Conservation activities historically have focused on local areas judged to be important because they have high species richness, harbour many endemic species, or are home to unusual ecosystems. Typically, parks or reserves established in these areas are managed as isolated entities whose regional roles are often not considered in their management. Although such efforts have clearly resulted in the protection of many valuable areas and have thereby contributed to the conservation of many species and ecosystems, there is growing recognition that additional approaches are needed if conservation goals are to be achieved.

New approaches are based on the fact that key ecological and evolutionary processes operate over large spatial scales and long temporal scales. Therefore, if we are to preserve the ecological interactions and evolutionary mechanisms that generate and maintain species, conservationists must think and plan at the scales at which nature operates. An important new approach, pioneered by The Nature Conservancy

and the Conservation Science Program at the World Wildlife Fund-US, attempts to do just that (Olson and Dinerstein 1998). Known as Ecoregion-Based Conservation (ERBC), it has been adopted by the WWF family worldwide and by other conservation organisations. In this paper I explain the rational and operational procedures of ERBC and illustrate these elements with examples from ecoregional planning underway at WWF.

WHAT IS ECOREGION-BASED CONSERVATION?

As the first step in developing conservation strategies that match the scales of ecological and evolutionary processes, the Conservation Science group at WWF developed the concept of ecoregions and prepared ecoregional maps of the world. An ecoregion is a relatively large parcel of land or

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water, within which the climate is relatively uniform, and that harbours a characteristic set of species and ecological communities. Although boundaries between ecoregions are typically fuzzy and can be drawn in a number of ways, the goals of mapping are to identify regions within which biotic interactions are stronger than they are with adjacent areas, and to identify regions large enough to encompass the scales of the most important ecological processes.

Appropriately characterised, ecoregions offer several advantages as units for conservation planning and action. Because they are defined in biological terms, ecoregions focus attention on biodiversity. They usually cross political boundaries, thereby encouraging international co-operation, and they direct attention to processes that are likely to be neglected by approaches based on political units. Operating at ecoregional scales directs attention to networks of key sites, migration corridors, and the ecological processes that maintain biologically rich ecosystems. For these reasons, WWF is now using ecoregions as the foundation for its global conservation activities. Of the hundreds of ecoregions into which the earth is divided, WWF has selected a subset - The Global 200 - as the primary target of its conservation activities. These ecoregions were selected because collectively they harbour the vast majority of the Earth's species.

An ecoregional approach also helps focus attention on social, economic, and policy factors that are essential to long-term conservation success. People who depend on the natural resources of ecoregions often use resources from more than one country. Threats to biodiversity, such as multinational timber companies and open-access fisheries, transcend political boundaries to affect entire ecoregions or clusters of ecoregions. Indeed, the rapidly growing global economy, which already dwarfs the budget of most individual countries, poses both threats to, and opportunities for, conservation that are relatively insensitive to political boundaries.

Economies of effort can be achieved by using an ecoregional approach because analyses of key biological and socio-economic factors, once carried out for an ecoregion, are generally applicable to all subsequent project activities within the ecoregion. At the same time, projects at local levels are more readily integrated with political activities at regional, national, and international levels, and programmes that deal with threats to biodiversity that operate at these scales. Finally, ERBC encourages partnerships because no single organisation can carry out the activities required to achieve conservation goals for an ecoregion.

THE FUNDAMENTAL PRINCIPLES OF ECOREGION-BASED CONSERVATION

Because no two ecoregions are alike, operational details are ecoregion-specific. Nevertheless, ERBC is based on the following set of principles that are applicable to planning in all ecoregions:

FOCUS ON BIODIVERSITY

Because the ultimate goal of ERBC is conservation of the fullest possible range of biodiversity - genes, species, ecological communities, and ecological and evolutionary processes - biological criteria define the goals of ERBC and are the ultimate measures of its success.

MULTIPLE DISCIPLINES

ERBC must incorporate insights, concepts, and data regarding the social, economic, political, and ecological processes that harm and foster biodiversity preservation. The goals of ERBC may be biological, but the tools to achieve them are multidisciplinary.

STAKEHOLDER PARTICIPATION

Lasting solutions to ERBC rely on participation by key stakeholders, such as local people, corporations, non-governmental organisations, governments, and donor institutions that have an interest, positive or negative, in the biodiversity of the region. These key stakeholders must be involved in ERBC planning.

PARTNERSHIPS

Because no organisation can achieve conservation goals for an entire ecoregion, partnerships must be formed among the groups whose coordinated efforts may lead to success.

LONG-TERM COMMITMENT

Ecoregion-based conservation does not accept the current situation in an ecoregion. Rather it imagines what success would look like several decades into the future and attempts to achieve that vision. Therefore, ERBC requires long-term commitments from its participants.

ADAPTIVE MANAGEMENT

Ecoregions vary greatly in the amount of available information regarding the distributions of species and ecological processes within them. Therefore, research and experimentation designed to fill gaps and test hypotheses about the distributions of species are a vital component of action in all ecoregions. Also, as conservation activities proceed, new and unexpected information is likely to arise. Responding adaptively to such information is vital if success is to be achieved.

FLEXIBILITY AND JUDGEMENT

Because each ecoregion has a different physical environment and a different set of species and ecological interactions, one size does not fit all. Actions must be tailored to the specific conditions found in each ecoregion. No attempt should be made to fit all ERBCs into one mould.

THE ESSENTIAL ELEMENTS OF ECOREGION-BASED CONSERVATION

Ecoregion-based conservation is guided by goals and action plans based on a rigorous and broad analysis of ecological, evolutionary, and socio-economic information. Success requires co-operation among biologists, social scientists, managers, local people, and staff of non-governmental organisations. Such co-operation requires mutually supportive relationships that emerge from a process in which these diverse people work together to develop visions and action plans to which they are all committed. To facilitate the development of congenial relationships and a shared vision, ERBC unfolds during a process that has five distinct elements:

1. Reconnaissance.
2. Biodiversity Vision.
3. Situation Analysis.
4. Ecoregional Conservation Plan; and
5. Action Plan.

Although I will describe these elements sequentially, in practice components of them often overlap in time.

RECONNAISSANCE

An ERBC reconnaissance is a multidisciplinary rapid assessment with three primary goals. The first is to determine

whether an ecoregion is suitable for a regional approach to conservation. A region might not be suitable for ERBC because the magnitude of investment needed to make a significant difference may be so great that the benefit-to-cost ratio is unfavourable. Threats to biodiversity preservation in the ecoregion may be weak, or existing conservation activities may be adequate to address them. Finally, political factors - civil war, governmental refusal - may make ERBC unworkable.

The second goal of the reconnaissance phase, which is developed only if ERBC is judged to be appropriate in the ecoregion, is to produce a conceptual framework and strategic plan for how to proceed with ERBC planning. This plan should be brief but should identify the key activities that need to be undertaken to develop a biological vision and situation analysis for the ecoregion.

The third goal is to identify the groups and individuals already working in the ecoregion, assess the existing knowledge base about biodiversity and its distribution within the ecoregion, and assess the form and availability of existing socio-economic information. The goal of this assessment is to provide general guidelines, not a thorough biological or socio-economic assessment. Those activities follow later in the ERBC process.

BIODIVERSITY VISION

The primary goals of an ecoregional biodiversity plan are to:

- Obtain representation of all distinct natural communities within a network of protected areas managed primarily for biological conservation.
- Maintain the ecological and evolutionary processes that create and maintain biodiversity.
- Maintain viable populations of species; and
- Create blocks of natural habitats large enough to be resilient in the face of large scale periodic disturbances (fires, storms) and long-term changes (climate change, vegetation succession).

The major components that need to be addressed in developing a biological vision consistent with these goals include:

- Assessing the relative rarity of different ecological communities within the ecoregion at global, regional, and ecoregional scales to determine which of the ecological communities within the ecoregion are entirely or largely restricted to that ecoregion.
- Asking where biodiversity has the best chance of persistence based on the availability and quality of remaining blocks of natural habitat.

- Identifying blocks of habitat or species that are critical for maintaining important ecological processes.
- Identifying threats that are widespread and pervasive in the ecoregion; and
- Identifying important components of biodiversity in the ecoregion that are not being addressed by existing conservation activities.

During the process of developing a biodiversity vision for an ecoregion, it is helpful to ask a set of questions that function as a checklist of items to consider. The most important of these questions are the following:

1. Where are the areas of unusually high species richness or endemism? Examples might include springs or oases, outcrops of unusual soil types, areas with structurally complex vegetation, and areas of high topographic relief.
2. Which habitats are of special importance for preserving species or processes in the ecoregion? Examples might include sources of water during the dry season, migratory corridors, and riparian corridors.
3. What are the ecological phenomena that require the largest areas for their functioning? Examples might include top carnivores with large home ranges, species with seasonal migrations within the ecoregion, large-scale disturbances (fires, hurricanes), and range shifts induced by climate change.
4. Which species (keystone species) are essential for maintaining important ecological processes within the ecoregion? Examples might include keystone mutualists (pollinators and seed dispersers), large mammalian herbivores that strongly affect vegetation structure (elephants, beavers), and keystone predators (seastars in rocky intertidal areas, carnivorous fishes in freshwater lakes).
5. Which processes in the ecoregion strongly influence processes in neighbouring ecoregions and vice versa? Examples might include migratory stopover sites, and inter-ecoregional migratory pathways.

Typically, a biodiversity vision for an ecoregion is developed during a workshop that brings together scientists familiar with the ecoregion who have worked on a wide range of organisms. The primary product of such planning is a map that identifies the high priority areas for biodiversity preservation in the ecoregion, indicates which areas already have some protected status, identifies which areas are especially important as additions to a network of protected areas, and identifies which areas are in need of special ecological restoration efforts. The map is accompanied by descriptive prose that provides the background for the choices.

Because the goal of ERBC is preservation of biodiversity,

the biodiversity vision should be developed using strictly biological criteria. At this stage in ERBG planning, areas should not be excluded for political reasons or because they are already seriously degraded. Constraints imposed by socio-economic and financial factors must, of course, be incorporated into a final action plan for conservation in an ecoregion, but it is unwise to compromise a biological vision at the outset. A biological vision is a statement of what success would look like in an ecoregion several decades into the future. It functions as a yardstick against which specific actions are judged and against which overall progress can be assessed. As long as it is recognised that full achievement of the vision may be impossible and that inability to fully realise the vision is not a sign of failure, a biodiversity vision best serves its purpose if it sets high goals and does not accept the existing situation. After all, what appears to be unachievable today may become achievable in the future.

Even though a biodiversity vision should be based exclusively on biological factors, the final action plan for an ecoregion will incorporate the full array of socio-economic factors. Therefore, it is important that at least some of the people who will be involved in preparation of the socio-economic components of ERBC participate in the process of generation of the biodiversity vision. If these people are not involved, they will lack an understanding of the context in which a socio-economic analysis is to be carried out, and they are likely to invest considerable effort in analysing factors that are of minor importance in the areas identified as highest priority for biological conservation.

SITUATION ANALYSIS

Given a biological vision of successful conservation in an ecoregion, what will it take to realise that vision? Once a relatively final biological vision has been produced, the focus of planning shifts to the human communities of the ecoregion. Ecoregions are biologically distinctive, but so are the human communities that have lived there for generations. In many ecoregions the human economy has undergone turbulent changes over the past century; changes that are likely to continue during the coming decades. Conservation of biodiversity is likely to be considered valuable by only some of the inhabitants of the ecoregion. Even for these people, conservation will be only one among several social objectives that influence their behaviour.

Given the complexity of each ecoregion's history and societies, and the high probability that ERBC will be caught up in conflicts, it is essential that human communities of the ecoregion be considered carefully and with full respect for the diversity of human needs and aspirations. This requires information on past, current, and projected trajectories of

the human communities in the ecoregion, and assessment of external pressures and incentives that influence those trajectories. Achieving a biological vision in an ecoregion is likely to require changes, perhaps significant changes, in the lifestyles of the human residents of the ecoregion. Conservation asks people to divert the paths of their lives for the sake of nature. These are serious requests with serious implications for how conservation, the economy, and society will interact.

Although a full situation analysis cannot be conducted until the biological vision has been generated, integration of socio-economic and biological factors is best accomplished if at least some of the socio-economic actors participate in the generation of the biological vision. The purpose of their participation is to generate awareness, not to introduce socio-economic constraints into the biological vision. In addition, during a biodiversity vision workshop, it will become obvious that certain socio-economic factors will inevitably strongly influence the ability to achieve key components of the biodiversity vision. Analysis of these factors can profitably begin while the biodiversity vision is being finalised. Early initiation of these components of a situation analysis can accelerate the planning process, thereby enabling action to be initiated sooner.

The overarching goals of a situation analysis are to:

- Identify the incentives and disincentives that drive human activities that generate threats to the preservation of, as well as opportunities to preserve, biodiversity in the region.
- Assess how the incentive structures can be altered so that it comes to be in the interests of actors to behave in ways that contribute to achieving the biodiversity vision.
- Identify major gaps in the knowledge of important ecological and socio-economic factors in the ecoregion; and
- Identify and distinguish among problems for which incentives can be prescribed with some confidence, those for which the best intervention is uncertain, and those for which intervention appears to be undesirable.

In other words, a situation analysis needs to provide a basic description of relationships between biodiversity and human geography in the ecoregion. It does not need to, nor should it attempt to provide a complete analysis of socio-economic processes in the ecoregion. The key is whether or not a socio-economic process is likely to influence biodiversity conservation efforts. Some examples of the questions to be addressed in a situation analysis are:

1. How do existing laws, institutions, and governing traditions encourage activities that degrade or protect biodiversity?
2. What is the existing pattern of use of land, water, and

major ecosystems services (*e.g.*, renewable resources, clean water, flood control)?

3. How has the pace of growth or other changes in these patterns and their infrastructure changed in the past 25 years?
4. What is the distribution of individual, corporate, communal, and public ownership over the ecoregion?
5. What ecosystem processes and flows affect human welfare?
6. How would protection of key corridors and biological reserves affect human trade and travel?
7. Where might the ecoregion go economically during the next 50 years?
8. Is ERBC likely to be a significant factor in the region's economy?
9. What are the known or estimated values of commodity production, watershed protection, ecotourism, carbon sequestration, aesthetic values, *etc.* in the ecoregion?
10. Which current stakeholders are certain or likely to be adversaries of ERBC?
11. Can ERBC become part of a durable, legitimate set of beliefs in the ecoregion?
12. Can resources adequate to support ERBC over two or more generations be assured?

Even though the reconnaissance phase of ERBC that preceded the launching of a situation analysis indicated that ERBC was probably appropriate for the ecoregion, a thorough situation analysis may suggest a different conclusion. Therefore, the option of aborting an ERBC effort in the ecoregion must be considered during all phases of ERBC planning. A negative decision does not imply that conservation efforts will cease (or fail to be initiated) in the ecoregion. It implies only that other pathways, which might include doing nothing, appear to be more appropriate.

ECOREGIONAL CONSERVATION PLAN

The next stage in ERBC is development of a conservation plan for the ecoregion. A conservation plan clarifies the strategies and tactics to be employed to realise the biodiversity vision. It establishes priorities for conservation actions, identifies the full range of partners that must work together if the conservation goals are to be achieved, and specifies the roles each will play. The order in which different activities are to be undertaken and the resources to be devoted to each should be specified. The action plan may recommend restoration projects, activities to protect existing high quality areas, additional fieldwork to fill important gaps in information, and modifications of land use patterns such that biodiversity

preservation is enhanced while economically valuable resources are extracted from the land. A conservation plan has timetables and budgets.

ACTION

The purpose of the ERBC process is, of course, to show how action can best be focused to achieve conservation goals in an ecoregion. Although planning is essential, experience demonstrates that planning exercises, however thorough, cannot possibly identify all contingencies that will be encountered when implementation of the plan begins. Therefore, during implementation of a conservation plan, adaptive management, which emphasises the need to learn from experience, is essential. However, adaptive management is more than simply learning from experience. A key component of adaptive management is implementing actions that are designed to maximise learning (Lee 1993). Gaps in knowledge identified during preparation of both the biological vision and the situation analysis should be used to guide early interventions whose outcomes are likely to influence subsequent actions. In other words, learning actions are initiated before extensive resources are committed to projects whose efficacy may be called into question when more complete information is available. Therefore, although the conservation plan should be taken seriously and generally adhered to, the plan should not be regarded as inviolate.

EXAMPLES OF ECOREGION-BASED CONSERVATION

ERBC is such a recent conceptual development that the full process has not yet been completed for any ecoregion. Nevertheless, enough progress has been made by WWF in several pilot ecoregions to identify some of the prospects and difficulties of ecoregion-based approaches. Two areas are used to illustrate the process; the Chihuahuan Desert and the Northern Andes, two ecoregions with which I have been involved.

CHIHUAHUAN DESERT

The Chihuahuan Desert is a large ecoregion that lies primarily in Mexico, but includes parts of the states of Texas, New Mexico, and Arizona in the United States. It is a region with a rich biological database, the result of decades of research by Mexican and American biologists. Nonetheless, it is an area in which WWF had not previously worked. Because it includes two countries with different languages and very different cultures, the region poses complex integration prob-

lems at both biological and socio-economic levels. These features recommended the area as an excellent one in which to carry out a pilot project.

The Chihuahuan Desert was identified as a high priority area by the Conservation Science Programme at WWF because of its unusually high plant species richness and endemism, particularly in the families *Cactaceae* and *Nyctaginaceae*, and the rich aquatic diversity in the springs at Cuatro Ciénegas. Major progress toward development of a Biodiversity Vision was achieved during a workshop held in Monterrey, Mexico, September 30 - October 2, 1997. Experts familiar with the distributions of aquatic organisms, plants, reptiles, amphibians, birds, and mammals in the desert identified high priority areas for the taxa with which they were familiar. These areas were then overlaid on one another to determine which areas were of high priority for more than one taxonomic group. In addition, unusual areas, such as gypsum sand dunes, occupied by highly endemic biotas, were identified. By integrating all of this information, a biological vision map for the ecoregion was prepared. The original map has been updated as additional information has become available, but its general outline has remained intact because the data available at the Monterrey meeting were so extensive.

To facilitate the next stage of the ERBC process, four socio-economic issue papers were commissioned. These papers dealt with human population distribution and growth, management of grazing lands, the legal frameworks governing environmental management in the two countries, and cultural organisation and traditions. These issue papers formed the basis for a second workshop in El Paso, Texas in November 1998, which brought together social scientists from the two countries. The goal of this workshop, which was to develop a Situation Analysis for the desert, was only partly achieved. A major reason was that neither the authors of the position papers nor the other attendees had participated in the Monterrey workshop. Even though the authors were provided with the biodiversity vision map, they did not have an opportunity to develop a deep intuitive understanding of the ERBC process and the conservation goals for the region. Therefore, although the papers raised important issues, their analytical frameworks did not match those of ERBC. In addition, much time during the El Paso workshop was devoted to assimilating the participants into the ERBC 'culture.' This lesson has guided subsequent ERBC planning processes.

Currently, the ongoing situation analysis for the Chihuahuan Desert is focusing on the major high priority areas identified in the biological vision. The socio-economic processes affecting these areas differ strikingly even though some overarching economic and legal factors affect all of them. Thus, at Cuatro Ciénegas, controlling withdrawals of water for irrigation and the purchase of gypsum sand dunes

are the key issues. Along the Rio Grande River, irrigation withdrawals, massive sewage discharges, and dramatic human population growth are the main factors destroying biodiversity. In the northwestern part of the ecoregion, where the complete regional fauna could be re-established by introducing the large mammals that have been exterminated, developing co-operation among ranchers with large land holdings is the key issue. Thus, current socio-economic analyses are being focused on factors specific to different components of the vision.

THE NORTHERN ANDES

Another WWF pilot project has been launched in the topographically complex, biologically rich Northern Andes. This region, which encompasses parts of four countries (Venezuela, Colombia, Ecuador, and Peru), actually consists of 13 ecoregions that are being united for planning purposes. The reason for the amalgamation is that individual ecoregions consist of thin altitudinal strips along the flanks of the three Andean ranges. Given these conditions, planning to manage the area on an ecoregion-by-ecoregion basis makes no sense. Individuals of many species migrate altitudinally on daily or seasonal bases and cross several ecoregional boundaries in the process. Watershed boundaries encompass several ecoregions. Some ecoregions are small and surrounded by other ecoregions. They need to be managed within that context.

The first planning workshop for the region was held in Cali, Colombia on June 8-9, 1998, followed by a second workshop on December 9, 1998, also in Cali. These activities set the stage for an international workshop in Cali, March 22-23, 1999, at which the boundaries of the operational ecoregion were determined. Participants decided to include the paramos above the timberline on the higher mountains, and the montane forests down to the lower slopes of the Andes as part of the "*Northern Andes Ecoregion*".

In contrast to the Chihuahuan Desert, the four countries in the Northern Andes share a common language and many elements of human culture, but the amount of biological information available varies greatly among the countries. In addition, both WWF and other conservation groups have long been active in the region. Therefore, ecoregional planning must build on conservation foundations established with varying goals over the years. To facilitate ERBC, WWF has hired an ecoregional coordinator who oversees data collection and integration among participants in the four countries.

Because biological knowledge of the ecoregion is very incomplete and variable among countries, a biological vi-

sion for the ecoregion cannot be developed by an intensive workshop. Instead consultants are being hired to gather distributional data for various taxonomic groups in the four countries and to identify the most serious data gaps. Some of the obvious biological data gaps will be rectified by focused research during the coming year. A draft of the biological vision will probably be available within a year.

Profiting from experiences in the Chihuahuan Desert, people (researchers) who were preparing materials for the Situation Analysis participated in the discussions at Cali and were thoroughly familiar with the ERBC process and the primacy of conservation goals. Therefore, it was profitable to assemble key socio-economic data simultaneously with the collection of additional biological data.

CONCLUSIONS

Although no pilot project has yet been completed experience to date is sufficient to indicate some of the advantages and problems of ERBC.

The problems of ERBC are more easily defined than the benefits. ERBC is more complex and difficult to implement than business as usual. Planners need to think about a broad array of factors that operate at varying temporal and spatial scales. People who have not previously worked together must learn one another's language and develop an appreciation of the conceptual platforms from which different people view issues. This takes time and money, valuable resources that might otherwise be devoted to direct conservation activities. ERBC is expensive and data intensive. Data generation and integration are costly, especially in ecoregions in which existing biological information is scant. To be effective, an ERBC programme requires detailed knowledge of the distributions of organisms within the ecoregion, and that information must be integrated with information on socio-economic factors that might assist or impede the realisation of conservation goals. If care is not taken, planning may assume the status of a goal, thereby displacing conservation action. Assessments of how to complete the essential elements of ERBC more quickly are currently underway.

Paying these substantial prices makes sense only if ERBC offers compensating advantages. The full array of benefits of ERBC have yet to be realised, but experience to date indicates that planning at the temporal and spatial scales at which natural processes actually operate offers new insights and provides a way to prioritise conservation projects. In addition, ERBC provides, for the first time, explicit criteria for deciding whether or not to initiate a particular project. In other words, individual projects can be judged with respect to their role in the realisation of a comprehensive conserva-

tion vision for the region. ERBC expands perspectives on individual projects by evaluating not only what is accomplished in those areas, but how those activities benefit conservation on a broader scale. ERBC also brings to bear, on individual projects, a fuller array of information and resources than might otherwise be available. For example, a regional analysis may show why a species is disappearing within an individual project area when the disappearance is due to factors operating outside the focal area.

Only after several decades of experience will the full potential and pitfalls of ERBC become apparent. ERBC is a conceptual and practical work in progress that appears to be a promising component of the conservation tool kit.

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Summaries

La Conservation éco-régionale (ERBC) reconnaît que, pour que la conservation soit efficace, il est nécessaire de réfléchir et de prévoir, à l'échelle spatiale et temporelle, les processus qui engendrent et préservent la biodiversité. Les éco-régions sont de vastes zones qui disposent de biotes et de climats relativement uniformes. La Conservation éco-régionale procède par une série d'étapes, dont la première est une « reconnaissance » pendant laquelle les caractéristiques principales de l'éco-région et son potentiel ERBC sont dégagés. L'étape suivante consiste à dessiner une Vision de la biodiversité, un tableau de ce que serait le succès dans une cinquantaine d'années. La Vision est le modèle par rapport auquel toutes les actions spécifiques sont jugées. L'Analyse de la situation examine les processus socio-économiques et culturels qui facilitent ou entravent la préservation de la biodiversité et identifie les moyens par lesquels des incitations pourraient encourager des comportements contribuant à préserver la biodiversité de l'éco-région. Le Plan éco-régional, qui est fondé sur la Vision de la biodiversité et l'Analyse de la situation, identifie des partenaires et les volets qui seront exécutés par chacun d'entre eux; il comporte des budgets et des calendriers. Tous ces préliminaires aident à concentrer l'action - les projets mis en oeuvre pour accomplir la vision. A ce jour, cette démarche n'a été suivie entièrement pour aucune éco-région, mais la Conservation éco-régionale aide déjà les écologistes à penser stratégiquement.

La conservación a nivel de ecoregión (Ecoregion-Based Conservation, ERBC) reconoce que la conservación efectiva requiere el análisis y la planificación a las mismas escalas espaciales y temporales que los procesos que generan y mantienen la biodiversidad. Las ecoregiones son áreas grandes que comparten biotas y climas relativamente uniformes. Por lo general, el ERBC se implementa en una serie de etapas, siendo la primera un reconocimiento durante el cual se delimitan las principales características de la ecoregión y su potencial para la ERBC. La etapa siguiente es el desarrollo de una Visión de Biodiversidad, que representa el aspecto que tendría el éxito en un plazo de 50 años. La Visión es el patrón de comparación utilizado para juzgar toda acción específica. El Análisis de Situación analiza los procesos socio-económicos y culturales que ayudan o dañan la preservación de la biodiversidad e identifica las maneras en las que los incentivos podrían fomentar comportamientos que ayuden a preservar la biodiversidad en la región. El Plan de la Ecoregión, que se basa en la Visión de Biodiversidad y en el Análisis de Situación, identifica a los socios y los componentes de los que se ocupará cada uno; tiene presupuestos y calendarios. Todos estos aspectos preliminares ayudarán a enfocar la acción - los proyectos iniciados para cumplir con la visión. Hasta la fecha el proceso total no ha sido completado para ninguna ecoregión, pero ERBC ya está ayudando a los conservacionistas a que piensen de manera estratégica.

The Landscape Kaleidoscope: The Conundrum of Protected Areas and Adaptive Management in the Context of Climate Change

Peter Bridgewater¹

Global change, including climate change, is not new, nor is the role of people in this change. What is new is the role of people in the rate and direction of change and the inability of so-called 'natural systems' to cope with the energised demon of climate change. Managing that demon is a major challenge for all involved with management and use of biodiversity. As a first step, monitoring of climate and other global changes is essential. Global change is not preventable (nor is it necessarily desirable to prevent such change), but it must be managed well. This management must begin with the management of local change, which will everywhere be driven by climate change. The effects of climate change will vary according to the various scales of biodiversity - this paper only deals with landscape-/seascape-wide effects. The paper finds that the key response areas to climate change of landscape policy, must incorporate a focus at the continental level, a policy approach to translocation, and an emphasis on the connectivity of landscapes. Inevitably an element of landscape design must be incorporated in all conservation projects.

INTRODUCTION - STABILITY AND CHANGE IN THE ENVIRONMENT

Of all global changes, climate change is the most insidious, and the most likely to devalue biodiversity assets. Direct and indirect impacts of climatic change may take many forms, apart from temperature rise (Intergovernmental Panel on Climate Change 1992; 1994; 1996). Such impacts will lead to changes in species composition and dominance, ecosystem structure (especially length of growing season) and in the distribution and abundance of species. Palaeoecological work on several continents has demonstrated that, during previous warmer climates, distributions and relative abundances changed, and changed again as cooling cycles and thus cooler climates became established.

A particularly important point to make at the outset is that climate change is but one component of global change. It may well be that climate change is actually less of a concern for biodiversity management than other components of global change, such as eutrophication, change in hydrologi-

cal balance, and poor land-use practice. Nonetheless, climate change continues to occupy the world's attention. From what we know of the potential impacts on biodiversity, we should be in a phase of contingency planning (Bridgewater 1996).

It is likely that exotic species already present in restricted sites, or that have not yet established themselves, will achieve range extensions. This gives greater emphasis to the need for the Global Invasive Species Program (GISP), and for the Convention on Biological Diversity (CBD) to re-emphasise the need for attention to be focused on exotic species as part of biodiversity strategies. New species interacting with existing communities will give rise to novel communities for which effective conservation measures will need to be defined. This will be one aspect of 'creative conservation' in the future - giving rise to the 'global garden' (Bridgewater 1997). Given the focus of the CBD on protected areas as a major objective to conserve biodiversity, will protected areas be an effective

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means of biodiversity conservation into the next century? In this context, the fixed, legal boundaries characteristic of protected areas would appear to be a problem, rather than an opportunity.

For protected area managers the difficult problem is to assess the risks of loss and the costs of retention of the nature conservation resource. They must attempt to predict the outcomes of global change, but cannot then wait until the prediction is proved. The general trends are clear, but scenarios are still far from clear. So adaptive management (Grumbine 1997) is now the only way to proceed. It is one side of the new paradigm we will need, which must focus on integrating a range of monitoring themes at a range of scales.

This suggests that in the future the most important features of conservation management strategies for biodiversity will require a fairly sophisticated understanding of conservation biology at the landscape level, as well as an understanding of the dynamics of the species populations (Bridgewater 1993; Grumbine 1997). Integral to the conservation of biodiversity is the connectivity of landscapes. If protected areas are isolated in the landscape or seascape, their purpose is defeated. And, if efforts for conservation and sustainable use of biodiversity are not firmly set in the broader landscape, then we risk all our efforts being wasted.

RATES OF CLIMATE CHANGE

Average annual temperatures increased by 0.6°C last century (Intergovernmental Panel on Climate Change 1996), and we have lived through the warmest decade on record. Changes in the earth's seasons and physical characteristics consistent with global warming are also starting to be detected, including accelerated glacial retreat, advances in seasons, reductions in sea ice, and rises in sea level.

On the assumption that atmospheric CO₂ concentrations will be double those of pre-industrial levels sometime around the middle of this century, it is predicted that temperature increases of 1.5 - 5°C will occur, with warming greatest at temperate latitudes. This corresponds to a 150 - 625km latitudinal (N-S) displacement of isotherms toward the poles. Rainfall may increase by 2% for every 1°C of warming, but some areas will become wetter whilst others will become drier. The snowline will rise by approximately 100m for every 1°C rise in temperature and sea levels, which rose by 2mm/yr last century, may increase by 15 - 95cm.

CLIMATIC EFFECTS ON THE DISTRIBUTION AND PHENOLOGY OF ORGANISMS

Based on palaeoecological evidence, we can conclude that species may respond to climatic changes by:

- Migrating with climate zones.
- Adapting *in situ*; or
- By going extinct.

However, the major difficulty with understanding likely reactions of biodiversity are the other anthropic global changes - landscape fragmentation, introduction of species from other biogeographic realms, *etc.*

Evidence is starting to accumulate that suggests that the changes in climate experienced last century are already having measurable effects on the distribution and abundance of organisms. The sea surface temperatures off the Californian coast have increased by 0.8°C over the last 42 years. This has been accompanied by a 70% decline in zooplankton abundance (Roemmich and McGowan 1995), a 70% decline in the biomass of macroalgae (1974 -1993), and a decline in a diversity of reef fishes by 15 - 25% (Holbrook *et al.* 1997). In the same area, a shift in species composition from dominance by northern to southern species of both reef fishes (Holbrook *et al.* 1997) and intertidal invertebrates (Barry *et al.* 1995) has also been documented.

Significantly for human health, *Plasmodium falciparum* malaria has been recently reported at increasingly higher elevations in Asia, Papua New Guinea, Central Africa, and Latin America (Epstein *et al.* 1998). Dengue fever, which was previously limited to about 1000m in the tropics, has recently been reported at 1700m in Mexico (Koopman *et al.* 1997). Geographical distribution of tree species also appears to be changing; over 25 studies show recent increases in establishment of subalpine conifers in subalpine meadows in western USA (Peterson 1994).

There is also evidence that changes in the timing of life cycles are also occurring. Increased plant growth in northern high latitudes associated with a lengthening of the active growing season (1981-1991) has been documented, with the most marked increase occurring at 45 - 70° N. (Myneni *et al.* 1997); the associated drawdown of CO₂ in spring and early summer has advanced by up to seven days. Trends to earlier egg-laying (range 4-17 days) in British birds (Crick *et al.* 1997), and advances in spawning dates of amphibians have been recorded, with every 1°C increase in annual maximum temperature corresponding to an advance of 9-10 days (Beebee 1995).

IMPLICATIONS FOR CONSERVATION AND RESERVE DESIGN

If warming trends continue, we can expect to see increasing evidence of species distributions expanding or contracting, and the timing of various life cycle events becoming advanced. These effects will produce widespread changes not only in biogeographic patterns, but also in ecosystem and land/seascape processes.

Clearly, not all species will be at a disadvantage, many will be placed at an advantage. It seems likely however that species that are already rare and geographically isolated, poor dispersers and/or slow to grow and reproduce (the k-strategists) are likely to fare poorly, compared to weedy, opportunistic, highly mobile species (the r-strategists). It is also likely that some landscapes will be relatively more vulnerable, including polar regions, alpine areas, coral reefs (primarily due to bleaching and death of coral) and wetlands (in areas where rainfall reduction is a consequence of warming trends).

In the future, conservation based on a 'static', legally defined reserve system, and landscapes with communities in an equilibrium pattern will be an increasingly inadequate strategy

So how can conservationists and land managers deal with a problem such as this, where specific predictions are few, where the time scale of change is of the order of decades, and other aspects of global change demand more urgent attention?

A fundamental conclusion is that environmental management is rather more about the management of human needs, desires and perceptions, than it is about managing tree growth or wildlife populations. While 'wilderness' is still a popular ideal, it has long gone from this world. The wildernesses of today are only in human minds and we confuse such wilderness with conservation imperatives at our peril. There is nowhere we can 'leave' as wilderness, rather we must be managers of human interaction on land or in the sea, wherever we are.

In this situation monitoring and feedback must be the key. To decide on conservation priorities, decision-makers need access to:

- Data and information about biophysical processes.
- Ecosystems and communities.
- Species populations; and
- Genetic characteristics within species populations, for the region under consideration, be that a catchment, a state or a continent.

Once the requisite data and information are available, an analytical procedure is needed to identify key candidate areas which could be managed for their conservation values. We then need to plan a monitoring program, with performance indicators to determine the level of our success.

Monitoring is not the preserve of the scientist, the manager, or the politician. To be effective we need monitoring networks involving the whole community. With appropriate feedbacks we can hopefully use monitoring information to change fundamental behaviours throughout the communities.

It would take enormous resources and many years to complete anything resembling a comprehensive inventory of any nation's biodiversity at the ecosystem/community, species, and genetic level. Accelerating rates of land use change, and increasing human use of marine resources means that measures to conserve biodiversity must be put in place now. Global monitoring and observing systems, including programs such as the Biodiversity Integrated Monitoring System (BRIM), UNESCO's Man and the Biosphere Programme (MAB), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS) need more focus and better support from the international community including the CBD.

PROTECTED AREAS AND THEIR MANAGEMENT

Protected areas will form a special part of our response. But first we need to re-design the protected area concept. One of the dilemmas facing us is that a future with a sole, or even major, emphasis on protected areas is simply not acceptable, or realistic. At one end of the spectrum is the idea that we should treat the whole world as a protected area. At the other end is the view that a set of protected areas is all that really matters in terms of biodiversity protection.

The CBD defines a protected area as:

"A geographically defined area which is designated or regulated and managed to achieve specific conservation objectives."

The Caracas Congress on National Parks and Protected Areas established a clear, but more elaborate, definition of protected areas which expands on the CBD definition:

"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means."

Using the preceding definitions, and recognising that while there are many definitions around, the following is given as a working definition for the future, building on those of the past:

"A protected area is a part of the planet used for the prime purpose of genetic, species and land/seascape conservation and management. The protected area may include cultural components, appropriate sustainable use and benefit sharing, and will be managed by the owners through the most effective means to achieve the conservation objectives."

You will notice that one particular difference between this definition and that adopted at Caracas is that it does not mention the primacy of legal management regimes, because this may become less and less effective in this century. Our emphasis must be more on partnership and less on legislative frameworks. But it is not just about definitions, we need a new paradigm for conservation.

So what are the key issues facing protected areas which necessitate the need for a new conservation paradigm? In addition to the CBD the Framework Convention on Climate Change and the negotiations on a Convention to Combat Desertification are all vital steps in the process of engendering global support for issues which have no national boundaries. These efforts are also attempting to blend the key issues of biodiversity conservation with sustainable human development. And that is where we need a new paradigm for protected area design and management.

Recent advances in bioregional planning and management provide us with new challenges (Thackway and Cresswell 1997). We need to embrace those challenges, but in a bio-cultural framework. The UNESCO World Heritage *Cultural Landscapes* (von Droste *et al.* 1996) represent real opportunities to ensure biodiversity conservation and management in a cultural framework. It is a truism that biodiversity cannot, and will not be conserved unless cultural diversity is also conserved. We need to take the concepts and principles of cultural landscapes much more seriously. This will help us deal with the imperatives of climate change.

Conservation across broad landscapes or seascapes not only conserves biodiversity, but also has significant influence on the landscape/seascape matrix. In the purely terrestrial arena, erosion control, catchment security, land reclamation, soil fertility improvement, modifications to air temperature and humidity, control of soil salts, and water table levels are all affected by properly placed and designed corridors, which then need careful management (Forman and Godron 1986). Resilience provided by adequate conservation outside protected areas will alleviate the problems that will spring from global change. Corridors in the sea may sound odd or impractical, but this need not be so, and the same principles can and must be applied in the marine sphere.

The best examples of natural and semi-natural areas are usually included in a protected area network, but all such habitat is important as a reservoir of biological diversity. It is important that as much of this resource as possible should be conserved, so that the maximum range of opportunities exists for wildlife to adapt to the effects of global warming. The landscape matrix which contains these prime sites for nature conservation will also be subject to changes. New species may be grown in afforestation projects and new types of agriculture introduced as existing systems are replaced. Again, specificity is difficult but it is likely that changes will be considerably complex and regionally variable. For example, in Europe good wildlife habitat areas where

semi-natural habitat has been substantially modified include hedgerows, ditches and recent plantations. Such areas are widely distributed throughout rural and suburban areas and represent a substantial part of the total wildlife resource.

Such a general strategy could well be founded on the 12 principles of landscape ecology enunciated by Forman (1995). The principles deal with species interactions, landscape texture, inherent ecosystem change, and overall landscape design. Forman's twelfth principle is worth quoting in full:

"Indispensable patterns: Top-priority patterns for protection, with no substitute for their ecological benefits, are a few large natural-vegetation patches, wide vegetated corridors protecting water courses, connectivity for movement of key species among large patches, and small patches and corridors providing heterogeneous bits of nature throughout developed areas."

Designer land and seascapes, incorporating relatively fluid conservation cores (our present day protected areas) may be the only future. And just as the landscape gardeners of the 17th and 18th centuries did much to restore wildlife habitat, so too must we attempt to become global gardeners.

KEY RESPONSE AREAS TO CLIMATE CHANGE

CONTINENT-WIDE PROTECTED AREA POLICY

Development of genuine protected area networks based on biogeographic scales is urgently needed, and these networks need to have a focus at the macrobiogeographic scale. Such networks then need to be established in an appropriate bioregional framework, irrespective of national boundaries. The UNESCO-MAB Biosphere Reserve approach is perhaps the best global example of how this might work (UNESCO, 1996). The Action Plan for UNESCO-MAB Biosphere Reserves offers opportunities for involvement of local communities (Bridgewater and Cresswell 1998). Opportunities to integrate protected area conservation programs with those operating in the wider landscape should be sought and developed. Where neighbours have similar, joint or mutual interests in resources, opportunities should be taken to implement not only agreed management plans, but to establish assessment protocols for evaluating management effectiveness - adaptive management in action.

EMPHASIS ON PHYSICAL FEATURES IN PROTECTED AREA SELECTION

Protected areas with the greatest physical heterogeneity, and those with wide latitudinal and altitudinal ranges will have a better chance of conserving the greatest biodiversity in the future than those chosen for their present-day species composition.

WIDER LANDSCAPE CONSERVATION AND CONNECTIVITY

The necessity for migration of species between protected areas will make the provision of corridors and buffer zones even more critical in the future.

TRANSLOCATION

To deliberately move a species to a place where it has never existed will be repugnant to many. But we have to consider both translocation and re-introduction as part of the new conservation paradigm. Of course questions of what to move, and where to, are difficult, but now is the time to start thinking about them.

CONCLUSION

In order to respond fully to climate change, we should be establishing a protected area system with the aim of:

- Maximising the conservation of biodiversity.
- Viewing protected areas as part of the landscape matrix, rather than as islands; and
- Putting into place an integrated adaptive management framework for those landscapes.

In turn this aim moves protected areas from a narrow sectoral basis, to a position where they are the key to developing a viable bioregional approach - which, again, has adaptive management at its functional heart.

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Summaries

Le changement global, y compris le changement climatique, n'est pas nouveau, ni n'est le rôle des individus dans ce changement. Ce qui est nouveau, c'est le rôle des individus dans le rythme et la direction du changement et l'incapacité des soit-disant « systèmes naturels » à faire face au démon qui excite le changement climatique. Dompter ce démon est un grand défi pour tous ceux qui participent à la gestion et à l'utilisation de la biodiversité. Dans une première étape, il est indispensable de suivre le climat - et autres changements du globe. Le changement global est inévitable (et il n'est pas nécessairement souhaitable d'éviter un tel changement), mais il doit être bien géré. Cette gestion doit commencer par la gestion du changement au niveau local, qui sera commandé par le changement climatique. Les effets du changement climatique varieront suivant les diverses échelles de la biodiversité - cet article ne traite que des effets au niveau du panorama terrestre/marin. Le présent article conclut que les principaux domaines d'intervention au changement climatique doivent être la politique d'aires protégées au niveau continental, la politique de déplacement de certaines espèces et l'importance accordée à la connexité des paysages. Il est indispensable d'incorporer un volet de conception paysagère dans tous les volets de conservation.

El cambio global, que incluye el cambio climático, no es nuevo, ni tampoco lo es el papel de la gente en este cambio. Lo que es nuevo es el papel de la gente en la velocidad y la dirección del cambio y la incapacidad de los sistemas naturales, como se denominan, para hacer frente al demonio energizado del cambio climático. El manejo de ese demonio es un desafío mayor para todos los involucrados en el manejo y el uso de la biodiversidad. Como primer paso, el monitoreo del clima -y otros cambios globales- es esencial. El cambio global no es previsible (ni es necesariamente deseable para impedir tal cambio), pero debe ser bien manejado. Este manejo debe comenzar con el manejo del cambio local, que en todos lados será impulsado por el cambio climático. Los efectos del cambio climático variarán de acuerdo a las diversas escalas de biodiversidad - este trabajo analizó únicamente los efectos a lo largo de paisajes terrestres y marinos. Este trabajo determina que las áreas de respuestas claves a los cambios climáticos de políticas de paisaje deben incorporar un enfoque a nivel de continente, un enfoque sobre la translocación a nivel de políticas, y un énfasis sobre la conectividad de los paisajes. Inevitablemente se debe incorporar un elemento de diseño paisajístico a todos los proyectos de conservación.



IUCN

Founded in 1948, IUCN—The World Conservation Union brings together states, government agencies and a diverse range of non-governmental organizations (NGOs) in a unique membership: over 950 members in all, spread across some 139 countries. The Union builds its strengths from its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

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SUSTAINABLE USE INITIATIVE

The IUCN Sustainable Use Initiative was established in 1995 to improve understanding about the factors that affect sustainability. Since that time, sustainable use has evolved from being a somewhat controversial notion to being successfully incorporated into mainstream thinking about conservation.

In keeping with this conceptual shift, IUCN has re-organized its work, moving away from a special, stand-alone Initiative towards an integrated approach. SUI was disbanded in 2001, but a Sustainable Use Team (SUT) was formed to carry on this work, synthesizing information and findings across IUCN's diverse programmes. SUT's goal is to disseminate information and knowledge about sustainable use, facilitate analytic and policy contributions from IUCN programmes and members, and develop tools and build capacity for understanding sustainability.

A key actor in this effort is the IUCN SSC Sustainable Use Specialist Group (SUSG, <http://iucn.org/themes/ssc/susg/>), an international network of experts operating in 17 different regions. SUT acts as the secretariat for the SUSG.

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