



The Norway/UN
Conference on the Ecosystem
Approach for Sustainable Use
of Biological Diversity.
September 1999 - Trondheim,
Norway

TRONDHEIM
CONFERENCES ON
BIODIVERSITY



Conclusions and recommendations
from presentations and discussion

CHAIRMAN'S REPORT

Chairman's Report

Conclusions and recommendations
from presentations and discussions

Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity

6 - 10 September 1999

- Hosted by
- The Royal Norwegian Ministry of the Environment

In collaboration with

- United Nations Environment Programme (UNEP)
- The Royal Norwegian Ministry of Agriculture
- The Royal Norwegian Ministry of Fisheries
- The Royal Norwegian Ministry of Foreign Affairs

Organised by

- Norwegian Directorate for Nature Management (DN)
- Norwegian Institute for Nature Research (NINA)
- Foundation for Continuing Education of the Norwegian Institute of Technology (SEVU)

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Conference Director

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Conference Secretary

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- Center for International Forestry Research (CIFOR)
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- The World Bank (WB)
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- United Nations Educational, Scientific and Cultural Organization (UNESCO)
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CONCLUSIONS AND RECOMMENDATIONS FROM THE NORWAY/UN CONFERENCE ON THE ECOSYSTEM APPROACH FOR SUSTAINABLE USE OF BIOLOGICAL DIVERSITY, TRONDHEIM, NORWAY, 6 - 10 SEPTEMBER 1999

Introduction

In January 1998 a workshop was convened in Malawi under the auspices of the Secretariat of the Convention on Biological Diversity (CBD) with a view to identify principles that could operationalize the 'ecosystem approach'. The workshop drew up twelve principles, which were later considered by the Conference of Parties at its fourth meeting, in May 1998. The conference of the Parties acknowledged the need for a workable description and further elaboration of the 'ecosystem approach'. Against this background, scientists, managers and policy advisors from 95 countries and inter-governmental agencies, institutions and organizations gathered in Trondheim on 6-10 September 1999, at the invitation of the Government of Norway.

Three closely interlinked objectives of the Convention on Biological Diversity are: a) conservation, b) sustainable use of biological resources and c) a fair and equitable sharing of the benefits deriving from this use.

The Trondheim Conference examined the 'ecosystem approach' as a mechanism to ensure the sustainability of biological resource use. There was broad consensus at the meeting that given the spatial and temporal complexity of biodiversity and the human use of ecosystems, the 'ecosystem approach' including adaptive management is the most appropriate framework to achieve the Convention objectives.

The "ecosystem approach" results from converging management strategies applied in various parts of the world. It addresses spatially complex, interconnected and temporarily varying systems. It promotes conservation and sustainable uses of biodiversity in an equitable and socially acceptable manner.

Biodiversity and ecosystem functioning

The many components of biodiversity control the stores and flows of energy, water and nutrients within ecosystems, and provide resistance to major perturbations. We have accumulating evidence on the sensitivity of ecosystems to biodiversity alteration or loss, but as yet we do not have adequate knowledge of the full magnitude of these relationships now, or under global changes. Further fragmentation may have considerable effects on the delivery of ecosystem services and these effects may vary with different ecosystem types. Hence we need to apply a precautionary principle or utilize adequate risk-management approaches before

altering ecosystem structure and composition. We need to accelerate our efforts to gain new knowledge about biodiversity/functional relationships, *inter alia* through international initiatives like the Millenium Assessment.

The Malawi principles offer an approach that will not only help gain the information that we need on the relationship between biodiversity and ecosystem structure and function, but will also help put this knowledge into a meaningful framework for achieving ecosystem sustainability.

Benefits and services

The benefits of biodiversity are found in the array of services provided by ecosystems. They provide the basis of human environmental security and sustainability. The 'ecosystem approach' seeks to ensure that these services are distributed equitably to people at local, national, regional, and global scales. Proper valuation of ecosystem services is needed. Further, the perverse incentives that devalue ecosystem services need to be removed and replaced with local incentives for good management practices. In particular, benefits from these services need to be shared with the stakeholders responsible for their production and management.

Decentralization

Considerable attention was given to the second Malawi principle, which establishes that ecosystem management should be decentralized to the lowest appropriate level. Several examples indicate that decentralization of management decision-making may render promising results. Decentralization of resource management has often been equated to democratizing the process of decision-making and to a broader participation of all stakeholders. This latter does not guarantee the attainment of sustainable use, but certainly increases the likelihood of doing so when all interested parties feel to be part of the decision-making process. However, decentralization is likely to have negative effects if it is not accompanied by proper empowerment, which implies both adequate capacity building and assuming responsibilities. Accountability and transparency in benefit sharing is crucial to the decentralization process and to successfully operationalize the Convention objectives. There is a need for studies to define which is the appropriate balance of decentralization versus centralization for ecosystem management in each case. Decentralization needs to be supported by concomitant policy and legislation frameworks.

Intersectoral cooperation

Management of natural resources, according to the 'ecosystem approach', calls for an increased intersectoral communication and cooperation. Persistent sectoral views must be overcome at a whole range of levels (government, management agencies, etc).

These changes should range from the formation of interministerial bodies within the government (e. g. national biodiversity committees) to the creation of networks for sharing information and experience.

Adaptive management

Ecosystem processes and functions are complex and variable. Their level of uncertainty is increased by the interaction with social constructs, which need to be better understood. Therefore ecosystem management must imply a learning process, which helps to adapt methodologies and practices to the ways in which these systems are being managed and monitored. These uncertainties call for flexibility in policy making and implementation, as well as for management precaution. Long-term, inflexible decisions are likely to be inadequate or destructive. Ecosystem management should be envisaged as a long-term experiment which builds on its results as it progresses. This "learning - through - doing" will also be an important source of information to gain knowledge of how to best monitor the results of management and evaluate whether established goals are being attained.

Additional suggestions:

Experience already demonstrates that Parties can take immediate steps to promote delivery to people of the full array of biodiversity benefits from ecosystems. The application and further development of the 'ecosystem approach' is a matter of high priority. Building capacity in adaptive management and participation at all appropriate scales is urgently needed. This should be promoted through good case studies leading to guidelines on the implementation of the 'ecosystem approach'.

- Implementation programs should be designed to adjust to the unexpected, rather than to act on the basis of a belief in certainties.
- The development of capacity in the 'ecosystem approach', adaptive management, monitoring, information, and participatory management is a matter of high priority.
- While the Conference stressed the need for countries to "get on with implementation" of the 'ecosystem approach', it also recognized that Parties must better understand ecosystem structure, function and process, as well as temporal and spatial dynamics, including human influence on biodiversity.
- At the management level there is a need for integrating scientists into decision-making, linking ecosystem functions to socio-economics and ensuring institutional integration as well as participation of local communities at various levels. It was also stressed to have scientists directly interacting with local communities in a two-way process of advising and learning about ecosystem management.
- As global trade accelerates there needs to be continuing monitoring and discussion on potential adverse impacts on biological diversity on ecosystem

properties. Cost effective ways of mitigating adverse impacts need to be developed, and, equally markets for sustainably produced components of biological diversity need to be promoted and facilitated.

- Ecosystem management needs to recognize the diversity of social and cultural factors affecting natural resource use.
- There is a need to develop accepted methodologies for the valuation of biodiversity and ecosystem services.
- There is a need to integrate the 'ecosystem approach' into agriculture, fisheries, forestry and other production systems that have effect on biodiversity.
- There is a need to investigate where ecosystem restoration is possible and the most cost-effective ways of doing it.

The Conference agreed that the outcome of the meeting formed a significant contribution to the preparations of the fifth meeting of the Subsidiary Body on Scientific, Technological and Technical Advice (SBSTTA5). Consequently, the results should be communicated at the first meeting of the liaison group on the 'ecosystem approach' to be held in Paris in September 1999.

INTRODUCTION

The Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological was hosted by the Norwegian Ministry of the Environment on behalf of the Norwegian Government, in collaboration with the United Nations Environment Programme (UNEP). The international advisory committee of the Conference had the participation of the Secretariat of The Convention on Biological Diversity (CBD), the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the United Nations Food and Agricultural Organisation (FAO), the United Nations Development Programme (UNDP), the World Bank (WB), the Global Environmental Facility (GEF), GEF's Scientific and Technical Advisory Panel (STAP), the International Conservation Union (IUCN), the Scientific Committee on Problems of the Environment (SCOPE), the DIVERSITAS programme, the International Council for the Exploration of the Sea (ICES), and the Center for International Forestry Research (CIFOR). The organisation and sponsoring of the Conference was a joint venture between the Norwegian Ministry of the Environment, the Ministry of Agriculture, the Ministry of Fisheries, and the Ministry of Foreign Affairs.

The Conference was organised by the Norwegian Directorate for Nature Management (DN), which is the executive body of biodiversity management under the Ministry of Environment, in cooperation with the Norwegian Institute for Nature Research (NINA), both based in Trondheim. The preparations for the Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity (EASUB) were led by a Conference Steering Committee, chaired by Mr. Peter Schei at the Norwegian Directorate for Nature Management.

The EASUB was the third one in the series of the Trondheim Conferences on Biodiversity, which started in May 1993. The Trondheim Conferences focus on the multidimensional nature of the implementation of the Biodiversity Convention. There is a need to establish the best possible scientific basis for this implementation, taking into account that the conservation and sustainable use of biodiversity and fair and equitable sharing of benefits derived from it, constitute the very foundation for sustainable development. The Conference series aims to establish and develop contact and collaboration between scientists and policy makers from all Parties to the CBD. Its major goal is to enhance the cross- and multi-sectoral dialogue on biodiversity research and management, and to contribute to a solid basis for policy and management decisions needed to implement the Convention on Biological Diversity.

The Conference in May 1993 provided an input that was highly instrumental to the first Intergovernmental Committee meeting of the signatories to the CBD in

September that year. The theme of the second Conference in July 1996 was scientific and management problems related to alien invasive species. The Conference provided useful input to the discussions at the second SBSTTA meeting in September 1996, and to the development of the Global Invasive Species Program (GISP). In June 1997, the organizers of the Trondheim Conferences hosted a workshop on biodiversity in freshwaters, to provide scientific input to the third SBSTTA meeting in September 1997.

During the negotiations of the CBD there was general agreement on the necessity of striking the right balance between conservation and use of biodiversity. Without use or usefulness, no motives for conservation, and without conservation, no sustainability. The three objectives of the CBD, conservation, sustainable use, and sharing of benefits, are closely linked. This means that biodiversity concerns have to be integrated into all sectors of society whose policies have an impact on the environment, and that human dimensions and interests have to be taken into account when we try to find solutions to problems about biodiversity loss.

We need to find new and innovative strategies regarding holistic approaches to answer ecological questions, as well as sector integration, inter-sectoral cooperation, and stakeholder participation. Focus on single species models and sectorized or fragmented biodiversity management has demonstrated only limited success. We have to develop ways of living with, conserving and using biological resources in an ecosystem context where the various stakeholders and influents are involved and held responsible for their actions. The mainstream understanding of the 'ecosystem approach' is that it 'integrates ecological protection and, if necessary, restoration, with human needs to strengthen the essential connection between economic prosperity and environmental well-being' (US Inter-agency Ecosystem Management Task Force, 1995).

In a workshop organized in Malawi in January, 1998, and submitted to the 4th Conference of the Parties of the CBD (UNEP/CBD/COP/4/Inf.9), identified the following twelve principles/characteristics of the 'ecosystem approach' to biodiversity management:

- *Management objectives are a matter of societal choice.*
- *Management should be decentralized to the lowest appropriate level.*
- *Ecosystem managers should consider the effects of their activities on adjacent and other ecosystems.*
- *Recognizing potential gains from management there is a need to understand the ecosystem in an economic context, considering e.g., mitigating market distortions, aligning incentives to promote sustainable use, and internalizing costs and benefits.*

- *A key feature of the 'ecosystem approach' includes conservation of ecosystem structure and functioning.*
- *Ecosystems must be managed within the limits to their functioning.*
- *The 'ecosystem approach' should be undertaken at the appropriate scale.*
- *Recognizing the varying temporal scales and lag effects which characterize ecosystem processes, objectives for ecosystem management should be set for the long term.*
- *Management must recognize that change is inevitable.*
- *The 'ecosystem approach' should seek the appropriate balance between conservation and use of biodiversity.*
- *The 'ecosystem approach' should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.*
- *The 'ecosystem approach' should involve all relevant sectors of society and scientific disciplines.*

The Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity focused on research and development which contributes to an improved understanding of these principles, with the aim to integrate them in everyday management practices. One important goal of the 1999 Trondheim Conference has been to provide useful input to discussions on one of the major themes at the 5th Conference of the Parties in 2000, the sustainable use of the components of biodiversity.

Against this background, the Norwegian Minister of Environment invited all members of the United Nations, as well as relevant UN agencies, all national focal points for the Convention of Biological Diversity, and a number of international instruments and non-governmental organisations in the field of nature and resource management.

The objectives of the Conference were:

- To contribute to a sound scientific knowledge of issues related to the sustainable use of components of biological diversity.
- To contribute to the development of the concept and principles of an 'ecosystem approach' to sustainable use of biodiversity.
- To provide a forum for cross- and multi-disciplinary dialogue between scientists and policy makers on research and management issues related to sustainable use of biodiversity, and to contribute to ongoing deliberations in other international and national fora.

The Chairman's Report and the Proceedings will be distributed to relevant international fora working on issues related to the 'ecosystem approach' and sus-

tainable use of biodiversity, in particular those working with the Convention on Biological Diversity and its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA).

The program included one opening session, nine thematic sessions, one panel debate and one session of follow-up of the conference.

The themes were covered by more than 35 oral presentations, with a main focus on forest and marine ecosystems, covering most of the elements emerging from the following 'ecosystem approach' principles/characteristics:

- involvement of stakeholders,
- impacts of use on ecosystem functions,
- the balance between conservation and use in multiple use areas
- appropriate decentralisation levels,
- the balance and relationship between international, national and local objectives
- principles of adaptive management.

Questionnaires were distributed amongst participants after each session. Here the participants were invited to give their views on the most important findings/recommendations from each session, and to put forward the most serious difficulties for their implementation. Participants were also asked to suggest possible means to overcome these difficulties. Finally, they were encouraged to suggest the next steps needed to develop and operationalize the principles of the 'ecosystem approach' under the CBD. The findings from these questionnaires have been incorporated in the conclusions and recommendations from the Conference.

This document presents the report of the Conference Chairman, Mr. Peter J. Schei, containing his conclusions and recommendations from the presentations and discussions at the Conference. The text is based on main points from the lectures and the following discussions and the panel debate, minutes taken by the session rapporteurs, and discussions within the editorial group. In most cases abstracts and proceedings have been available.

The report does not necessarily represent a consensus among the participants.

In addition to this report, ordinary proceedings from the Conference will be produced and published. A scientific book containing selected peer-reviewed contributions to the conference is also being planned.

SESSION 1

OPENING SESSION

Chair: **Guro Fjellanger**, Minister of the Environment, Norway

Opening statement were delivered by:

- Kåre Gjønnes, Norwegian Minister of Agriculture
- Johannes Nakken, State Secretary, Ministry of Fisheries
- Shafqat Kakakhel, UNEP
- Jeffrey McNeely, IUCN
- Lazcso Miklos, Chair of 4th Conference of Parties CBD
- Anne Katrine Slungård, Mayor of Trondheim
- Hamdallah Zedan, Executive Secretary of CBD
- Guro Fjellanger, Norwegian Minister of the Environment

In his opening statement, **Kåre Gjønnes**, Norwegian Minister of Agriculture pointed out the following:

Long-term conservation efforts and the sustainable use of natural resources are of concern to all of us. Our challenge as decision-makers is to make balanced judgements, which ensure a fair distribution among today's populations of the asset inherent in biological diversity while preserving their value for future generations.

It is important that we establish close, binding co-operation across traditional sector lines, and this is why the Ministry of the Environment has organised this conference in collaboration with the Ministry of Fisheries, the Ministry of Foreign Affairs and the Ministry of Agriculture.

In Norway, the Ministry of Agriculture has the overall responsibility for formulating and implementing policies relating to the protection and utilisation of forest and agricultural land. These policies are designed to achieve important but often-incompatible goals.

Norwegian agricultural policy seeks to increase productivity, provide for the stability of the rural population, promote sustainable resource management and maintain a viable cultural landscape, as well as sharing in the responsibility of preserving biological diversity for future generations. To maintain balance in the achievement of these goals, it is essential that the agricultural authorities work in close co-operation with the environmental protection authorities and the competent authorities in other sectors at the local, regional and national levels.

Sustainable use of biological diversity also depends on the preservation of the basic factors of biological production and on diversity being given top priority at all levels in all sectors. Conservation of soil, water and air are all important aspects of the effort of securing bio-

logical diversity and the viability of the major ecosystems.

An 'ecosystem approach' to the sustainable utilisation of forestry resources is one of the central topics of this conference. The Rio conference in 1992 laid the groundwork for a thorough discussion of international policy through Agenda 21, the forest principles and the two conventions on biological diversity and climate change. Norway's national forest policy is heavily influenced by these processes, and we will seek to further establish, at the international level, greater clarity on the balance between commercial utilisation versus the long-term conservation of forestry resources.

In order to implement more effective measures that promote sustainable use, it is necessary to enlist the widest possible base of support and this requires the participation of all sectors potentially affected. In Norway, the forestry sector, including the forestry industry, initiated a 3-year project ("Living Forests") to promote more sustainable forestry. The most important results to come out of the project were criteria, indicators and standards for sustainable forestry. The criteria and indicators, which have now become important tools in policy development, monitoring and reporting, are based on the framework of the Ministerial Conference on the Protection of Forests in Europe.

A number of important efforts in the agricultural sector are crucial to the protection of ecosystems, flora and fauna and their genetic resources, e.g. in Norway, where only 3% of the land is cultivated, protection of productive farmland against development and other impairments is important. Another important issue is to step up our efforts to maintain the world's genetic resources.

Research and experience show that biologically sustainable production methods can be financially worthwhile even in a short-term perspective, e.g. grazing and other traditional forms of land use on non-arable land and certain biological pest control methods.

Monitoring systems will provide better information on the status and development of forest and farmland as viable environments for various organisms, and give us a better basis for evaluating specific measures and policies.

Even though some progress towards the sustainable use of biological diversity has been made, much remains to be done. We must deepen our knowledge on how ecosystems function, and this Trondheim conference will contribute to the continued development of the scientific basis for the management of biological diversity.

In his address to the Conference State Secretary in the Norwegian Ministry of the Fisheries, **Johannes Nakken** presented Norwegian views on the international management of marine resources and pointed out:

A good management of the environment is of vital importance to ensure the productivity of the oceans and as well as healthy and good seafood.

Active co-operation with the environment authorities both nationally and internationally is important.

Norway is among the 10 largest producers of fish in the world. Over 90 per cent of the catch is exported.

Norway has a large and steadily growing production of farmed fish and shellfish. Most of the farmed products are also exported. Almost 40 percent of the total export of seafood comes from aquaculture products. Today Norway is the largest exporter of seafood (in value) in the world.

The fisheries industry is the second largest export industry in the country, which illustrates the importance of this industry in the national economy. In some regions, especially in the north of the country, the fisheries industry is of vital importance for employment and settlement.

Management of marine resources today is a global concern, as the world community in an increasing rate is setting standards for management of the living marine resources and for management of marine environment as a whole.

The CBD will be a driving force at the global level for development of the 'precautionary' and the 'ecosystem approaches' as tools for taking care of the living resources at sea and on land.

Increased fishing in international waters has threatened the regional management regimes that were established after the adoption of the Convention on the Law of the Sea. Norway has made efforts to counteract the consequences of this kind of fisheries.

Our management strategy includes exploitation of sea mammals, like seals and whales. This has lead to strong opposition from a number of international environmental organisations and from many governments. The Norwegian struggle to find understanding for catching sea mammals is not only tied to the need for a balanced exploitation of the resources, but also to the fact that this catching has long traditions along the coast and is an important part of our coastal culture.

Norway therefore by necessity has made a long lasting and costly diplomatic and scientific struggle to defend and prove the justification of the catching of sea mammals.

The struggle has been fruitful, but there are still many nations that are not willing to accept that seals and whales should be object of catch. This has made it necessary to impose strong restrictions on our catching, which has resulted in strong growth of the seal stocks in the Arctic Sea and made it a threat to our fisheries in the north and to the basis of existence of the people in these regions.

The long term strategy is therefore to work actively within the global environment processes, like the CBD, where it is agreed that both conservation and use of the diversity of species should be the basic principle for management of nature resources.

Shafqat Kakakhel, Deputy Executive Director of UNEP, said in his opening address that:

The objectives of the Trondheim Conferences go to the very heart of the current global debate on sustainable development and environmental protection.

The Trondheim Conferences have focused on the multidimensional nature of the implementation of the Convention on Biological Diversity addressing the three closely interlinked objectives of the Convention.

This Conference will provide a forum for the cross-sectoral and multidisciplinary dialogue between scientists and policymakers on research and management issues related to sustainable use of biodiversity. Also, it will contribute to the deliberations in the other international and national fora on issues on the application of the 'ecosystem approach' and sustainable use of biodiversity.

The sound management and wise stewardship of the earth's biosphere and its ecosystems has emerged as one of the most critical concerns of the global community, due to various pressures *inter alia* increasing human population, overexploitation and pollution. Unabated disruptions on ecosystem processes involving changes in both their structure and functioning would have far-reaching consequences for the long-term survival of the human species.

Ecosystem-based management can be defined as a holistic integrated approach to conserving biodiversity, using biological resources in a sustainable way and ensuring the equitable distribution of benefits arising from any such use. Ecosystem-based management will include activities across both land and water, and will cross ownership, political and even international boundaries.

Adopting the 'ecosystem approach' means looking at the functional linkages between target ecosystem and habitats or ecological communities outside in order to define viable management units.

The ecological Society of America's Committee on the Scientific Basis for Ecosystem Management has defined an 'ecosystem approach' as "management driven by explicit goals, executed by policies, protocols and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure and function".

Significant progress has been achieved in the development and promotion of the 'ecosystem approach' by the CBD, especially SBSTTA, *inter alia* the international coral reef initiative, the global taxonomic initiative, the work programmes on alien species, agricultural biodiversity and the Jakarta mandate on marine and coastal biodiversity.

The Malawi principles represent a significant advance towards the operationalisation of the 'ecosystem approach'. They recognise the central role that human beings play in shaping their ecosystems and the complex interlinkages between ecosystems. Hopefully this conference will facilitate an improved understanding of these principles and contribute for the success of the fifth Conference of the Parties (COP5) to be held in Nairobi in May 2000.

Several initiatives have contributed to the promotion of the 'ecosystem approach', e.g. the IUCN Ecosystem Management, the WWF's Global 200 Ecoregions, the WRI's bioregional planning approach and the ecosystem based projects funded by GEF. Special reference is made of the Ecosystem Conservation Group, which has been instrumental in bringing together UNEP, FAO, UNESCO, UNDP, the World Bank, WWF and IUCN to address the objectives of the 'ecosystem approach' at the global level, e.g. large scale ecosystem management (marine and coastal environments) and the Millennium Assessment.

Jeffrey McNeely, The World Conservation Union (IUCN), Gland, Switzerland

Sustainable use is not a new concept. Throughout history, those human groups that have been able to use resources sustainably have survived, while those that have abused their resource systems have either become extinct or have been forced to change their ways of life.

The concept of sustainability should not be limited to the use of products but also to processes. There is a general agreement about the high value of the services that are provided by highly diverse systems. There is no unique 'ecosystem approach'. We need many 'ecosystem approaches' at very different scales.

There are two kinds of harvesters:

1. *Those who harvest for external markets. They can over-harvest and then move on. There is a weak*

feedback between behaviour and productivity of resource base.

2. *Harvesters who live close to resources and depend on a healthy ecosystem. Here there is a strong feedback between behaviour and productivity of resource base.*

Ecosystem-based management at large, bio-regional scales has many advantages:

1. it is comprehensive, useful to all sectors
2. it addresses scale of human impacts
3. it is more cost-effective than single-species approaches
4. the scale is large enough to enable multiple use and ecosystem restoration

But ecosystem-based management has also constraints. Non-sustainable use may be due to:

1. market failures
2. insufficient knowledge about processes at this scale
3. bureaucratic obstacles
4. ultimate causes of overexploitation relate to politics, power (differences among stakeholders), and equity issues where ecology has little to contribute.
5. Lack of trust among stakeholders
6. Legitimate conflicts of interests.

- Ecosystem management is the trendy approach, but 'Noah's way' is still valid because:
- Species are more objectively defined
- Population declines are good indicators of stress
- Species are units of interest to people
- Species play key roles in providing ecosystem services

Mr.Laszlo Miklos Slovakian Minister of Environment

To maintain biodiversity we need to protect the conditions, i.e. the geophysical system, as well as the forms of life on earth. By protecting the conditions we protect also the forms, but protecting just the forms does not ensure the protection of conditions.

We need to define and choose our object for conservation, first, by its importance. In each region there is always some ecosystem which is representative. There is also a need to establish an ecological network.

The characteristic, **representative** ecosystems should be strategic for the network. For each region this implies the most characteristic representative **landscape type**.

Geo-ecosystems with large spatial extent should be considered as representative despite their actual state. Classic nature conservation often prefers ecosystem with small- extent, rare ecosystems. Large scale geo-ecosystem are usually not interesting despite playing a crucial role in bio-production and other ecological functions in the landscape.

Ecological networks need to be put into a spatial system. Otherwise, a list of declared areas is not a real network in the ecological sense. What is needed is the whole space-covering approach.

Agenda 21, Chapter 10 establishes the political basis for an integrated approach. Nevertheless, there has been little real development in this field, partial approaches prevail.

How to proceed in integrated approach issues? We believe in an integrated approach where space is an integrative frame rather than a scene of conflict of interests and a major source of environmental problems.

Hamdallah Zedan, Executive Secretary of the Convention on Biological diversity highlighted the following points in his statement:

The Trondheim Conferences have made an important contribution to the development and implementation of the Convention on Biological Diversity in that they have provided scientists and policy-makers with an independent forum for analysis and dialogue on biodiversity research and management.

Close interaction between science and policy-making has been evident from the outset of the Convention process, where scientists enabled policymakers and negotiators to assess the status of and threats to biodiversity. Now, with the challenge of implementing the provisions of the convention, many countries and organisations need technical and other guidance to fulfil their commitments.

The Trondheim Conferences are a particularly valuable tool for decision making that incorporates sound scientific knowledge and technical advice, since the CBD does not have a body equivalent to the (Intergovernmental Panel on Climate Change) IPPC under the UN Framework Convention on Climate Change.

The thematic areas that will probably form the core of the Convention's activities for the foreseeable future, are marine and coastal -, forest -, agricultural -, inland water - and dryland biodiversity. For each area, the COP has recommended an 'ecosystem approach' to address the three objectives of the Convention. However, generally accepted and measurable criteria for sustainability are still lacking.

The importance of the concept of an 'ecosystem approach' was identified at a very early stage in the convention process and has since been endorsed by the UN General Assembly as the main vehicle for a holistic approach to conservation and sustainable use. The concept is relatively new, and there is a need for an agreed understanding of its guiding principles, meth-

ods, substantial and procedural elements to pave the way for its implementation at all levels.

A number of initiatives have already been undertaken to address this issue, *inter alia* the Malawi workshop in 1998, which drew up twelve principles that could operationalise the 'ecosystem approach'. Later on, SBSTTA has been asked by COP to develop principles and other guidance on the concept, taking into account the results of the Malawi workshop.

This Conference will hopefully facilitate this endeavour and will contribute a solid basis for future policy and management decisions needed to implement the 'ecosystem approach' whereby varying interests of stakeholders can be reconciled. To this end cross- and multi-sectoral dialogue is important.

The concepts of sustainable use and 'ecosystem approach' are also linked to a number of other cross-cutting issues and that complicates their operationalisation. This is a challenge for the scientific community interested in the implementation of the Convention. It is with the view to manage this complexity, that indicators of biological diversity are used for the assessment of ecosystem sustainability, rather than assessing all the ecosystem components individually. SBSTTA will consider indicators of biological diversity at its next meeting.

In her opening statement to the Conference, **Guro Fjellanger**, Norwegian Minister of Environment emphasised:

The inadequacy of our current understanding of the key roles and functions of biodiversity is a serious shortcoming and must be considered to be an underlying cause of biodiversity loss. We must resist the temptation to use this state of relative ignorance as an excuse for postponing action. We know more than enough already to improve the ways in which we manage the biological resources of the planet.

We need to make sure that policymakers use the best and most up-to-date knowledge at hand. We also need to make sure that scientists have a clear picture of the most pressing policy issues. We need to improve the dialogue between the politicians, policy-makers and the scientists. This is one of the basic ideas underlying the Trondheim Conferences.

World wide, our ability -- and tendency -- to exploit our natural resources is expanding, as of course are population and consumption. Even in a small, rich, and fairly straightforward society like Norway, we are losing biodiversity: 103 species of plants and animals have gone extinct in the last 150 years. Almost 300 more are now threatened, and may well disappear over the next five to ten years.

The various economic sectors have their own legitimate objectives and responsibilities in the provision of goods and services to society. They must, however, take the interest of biodiversity into consideration when meeting society's needs.

I would like to emphasise one of the basic ideas in the Biodiversity Convention; that each sector of society should take full responsibility for biodiversity in accordance with the measures at its disposal. Although this obligation is felt mainly at the national level, the same way of thinking should be applied internationally, for example in trade policies. This is certainly a fundamental principle for my government. Productivity and nutrient cycles, and our opportunities to benefit from the passive values associated with biological diversity, must be secured.

National authorities need to establish co-ordinated policies and action. Such co-ordinated action must also be communicated to local authorities, industry and consumers. I would like to stress the need for local understanding and participation. Unless the people most dependent for their living on the use of biodiversity are with us in our endeavour, we will fail.

The obligation under the Convention to prepare national biodiversity action plans should reflect these imperatives. Norway is now in the midst of preparing a second-generation action plan on biodiversity incorporating proposals put forward by eleven different ministries and their constituencies in various sectors. We see it as a tool for co-ordinated policy-making, for identifying – and achieving --priorities at the turn of the Millennium.

SESSION 2

INTRODUCTORY NOTES: ECOSYSTEM APPROACH AND SUSTAINABLE USE

Session Chair: **Peter J. Schei**

Co-chair: **Zipangani Vokhiwa**

Presentation of the "Malawi principles"

Herbert Prins

Wageningen Agricultural University

The Netherlands

"Malawi principles"

1. Management objectives are a matter of societal choice
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognizing potential gains from management there is a need to understand the ecosystem in an economic context. Any ecosystem management should –
 - a) reduce those market distortions that adversely affect biological diversity;
 - b) align incentives to promote sustainable use; and
 - c) internalise costs and benefits in the given ecosystem to the extent feasible.
5. A key feature of the 'ecosystem approach' includes conservation of ecosystem structure and functioning.
6. Ecosystems must be managed within the limits to their functioning
7. The 'ecosystem approach' should be undertaken at the appropriate scale.
8. Recognizing the varying temporal scales and lag effects which characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.
10. The 'ecosystem approach' should seek the appropriate balance between conservation and use of biological diversity.
11. The 'ecosystem approach' should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The 'ecosystem approach' should involve all relevant sectors of society and scientific disciplines.

When developing the Malawi Principles in the spring of 1998 the Government of Malawi and The Netherlands invited a group of people with different background and from different parts of the world to Malawi to par-

ticipate at a CBD-Workshop on the Ecosystem Approach. The group started with the basic text given in the Convention on Biodiversity.

Fundamental requirements for the conservation of ecosystems and natural habitats are:

- 1) The *in-situ* conservation of ecosystems and natural habitats.
- 2) Maintenance and recovery of viable populations of species in their natural surroundings.

The objectives of the Convention are:

- 1) The conservation of biological diversity
- 2) The sustainable use of its components, and
- 3) The fair and equitable sharing of benefits arising out of the use of genetic resources

This fundamental requirement has led to what is now referred to as *the 'ecosystem approach'*.

The 'ecosystem approach' is being developed to meet the requirements and objectives of the Convention. Two important questions are then "But why and how".

Ecosystems are central to the 'ecosystem approach'. Properties of ecosystems are; discontinuities, thresholds, resilience and interconnectedness of which humans are parts. Fundamental to understand the problems and limitations of managing areas is the awareness of that:

- ecosystems are complex,
- there are many non-linear relationships within ecosystems,
- the outcomes of ecosystem processes often show time-lags.

The awareness of these complexities results in ecological reasoning, which is the realization that ecosystems are dynamic, and that they contain elements of surprise and uncertainty for the ecosystem manager. It is thus necessary that management be adaptive. An ecosystem is not a unit of a particular scale (such as habitat, biotope or biome). Ecosystems can be thought to even show a high degree of nestedness. The Convention does not define the scale at which an ecosystem has to be viewed. Hence the problem or question should determine the scale to which the 'ecosystem approach' is applied to.

All over the world there is an increasing conflict over resource use. Many different legal concepts were developed for the regulated use of land or sea beyond the individual small-sized plot. Some countries recognize tribal lands; other countries have abolished communal lands, other countries again did away with private ownership. Scarcity is at the root of the variety in legal or traditional judicial systems and rules about resource use. Linked to this are the questions of:

- Who has the rights to make use of these scarce resources?

- At which level of social organization can or should decisions be made?

Rules and regulations concerning use or non-use of scarce resources are thus only rarely the concern of national governments only. The Convention on Biological Diversity, though, is a treaty between national governments. Yet, use and dependency is nearly always at levels much closer to the land, or the ecosystem.

Points from questions and comments.

- There is a need for a tightening of the definition of the 'ecosystem approach' based on the twelve Malawi principles.

Ecosystem approach from principles to practice

Edward Maltby

IUCN Commission on Ecosystem Management
Royal Holloway Institute of Environmental Research,
London, UK.

The 'ecosystem approach' is not a static model but is a process for integrating and delivering in a balanced way the three key objects of the Convention on Biological Diversity: conservation and sustainable use of biodiversity and equitable sharing of the benefits.

The 'ecosystem approach' is not a substitution for the traditional approach to conservation such as emphasis on single species, rarities or protected areas which remain essential parts of the delivery mechanism for biodiversity conservation. The need for a wider approach arises at least in part because of the deficiencies of 'classical' approaches to adequately conserve biodiversity and natural resources as evidenced by the unprecedented rate of species extinction and increasing conflict over natural resource use. Such historic limitations include failure to recognise the importance of ecosystem functioning in providing important goods and services for people as well as wildlife, involving multiple sectoral interests and stakeholder participation in management, inappropriate division of costs and benefits resulting from ecosystems and the inadequate links between nature and culture.

Recently considerable effort has been directed at clarifying the meaning of 'ecosystem approach' and defining the underlying principles or elements that should guide its *modus operandi*.

Some of these elements, when defined broadly meet general approval e.g. inter alia.

- *There is no single or unique 'ecosystem approach'.*
- *The final goals of the approaches acknowledge human participation and interests.*
- *Emphasis is on maintaining the interactions within and functioning of natural systems.*
- *The approach may be applied over a wide range of scales*

How to implement 'ecosystem approaches' practically reveals a lack of consensus over what the approach does and does not entail, and when it can and cannot be used. Yet most agree that 'ecosystem approaches' are already being implemented on the ground in many cases, although they are not described as such. A number of key but contextually limited actions (The Malawi, Vilm and Perth workshops) have been important efforts to build on and give awareness of the meaning of the 'ecosystem approach' especially at a technical level.

An important next step to further clarification and agreement of the use of an 'ecosystem approach' is to identify cases where it is already being implemented on the ground. From an analysis of the successes and failures of these cases, it should be possible to identify the value and scope of an 'ecosystem approach' in implementing the Convention's objectives. A considerable number of such 'case studies' have been compiled already, and some analysis of these has been prepared, but these are by no means regionally or nationally comprehensive.

It is necessary for as many countries as possible to provide what experience they have in implementing what they perceive as adopting an 'ecosystem approach' and to give their views on how applicable they are and what constraints operate in their context. We need to make sure an analysis of these experiences is shared with other parties of the Convention, and can lead to better guidance on when and how to use an 'ecosystem approach' under the Convention.

Already some of the lessons learnt include the importance in many instances of a non-prescriptive approach and new non-statutory organisations for effective implementation on the ground; a close working relationship with local people, guidance and support measures based on demonstration of practical, simple techniques at the appropriate scale. The potential economic benefits to individuals from better ecosystem management are important incentives for applying methods which will also maintain or restore biodiversity. The Tamar 2000 project in the UK aimed at environmental restoration and sustainable management practices over an entire river catchment exemplifies these experiences.

In order to effect implementation of the 'ecosystem approach' we need:

At the management level: Involvement of many actors to ensure (i) Integrating scientists into decision making, (ii) linking ecosystem functions to socio-economics and (iii) cross-sectoral institutional integration or new institutional mechanisms.

At the science level: a better understanding of structure, function and processes, as well as temporal and spatial dynamics, and the effects of different management scenarios and natural change of ecosystems.

At the social level we need to evaluate the alternative means for redistributing costs and benefits particularly in relation to externalities such as subsidies; new environmental incentives and non-regulatory as well as regulatory mechanisms.

There is a new way of thinking about biodiversity conservation and management which is encapsulated in the CBD. The 'ecosystem approach' is vital for meeting this new challenge. Thinking and approaches to solution still need to be advanced at three levels: conceptual and technical (especially application); regional and national guidance; constraints on implementation. There are key roles for the CBD Secretariat, the contracting parties and the scientific community and technical networks in meeting this new agenda. It represents an emerging new paradigm for biodiversity conservation and management.

Points from questions and comments:

- Difficulty of optimising the interests of all stakeholders and the need to find a balance between achieving the Malawi principles within existing realities.
- The importance of inter-agency communication and interaction is paramount as well as the possibility of new independent organisations to coordinate 'ecosystem approach' activities.

It is important to remind ourselves that all the problems are here to be solved, there is no other idea than the 'ecosystem approach' that is trying to integrate the key objectives of the CBD.

Sustainable use: fiction or future challenge?

Bror Jonsson

Norwegian Institute for Nature Research (NINA)
Oslo, Norway.

The guiding "Malawi-principles" are far from enough to secure sustainable use of biodiversity in a complex, modern society. This is both because of (1) the way nature management is administered and carried out and (2) the users themselves.

Management decisions are only partly based on ecological points of view. Other professional, as well as practical, cultural, economical, juridical and political regards must also be taken. Nature conservation is seldom given priority in matters concerning biodiversity use. Unsustainable use may result from time constraints (decisions are often taken before satisfactory ecological knowledge can be gathered), or a conservative management system (decisions are based on historical use, legal rights, short term profit, and the management rules and regulations may be based on ecologically antiquated or inadequate knowledge). Also, the ecological advice given by the scientists may be vague or prove wrong, or the case may be politically controversial and/or professionally disputable making

management decisions even harder. At present, there is a tendency towards decentralized management decisions to the lowest appropriate level. This may improve the local acceptance of the decisions made, but is no guarantee for sustainable use.

The pressure on natural resources increases steadily. As human beings we are selfish, try to secure our welfare and increase our personal status and wealth through increased resource use. The human population size is growing with some 95 million people each year, and the increase will stay high for several years to come. Thus, there is reason to ask if it ever will be possible to obtain a balanced, long-term use of natural resources.

Economically, it is not always the most profitable alternative to use biodiversity sustainably. Over-exploitation and investment of the revenue in other business is sometimes more profitable. Moreover, (1) the resources may be common and others may harvest the resource if you refrain from doing it (the tragedy of the commons), (2) you may need the resource now and cannot afford to make the exploitation sustainable, (3) you do not want to obey any regulation whatever the management decision is.

The resource use can be improved by:

1. limiting the access to commonly owned resources and obliged co-operation among the users,
2. increased flexibility through adaptive management,
3. multi-sectorial, strategic planning and inclusion of ecological thinking in the various use sectors (integrated management),
4. managing the systems at a large enough scale to balance the needs of the biological communities, and
5. increasing the ecological capacity and level of competence.

Points from questions and comments:

- What advice should we give to our policy makers regarding management level? Transfer of responsibilities to local communities is difficult and especially when it comes to priorities of sustainable use of biodiversity. There should be economical follow up of the responsibilities.
- Predictions do not materialize, richer are becoming richer and the poorer becoming poorer. The population is growing and this will lead to overuse of biodiversity, it is therefore important to stabilize the consumption at some level.

Biodiversity and ecosystem functioning **Harold Mooney**

There is general agreement about the potential value of the 'ecosystem approach' as embodied in the Malawi principle context. Our problem is how to execute these principles within the constraints of both our lim-

ited knowledge of how the biophysical components of ecosystems operate, now as well as in the future, as well as how to utilize institutional structures to execute these principles even though they were designed along sectorial rather than ecosystem lines.

There are many case studies that show the value of a broader 'ecosystem approach' to management than we have utilized in the past. For example, sometimes conservation measures for a particular species can be in conflict with the conservation of other species or habitats. Good practices in one region for a given species may have adverse effects on this species and their habitats in other parts of their range.

Understanding ecosystems, their structure, processes and functioning is difficult. Eventually we will have the knowledge to manage ecosystems from first principles. Until that time we need to utilize what information we have on ecosystem functioning in an adaptive management mode and use management manipulations as experiments with controls in order to maximize our successes.

We are learning about the role of biodiversity on ecosystem functioning. Studies on the changes in ecosystem functioning resulting from adding and subtracting species have shown that species characteristics are important for many functional aspects of an ecosystem. These include productivity, resilience, as well as resistance to pests and invasive species. Studies have demonstrated the need for the utilization of the precautionary principle in modifying ecosystems since we do not yet have capacity to identify keystone species *a priori*. Such species can be abundant or rare, large or small but yet have a major controlling role in ecosystem functioning.

Our job of understanding the biodiversity/functioning relationships of any given ecosystem is going to become increasingly difficult as the nature of these systems is altered due to changing land use patterns, climate change, nitrogen deposition and the intrusion of invasive alien species. To deal with these issues we not only need to improve our scientific understanding but we need to utilize the Malawi principles and engage the many constituencies that have to be involved in developing new tools and approaches for solving these complex issues. For example in order to understand and deal with the invasive species problems we need to engage scientists, managers, lawyers, sociologists, and many sectors of commerce.

Points from questions and comments:

- In agriculture in many parts of the world there is a growing awareness about the need to understand ecosystem functions for food productions and use ecosystem functions to produce food, *inter alia* rice.

- In some cases protection of species is regulated by legislation. To achieve the goal of 'ecosystem approach', such legislation must be more flexible, but not so flexible that misuse is the result
- A strong emphasis on 'ecosystem approaches' does not mean that the focus on gaining knowledge on species alone should be stopped.

SESSION 3

DE-CENTRALISATION OF RESOURCE MANAGEMENT

Session Chair: **Inger Stoll**

Local community control: conflicts and solutions

Madhav Gadgil

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The Global Environment Facility (GEF) serves as the financial mechanism for CBD.

Until now the majority of the GEF supported programs have focused on conservation of biodiversity through protected areas. It is currently exploring ways to broaden this approach to include sustainable use.

The aims of the CBD are more complex than those of other international conventions, e. g. The Convention of Climate Change: 1) Because it involves all ranges of scales and complexity. 2) It is not clear what sustainable use of biodiversity is.

The decisions about spatial and temporal boundaries of what should be sustained, the forms of biological production and the nature of biological diversity are all subjective decisions. Socially, it is desirable that they are broad-based. In particular, individual stakeholders may have very different perspectives.

Surprises in the behaviour of natural ecosystems are inevitable; and management systems must be designed to adjust to the unexpected, rather than act on the basis of a spurious belief on certainties. Long-term and large scale plans of intervention are inappropriate.

This calls for flexibility. Flexibility will be ensured through management systems based on small communities, and through an adaptive management process, i. e. learning about the biophysical system and the behaviour of human agents while using the system. Stakeholder involvement should be directed towards deciding on management goals, visualizing alternative management strategies, understanding system behaviour on the basis of historical observations, on the spot monitoring, and stewardship.

Exploring new paths calls for new institutions and for new capacities. This is a major task both at national and global level.

There is a need of new capacities in: adaptive management, monitoring techniques, information management, and participatory management.

It is suggested that GEF portfolio in the area of sustainable use of biodiversity may then focus on building of capacity to undertake such adaptive management of

natural resources; instead of promoting large scale programmes planned in detail by centralized bureaucracies.

Points from questions and comments:

- Usually the GEF-supported National Biodiversity Strategies and Action Plans are under the mandate of the Environment Department whereas forest policies come from Forestry Departments. This often implies high risks of jeopardizing the guidelines of the Strategy Plan in forests.
- It is very important to focus on incorporating current knowledge into monitoring techniques. We know extremely little about how to monitor the consequences of management and human use.
- We need to specify the term 'stakeholder'. Not everybody is equally involved, some closer others more distant.
- We need the participation of villages in monitoring. Governments should respond by giving appropriate support and donor agencies should support projects to build capacity at the community level.

The challenges of community-based management of biodiversity

Vivienne Solís Rivera

IUCN- Mesoamérica

From our experience in the region, the following Malawi principles should read slightly differently:

Ecosystem management must recognize that change is inevitable. We believe that ecosystem management needs to recognize the heterogeneity of social and cultural factors affecting natural resource use.

The 'ecosystem approach' should consider all forms of relevant information, including scientific, indigenous and local knowledge, innovations and practices. Local communities and ethnic groups are not necessarily asking for discussions on traditional knowledge as oriented towards intellectual property rights only.

The 'ecosystem approach' should involve all relevant sectors of society. The 'ecosystem approach' should promote the strengthening of democracy. Democratic systems are indispensable for successful biodiversity management.

Two examples provide an opportunity for following up on practical applications of the 'ecosystem approach' discussion:

The Mesoamerican Biological Corridor. In this initiative, conservation, financial, political and technical interests have been concentrated in an area where more than 46 different ethnic groups live and make use of natural resources.

The diverse biological nature of the corridor including altered and non-altered ecosystems, coastal and marine areas and human settlements will require different degrees of change. Appropriate management strategies will thus need to be developed. If this is not seriously taken into consideration, the success of this important initiative will be jeopardized, irrespective of the amount of money invested or political priority given to the effort.

The Costa Rican biodiversity law experience

The law names an inter-ministerial body, the National Commission for Biodiversity Management, (CONAGEBIO), for proposing national policies on biodiversity access to genetic and biochemical resources with a wide participation of all sectors involved.

The state recognises and explicitly protects community intellectual rights, knowledge, practices and innovations of indigenous peoples and local communities, related to the use of biodiversity components and associated knowledge. The recognition implies that none of the forms of protection of the intellectual and industrial rights regulated in this section, special laws and international law will affect such historical practices

Various lessons have been learned:

- The regulation of activities, which are already underway and un-regulated, faces strong political and economic opposition.
- Information available to the population in general public on biodiversity and its broad economic, ethical, and social benefits is very limited.
- There is still a need for the state to share decision-making with other sectors of civil society, especially farmer and indigenous sectors

We consider the 'ecosystem approach' to be a tool that would support a more integrated way to approach conservation, rather than gloss over the complexity and comprehensiveness of biodiversity.

Conservation of forests, in-land waters, agriculture, biological diversity, wildlife or marine-coastal zone conservation is not a problem that concerns our communities. Their problem is survival. The challenge is clear and strong: Can we distribute the benefits of the use of natural resources in an equitable and just way?

Points from questions and comments:

- The process of decentralization implies the transfer of a mandate from the central administration to a new level of administration. But still, it is the central government that is the ultimate responsible for the implementation of CBD.
- Decentralization is a very long-term process. It does imply capacity building and it means to incorporate new sectors. Policymaking should include participation of communities.

- The concept of biodiversity calls for a very broad perspective, not only about the biological resources *per se* but also about the knowledge surrounding these resources.

Institutional requirements for community based management of land resources: Case of Tanzania

Mary C.R. Shetto

Southern Highlands Extension and Rural Financial Services Project, Tanzania

Community-based Management of Land Resources (CBMLR) is defined as an approach where the needs and interests of the community are considered in the management of individually or communally owned resources. Community members must be involved in the identification of problems and possible solutions. In most developing countries like Tanzania, local communities largely depend on natural resources as agriculture and forestry dominate their economies. The fact that biodiversity is diminishing has far-reaching consequences on the livelihood of local communities.

Human pressures leads to environmental degradation and desertification in Tanzania's dryland ecosystems. Past conservation efforts has focused mostly on soil and water, ignoring social issues of food security and gender discrimination.

In Tanzania, organised efforts in people's participation in natural resources management has gone through four major stages:

- Prior to the colonial period: Traditional groupings (chiefdoms and clans) managed land, water and forest resources
- In the colonial period: Traditional local institutions were replaced by new institutions reporting to the national colonial authority
- After the Arusha Declaration: The policy of collective production at village level was initiated and brought about institutions such as cooperatives and village governments
- Current situation: Farmer's groups have been formed under the liberalised economy, but they are still very weak in LRM

A new land policy and law was enacted in 1998 and three categories of land were recognised:

- Village land
- General land
- Reserved land

The stakeholders of land resources in Tanzania are:

- Rural households
- Village communities
- Urban dwellers and commercial sector
- Government and public institutions
- International community

The land resources accessible to the stakeholders are sandwiched between the land required for reserves and land used for commercial purposes. These are the major constraints facing rural communities in LRM:

- Limited influence in policy-making
- Unfavourable location in marginal areas
- Conflicts over resource use
- Limited resources
- Gender imbalance in the control of land resources
- Population growth and urban migration
- Poor access to knowledge and technologies

The presence of multiple stakeholders to land and the socio-economic changes brought about by economic and political liberalisation, create conflicts. The types or causes of conflicts that have arisen in LRM include:

- Household/individual vs. other households/individuals
- Household/individual vs. the village community
- Women vs. men
- Poor people vs. local elite
- Crop cultivators vs. livestock keepers
- Unequal application of rules (favouritism)
- Unfair distribution of benefits from commons
- Unfair representation on village committees
- Local demands vs. outside demands
- Livelihood requirements vs. resource conservation

Institutions capable of harmonising the needs of the different stakeholders as well as mitigating the constraints facing the local communities are necessary for effective CBMLR. Both national, district and village level institutions are needed.

From the above, we may conclude that CBMLR in Tanzania is complicated because of the number of stakeholders involved. In addition, the stress on land resources makes CBMLR difficult. These problems require a mechanism for national policy formulation integrating and harmonising the interests of different stakeholders. Further, transparent implementation of such policies is necessary to avoid conflicts that hinder community participation in LRM. Authorities at district level should be transformed so that they are fully accountable to local communities. At village level, to effectively meet the needs and exploit fully the capabilities of communities, there must be effective local institutions linked both horizontally and vertically. Formation of strong farmers' groups is essential. Furthermore, support from governments and NGOs is required.

Points from questions and comments:

- The need of diversity of "communities" at the same level where pointed out.
- Tenure is a key community need along with sources of alternative livelihoods, clear economic and fair markets.

Decentralization of resource management in fisheries

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Chr. Michelsen Institute, Bergen, Norway, and Fisheries Centre, University of British Columbia, Vancouver, Canada

This paper develops a simple model that allows us to investigate the consequences of market-based decentralization of fisheries management on the three objectives of the CBD, namely, conservation, sustainable use, and sharing of benefits.

For clarity of the presentation and computational ease, it is assumed that there are two agents in the model who are under the control of a body, such as the government of a country, or an international organization.

Present value of economic rent, standing biomass and harvest were assessed through modelling of fishing activities.

One centralized model and one decentralized model with two different scenarios are presented:

Centralized model: The authority actively regulates the fishery by fixing quotas and distributing this to the participants, with a view to balancing the to maximize the private benefits to participants in the fishery with society-wide concerns such as bio-diversity.

Cooperative scenario: Authority to manage fishery devolved to users and users work together with the objective of maximizing their joint private long-term economic benefits.

Non-cooperative scenario: Authority to manage fishery devolved to users and they end up using the resource in a unilateral manner.

We take Namibian hake as an example. We look at the total net present value of rent (NPV), standing biomass (the indicator of biodiversity in the model) and harvest for the centralized (the Ministry of Fisheries and Marine Resources regulates the action of the trawlers) the decentralized cooperative and the decentralized non-cooperative. The centralized model had the lowest NPV and the lowest harvest. Of the three models the standing biomass was highest for the centralized model. Compared to the cooperative decentralized model, harvest was higher and standing biomass was lower in the non-cooperative model. But the cooperative model had the highest NPV of the three models, an indication of the economic waste resulting from non cooperative behaviour.

The modelling framework we develop can be used to determine the possible outcomes under different institutional assumptions. The approach can help us to examine the trade-offs between biodiversity conservation, and economic and social considerations. Ques-

tions that can be addressed include, is it possible to strike the right balance between conservation and the use of fishery resources when management is decentralized? If not, would a properly implemented regulatory measure help improve the outcome?

Two conclusions can be drawn from the results of this paper. First decentralization will not automatically result in sustainable use of biodiversity. Chances for achieving sustainable use are greater if participants cooperate. But even in this case, society-wide concerns such as biodiversity may not be adequately taken into account. Second, to decentralize fisheries in a desirable manner, efforts must be put into facilitating cooperation by the participants. In addition, decentralization needs to be cast in a framework, which takes into account broader society-wide concerns.

SESSION 4 MANAGEMENT IN DYNAMIC ENVIRONMENTS

Session Chair: **Odd Terje Sandlund**

Bioregional management

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Experience already demonstrates that Parties can take steps to deliver the benefits of ecosystems to people in practical ways. While there remain many almost overwhelming unknowns and uncertainties to the science of ecosystems, on-going efforts around the world already provide sufficient and transferable guidance on how governments, communities, NGOs and civil society can design and take action.

Four fundamental schools or types of experience are under way around the world: bioregionalism, biosphere reserves, integrated conservation and development projects, and most recently, ecosystem management. Close examination of these efforts suggests that their goals and methods are converging. Given the longer time period of experience and the people-oriented basis of the approach, we will employ the terminology of the so-called bioregional approach.

The purpose of the bioregional approach is to ensure the delivery of ecosystem services to people while protecting the full diversity of life. The approach is applied at the 'bioregional' scale, defined as a land or water territory whose limits are defined by the geographical limits of human communities and ecological systems; it is large enough to maintain the integrity of the regions biological communities, habitats and ecosystems; yet it is small enough for local residents to consider it 'home'; that is, it is a unit of planning and management defined by natural and social criteria.

Within a bioregion we find a mosaic of land and water uses, including farms, forests, fisheries, villages and infrastructure. Areas that are critical for the provision of ecosystem services are provided special protection and management, often under one of the IUCN Categories, or through private and cooperative arrangements with land owners or communities.

From our analysis of on going field experiences we can note the characteristics of these programs. In brief, leadership can come from governmental or non-governmental people, but it is critical that the approach be essentially 'bottom-up' to develop full stakeholder engagement. All sectors found within the bioregion must be involved and part of the process. Critical ecosystems are identified and provided appropriate management regimes. Full information about the re-

sources, social, economic and political characteristics of the bioregion must be made available to all stakeholders equally.

Given the growing limitations of government funds and professional personnel, it appears vital that alliances be established to mobilize the talents and expertise found in communities, local universities, NGOs and indigenous groups. Where ecosystems of interest cross international boundaries, institutional mechanisms can be established to ensure international cooperation (Article 5). And finally, replacing older models of 'master planning' and full scientific analysis and inventory prior to field action, the approach advocates 'learning by doing.' Modern adaptive management principles enable stakeholders to act as managers and quickly gain experience and take timely corrective measures.

Growing emphasis is being places on providing 'connectivity' through corridors of landscape from region to region, protected area to protected area, etc. These connections seek to recognize the migration and dispersal pathways for fauna and flora, the flow of services from rural to urban areas, the routes of catastrophic events, among others.

Where problems of biodiversity management transcend the geographic scale of individual bioregions, for example with wide ranging migratory wildlife or stream flow from large watersheds, then additional institutional arrangements can be established to promote cooperation at these wider scales.

The bioregional approach also provides a context and mechanisms within which parties can promote synergies among their programs to address the Rio accords on biodiversity, climate and land degradation. Namely, investments in any one commitment can feature pay-offs in the other two. The example of organic agriculture is particularly illustrative: improvements in the organic content of soils increase food security, soil biota, water holding capacity; they reduce erosion and run off, and capture and hold carbon.

So, what can Parties do? They can take immediate steps to implement the bioregional approach in selected areas of their countries by:

1. creating an enabling environment that encourages local levels of government and communities to take responsibility, make investments in biodiversity, and formulate and implement appropriate policies, taxes, tenurial rights, etc.;
2. defining units of management that are meaningful for action and stewardship (bioregions);
3. ensuring that all stakeholders have full information;

4. establishing processes of negotiation, visioning, goals and means, funds and foundations, etc.; and,
5. establishing partnerships with local government, indigenous and rural communities, and NGOs.

Thus, we suggest that the bioregional approach can help Parties to promote practical ways to deliver benefits to people drawing upon existing experience and know-how.

Adaptive management: The only tool for decentralized systems

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Adaptive management recognizes the inevitability of management interventions in higher order systems characterized by inherent uncertainties and, accordingly, requires each act of management to be structured as an experiment.

Adaptive management requires:

- A statement of provisional objectives for the system to be managed
- A hypothesis about the workings of the system
- A tentative plan for management interventions
- A monitoring program to collect data on relevant variables, and
- A feedback system which permits the management activities, or the hypothesis, or the objectives to be modified in light of the information from the monitoring

Adaptive management is simultaneously a research method and a management approach – 'learning by doing'. Whilst it is frequently considered as having a narrow application to managing ecological systems, adaptive management can, in fact, encompass far more than this by the inclusion of economic, social and policy dimensions. Indeed, all sustainable development issues need to be viewed in a hierarchy of nested adaptive management systems. Research questions pertaining to large systems, which cannot be answered by reductionistic scientific methods, may, perhaps, be tackled by adaptive management.

Passive adaptive management is characterized by the collection of data in an unchanging management regime.

Active adaptive management is a deliberate manipulation of any system with the objective of understanding its response to a wide range of perturbations. A given example shows that by varying the fishing effort over a wide range it may be possible to estimate where the maximum sustained yield lies.

Although adaptive management has been around for some thirty years, it has not been adopted widely either as a research or a management technique. The "blueprint" approach still dominates mainstream scientific methodologies despite its limitations. A key differ-

ence between adaptive management and the classic "blueprint" approach is that the latter requires considerable study in advance of any management whereas adaptive management allows the immediate inception of any project. And this implies no superiority for the approach, which demands a large amount of initial study. Such study may well be a waste of time because the response of the system under, for example, a harvesting regime may be impossible to predict without actually carrying out some harvesting.

Blueprint characteristics

The blueprint approach differs from adaptive management in the following ways:

1. There is a reluctance to re-examine objectives once they have been established
2. It is assumed that if sufficient expert effort is put into understanding the workings of the system there is no need to develop a hypothesis about the system and it is possible to design a set of correct management activities
3. Monitoring is aimed more at checking that the activities have been carried out – rather than establishing whether they are achieving the objectives
4. As a result the method is vulnerable to any significant changes in the input parameters

Applications of adaptive management

Malawi principle 2: Management should be decentralized to the lowest appropriate level.

Rights of access to resources and responsibilities for their management are the most important factors affecting sustainability. Use is most likely to be sustainable where the prime beneficiaries are the people living with and using the resource. This principle has been used when setting the quotas for international sport hunting in communal lands in Zimbabwe. For example, the quotas for sable, eland and zebra require an expanded institutional framework whereby representatives from all the villages within a ward meet to decide on the quota. At a higher level, quotas for wider-ranging animals need to be decided at district level. A set of cascaded institutions is needed, and the important point is that there is no need for any institution to be larger than the size of the problem it has to deal with.

Malawi principle 5: Conservation of ecosystem structure and functioning.

Sustainable use must be addressed at the ecosystem level since it is the maintenance of key ecosystem process and functions which ultimately determine sustainability. The most complex and desirable ecosystems that we wish to conserve are markedly unstable (non-constant), and achieving our conservation goals depends on their remaining that way. It is the continued instability of these systems which allows for co-existence of their many species. Adams (1996) makes the observation that "Conservation is about handling change, and about the transition from past to

future". It is this essential aspect of change that characterizes adaptive management and makes it so important to adopt as both a research and a management tool. The CBD has avoided pitfalls of various "blueprint" treaties through its Articles which provide flexibility towards conservation and are ideally suited to adaptive management.

Points from questions and comments:

- How is quality assurance obtained at the local level?
- How to deal with commercial utilization at the local level that does not take environmental considerations into account, e.g. meat production versus wildlife conservation
- Management decisions are taken continuously, often without having the full scientific knowledge. It is a challenge for the scientific community to supply managers with the best available information.

Within Fisheries Management Plans in the Maritimes Region of Atlantic Canada

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The Canadian Oceans Act entails new obligations for oceans management. Fisheries must be managed within the broader context of integrated ocean management, taking into consideration multiple uses, ecosystem features and the precautionary approach. It is a challenge to address different sectoral priorities such as marine transport, oil and gas, aquaculture, commercial fishing and eco-tourism. The use of The terminology "incorporating ecosystem objectives within management plans" rather than "ecosystem management", is recommended.

Decision-making framework needs to accommodate conflicting objectives within the fishing sector and amongst the aggregate ocean use sectors, but socio-economic objectives for the present situation in fisheries management are not considered further.

Fisheries are managed on the single-species basis throughout Canada. In addition to the single-species conservation objectives, there are some *ad hoc* ecosystem considerations in management plans and associated activities, which shows the need to include ecosystem considerations. But are these *ad hoc* ecosystem considerations sufficient to meet the legislated obligations? If not sufficient, how can they be supplemented to achieve some more explicitly stated ecosystem objectives? Improvements building upon the existing management system, but in a pro-active manner to ensure change recommended.

Could single-species fisheries management achieve ecosystem objectives? The answer is NO for a number of reasons:

- Genetic diversity of target species at risk
- By-catch species at risk
- Dependant species at risk
- Increase in scavengers may replace some species at risk

The problem of geographical boundaries for the evaluation of ecosystem objectives.

- Boundaries of marine ecosystems difficult to define
- Relevant oceanographic and biological features large in geographic area and species specific
- Ocean management areas for evaluation of ecosystem objectives defined at smaller scales within national, provincial, regional and municipal boundaries

Ecosystem objectives for ocean management areas will include

- Maintenance of biodiversity
- Maintenance of habitat productivity

In an example, three Ocean Management Areas (OMA) in the Maritime area of Atlantic Canada were proposed based on administrative and community boundaries, while recognizing that specific trans-boundary environmental issues would require decision-making at higher levels. The need to define ecosystem objectives such as maintaining biodiversity and habitat productivity, along with relevant performance measures, reference points and management tools, was discussed.

The governance challenge to achieving ecosystem objectives:

Each of the defined performance measures for ecosystem structure and function require monitoring. RAP (Regional Advisory Process) reviews of OMAs will be needed. The evaluations will also need to consider impacts of non-fishing industrial activities.

New institutional structures that involve municipalities, provincial departments and provinces, other federal departments, First Nations, NGOs as well as representatives of the relevant commercial interests need to be developed in a cost effective manner. The principle functions that need to be achieved are the audit of the degree to which the sectoral management plans are being implemented in relation to the overarching conservation objectives, as well as the capacity to resolve conflicts amongst competing users.

Points from questions and comments:

- It was pointed out that CBD Article 5 requires parties to cooperate on areas beyond national jurisdiction and other matters of mutual interest.

- Pragmatic social definition of boundaries allows for local political mobilization and empowerment.
- It was asked about possible governance measures to address trans-boundary resource conflicts and how the CBD could address such disputes.

Understanding ecosystem condition to maintain productivity and conservation

Ian Cresswell

Australian National Land and Water Resources Audit

Several Australian-based efforts are currently underway to provide a better understanding of vegetation and broader ecosystem condition to inform management at a landscape scale. The focus of the National Land and Water Resources Audit is to place the status and trend of our natural resources in the context of current management response and generate options for remedial action, development and protection – recognising that natural resource management includes biophysical, social and economic components.

Sustainable use and conservation of Australia's biodiversity cannot be effectively pursued without such a framework, and data concerning vegetation and ecosystem status and condition are critical components of this baseline.

Key to the success of this work is to integrate this information with a broad range of natural resource data, and to provide useful tools for management and policy decision-making.

Gaining an understanding of the condition of any particular system is a key requirement for measuring and monitoring the system's response to the prevailing land-use.

Provision of data and analysis on the status and trends in natural resource condition is mostly carried out on a sectoral basis according to the management and legislative responsibilities of individual agencies in each sub-national jurisdiction. There is generally a lack of coordination, and data describing all aspects of the landscape are fragmented and distributed among agencies.

Current understanding of natural processes and environments is still developing, with much research still needed. It would be neither possible nor desirable to collect all known information on all systems, instead what is required is to collect both base information on the status of our systems as well as information on the major drivers of change.

There is little agreement on criteria and/or attributes for defining ecosystem condition. Underlying all previous attempts there is a desire to measure in some way the change in ecosystem function and/or composition from a perceived desired state. Each measure of ecosystem

condition has been designed to provide a clear indication of change away from a perceived optimal or desired state.

The work ahead is to gain agreement on a core set of attributes, the scale at which they should be measured, and the detailed methods for measuring them.

More generally condition must be recognised as a value judgement, and an estimate of change away from a desired state. In order to define and then assess condition those processes that force change within the system must be known, and some way of measuring them must be available. In providing such assessments it is important to acknowledge that there has never been any one time when ecosystems have been in status, i.e. change is a continuous process, and all change has both ecological and social dimensions.

Points from questions and comments:

- It is important to recognize that condition statements reflect particular values that are being investigated. Therefore the definition of condition must reflect these values.
- Not only are there differences in condition assessments based on the landuse, but also from a cultural perspective. It is equally important to recognize alternative viewpoints and an indigenous peoples understanding of condition, especially from a viewpoint of biodiversity maintenance.
- While the species and genetic components of biodiversity have agreed standards and protocols for exchange of data and information, the same does not exist for ecosystems, and agreement on classification is needed for implementing the 'ecosystem approach'.
- Assessment of ecosystem condition (health, vitality, integrity) are value judgement providing a measure of change from a desired optimal state depending on the purpose of the assessments.
- Provision of clear purpose-driven condition assessments for both sustainable use and conservation requires agreed attributes/indicators suitable for the stated purpose.

SESSION 5 THE SOCIO-ECONOMY OF SUSTAINABLE RESOURCE USE

Session Chair: **Monika Hammer**

Sustainable Development and Environmental Change

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Development implies a process of evolutionary change which has all the usual dynamical properties of complex systems: path dependence, sensitivity to initial conditions, non-linearities and discontinuous change around threshold values for both environmental resources and ecological functions. For any economy-environment system there are many possible states (equilibria) and many development paths associated with those states.

It has been argued that if we are concerned with the environmental sustainability of economic development, the appropriate measure of environmental quality is one that relates emissions or depletion to the assimilative or carrying capacity of the environment. This reflects the notion that the sustainability of activities that stress ecological systems depends on the resilience of those systems. Stress is generally measured by the level of demand on the carrying or assimilative capacities of the system. An increase in stress makes the system more susceptible to exogenous shocks or changes in environmental conditions.

One measure of resilience is the magnitude of disturbance that can be absorbed before a system flips from one state to another. It is an index of the capacity of a system to retain productivity following disturbance. For example, in ecology and ecotoxicology assimilative capacity refers either to an ecosystem's ability to return to the original equilibrium following some pollution event, or the capacity of an ecosystem to absorb pollution without degrading some notion of biological integrity.

Sustainability is about protecting the resilience of the system in desirable states. Resilience often depends on the mix of species – the biodiversity – of the supporting environment. A policy for biodiversity conservation should include a supporting structure of incentives and disincentives to induce the desired response. Such a policy should bring the private and social cost of biological resources into line, and it should give resource users the means to respond to the social cost of resource use in a way that is consistent with social interests.

While there is a need for better data and better models of the behaviour of ecosystems, it is also possible to get much more out of existing data. In fact, eco-

nomics data can often tell us much about performance of ecosystems.

Points from questions and comments:

- examples of economic data and traditional knowledge can provide long-term data useful for analysing ecosystems
- the scale of property rights (e.g. individual vs. collective) needs to be appropriate for the problem, but we must be aware that private property can be a solution or a problem to environmental issues

Wildland biodiversity and ecosystem development as the primary tool for their survival: the Area de Conservacion Guanacaste, Costa Rica, pilot project.

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Non-damaging socio-economic development of the biodiversity and ecosystems of a large conserved tropical wildland is probably the only viable way to insure its survival into perpetuity.

Therefore I focus on:

biodiversity - if we do not use it, we lose it!

Further, biodiversity development is based on the integration of:

- save it - traditionally conservation approach
- know it - academic approach (the classical biologist)
- use it - the commercial part

After protection measures have been adopted and the knowledge base has been established you have options for commercial use of biodiversity, either directly (non-damaging harvesting) or indirectly (e.g. bird watching)

A 'gardenification' of nature implies that humans take care of and utilize natural ecosystems for products and services. A gardenification of wildland nature will:

- Produce products: their harvest and use must be managed and understood
- Grow wild species: biodiversity services and ecosystems services

This means:

i) multicropping, ii) multitasking, iii) multiuse

Key tools for wildlife gardening come in two groups, the former being easy for biologists and the latter very difficult:

Easy: i) taxonomy, ii) natural history, iii) ecology, iv) evolutionary biology, v) biotechnology, vi) computerization

Difficult: i) legislation, ii) zoning, iii) marketing, iv) decentralisation, v) democratisation, vi) humanity

The Area de Conservación Guanacaste (ACG) in northwestern Costa Rica, is 15 years of pilot project based on this philosophy. It has meant evolving from a blind-protectionist and central-government national park model to a user-friendly, self-sustaining, and decentralized wildland management process.

This process is oriented to 'survival-through-use' and 'management-through-knowledge' of the ACG as an integrated whole rather than as a collection of projects, historical agendas, and regulations developed for other places at other times.

Tropical wildland ecosystems, like ACG, can be managed similarly to other socio-economic sectors through e.g. planning, investment, compensation for its environmental services, and knowledgeable custodianship.

Two sets of regulations in biodiversity conservation are needed: one for the agriculture landscape and one for the wildland areas

There is a need for a self-sustaining and decentralized wildland management process.

And what is portable from the ACG? An attitude, a viewpoint!

Points from questions and comments:

- conservation management must look for new alliances for the purpose of conservation, especially with the agricultural sector, e.g. the orange peel biodegradation example, and the example of using gmelina to restore rainforest, and the example of using carbon sequestration to finance rainforest restoration.
- wildland environmental services should be negotiated with the consumer as would any commercial business to sell and develop its products.

SESSION 6

CASCADING EFFECTS OF RESOURCE EXPLOITATION ON ECOSYSTEMS

Session Chair: **Karin Refsnes**

The relevance of ecosystemic services by native species and species assemblages: coupling salmon farming and sport fishing with biodiversity use and management

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Aquaculture could help to preserve biodiversity by reducing the pressure on commonly harvested aquatic species at the local level. Aquaculture could also be of economic value indirectly, e.g. sport fishing around the aquaculture facilities.

Some ecosystem services needed and provided by native biodiversity are (1) nutrient cycling after aquaculture and (2) water quality and quantity.

Nutrient cycling after aquaculture

Salmon farming utilizing floating pens increase N and P inputs to the lake, bay or estuary where the pens are located. Approximately 70% of the P and 30 to 50% of N in the salmon feed is unassimilated by the fish and released to the environment. One way to diminish these environmental impacts is to prevent nutrients from being lost to bacterial degradation finding alternative pathways by

- enhance use of native mussel beds under fish farms
- using artificial reefs to increase habitat heterogeneity to provide a better chance for native species to use the excess nutrients and to increase biodiversity
- managing the native fish and especially, introduced salmon which surround the fish farms to enhance sport fishing. This provides alternative revenues and stands as an important approach and management tool for conservation.

Water quality and quantity

Water quality (transparency and chemical composition) and availability has also been key players in the salmon farming success as well as for sport fishing. Such water quality is a result of multiple ecosystemic processes and services. One of them relates to the forest as a filter.

The pristine temperate rain forest in southern Chile provides clean water, which has an economic value for salmon farming and sport fisheries. Such approach has become a new way for conservation and proper management of native forest, particularly to avoid replacement with monocultures of non-native trees.

Points from questions and comments:

- This study does not look at the total ecosystem effects of salmon farming, e.g. the need of 3 tons of wild fish to produce 1 ton of cultured fish. Salmon farming is not the major consumer of fish meal, and any attempt to mitigate the environmental effects of this economically important activity, is interesting.

The future for coastal marine community/ecosystem approaches in invertebrate multispecies management: the need for spatial "take" and "no-take" areas networking and connectivity

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Marine benthic communities/ecosystems and their exploitable resources show a persistent spatial structure. The species life history, spatial distribution, and variables affecting settlement play critical roles in the structure and dynamics of marine communities. Furthermore, the contribution of different areas to population recruitment varies ('source and sink' areas). Therefore, biological connectivity and its dependence on water circulation are key factors in benthic communities.

Spatial patterns of benthic communities and species ecological roles are usually not considered in species management. The reasons are a) that interest in single species ignores community functioning, b) that multi-species management requires understanding of community functioning, which is rare, and c) that territorial use rights in fisheries (TURFs) are non-existent.

We present a novel approach to the management and legal regulation of shellfish harvesting in Chile. Shellfish are harvested by a small-scale fishery which is organized locally, and which generates an economic value of national importance. The shellfish management strategy now being developed uses TURF and exclusive access for small-scale fishers, and single- and multi-species management plans. We combine basic and applied ecological research with experimental demonstration to fishers that this management strategy actually works on a local scale (i.e. increasing CPUE).

The Chilean coast has the potential for the establishment of hundreds of spatially distributed 'Take' areas (Management and Exploitation Areas), alternated with 'No-Take' preserves and/or National Parks. We propose a spatially structured coastal management system which incorporates biological connectivity, the ecological role of target species, and community functioning. This promotes the rational management of invertebrate multispecies and habitat

refuges. The proposed practise merges, for the first time, conservation and management objectives.

Points from questions and comments:

- The success of combining Take and No-Take areas depends on how far shellfish larvae disperse, i.e. to what extent No-Take areas can serve as sources for Take areas. Other systems for protection (e.g. IUCN's Marine Protected Areas) must be viewed in this context.
- Local fishers should be trained in performing stock assessment themselves.
- Few conflicts are expected as long as local fishers are incorporated in the implementation of the management strategy.

Effects of fishing on coral reef ecosystems

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Coral reef ecosystems provide a significant proportion of the marine harvests taken by developing countries in the tropics. The harvest includes a wide variety of fish and invertebrates. Coral reef organisms are captured by a wide variety of fishing gears but the trawl nets, gill nets and seine nets which characterize industrial-scale temperate water fisheries cannot normally be used in the vicinity of coral reefs. Few of these fishing gears are highly selective for particular species of fishes or invertebrates and often several hundred species are caught by a single method, almost all of which can be sold, bartered or used.

Coral reef fish and invertebrates differ widely in their catch ability but the larger, slower-growing, predatory, species are usually vulnerable to a wider array of fishing gears than are smaller, fast-growing, herbivorous species. It thus becomes possible for the most catchable species to become over-fished to the point of local extinction while the overall volume of the catch is not significantly decreased. Over time this leads to changes in the composition of the community in which the organisms at the apex of the food web are progressively eliminated.

Islands which receive a constant influx of larvae from upstream sources are partially buffered against ecosystem changes and local extinctions. Isolated islands are vulnerable to severe structural changes, local extinctions and even the total extinction of some endemic species.

In countries where poverty is combined with open access to aquatic resource systems, over-exploitation of the fisheries can lead to profound changes in the coral reef ecosystems. This can include dramatic increases in the biomasses of some plants and invertebrates as a

result of the extinction of their predators and the overgrowth of corals by macro-algae. Invariably there is a concurrent loss of biodiversity.

Points from questions and comments:

- There is not yet enough knowledge for enhancing coral reef fishes by releasing fish larvae.
- Coral reefs are suffering from more than overharvesting, e.g. global warming, growth of algae, sedimentation and eutrophication.
- Mangroves are important as nursing areas for several coral reef fishes, and need to be integrated into coral reef management.

Ecological and evolutionary conservation implications of species interactions in ecosystems

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Species and ecosystems are bound together by mutual ecological constraints and a shared evolutionary history, so that in the long term it may be impossible to conserve one without conserving the other. Species traits and their evolution are ultimately constrained by ecosystem processes, just as ecosystem properties are constrained by the ecological and evolutionary history of interacting species. These mutual constraints are illustrated for a classical trophic cascade and for plant-herbivore interactions in an ecosystem context. Even in a simple food chain, indirect effects among species change the nature of the selective pressures experienced by each species depending on the number of trophic levels, thus leading to species with different traits. An example of the complexity generated by ecosystem processes on the very nature of species interactions is provided by the effect of nutrient cycling on the ecology and evolution of plant-herbivore interactions. Even though herbivores have a direct negative effect on plants through biomass consumption, they can have a positive net effect on plant productivity through nutrient recycling. The conditions under which this positive ecological effect can turn into an evolutionary mutualism, however, are complex; they depend on such features as the spatial structure of the ecosystem, the intensity of nutrient cycling and plant competition for nutrients. Evolution can even lead to the paradoxical situation where the evolutionary benefit of herbivory for plants increases while there is an increased conflict between the two partners. Some implications of local evolution for the resistance of communities to disruptions by biological invasions are discussed. It is argued that conservation efforts should aim to preserve the rich variety of interactions in which species are imbedded in natural ecosystems.

Points from questions and comments:

- The take-home message from theoretical studies is that biodiversity management will benefit from

integrating population and ecosystem perspectives, and ecological and evolutionary perspectives.

- There is evidence that rates of evolution can be much more rapid than previously believed. Therefore, evolutionary considerations may be important even on a time scale of a few generations.
- Phenotypic plasticity is a way of changing which does not require evolution, but which itself is subject to evolutionary change.

SESSION 7

ECOSYSTEM APPROACH IN MARINE RESOURCE USE

Session Chair: **Ragnhild Lofthus**

The precautionary approach to sustainable utilisation of marine ecosystems

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The management of marine ecosystems including fisheries is a young discipline, mainly being developed during the last 2-3 decades.

Why do we need a 'precautionary approach' (PA)?

- fishing capacity exceeds net production of marine resources
- it has proven difficult to control fisheries within sustainable levels
- has been PA developed as a tool for improved decision making in fisheries management – mainly to avoid collapse of fish stocks and fisheries

In the development of PA to fisheries management advice, the International Council for the Exploration of the Sea (ICES) has set limit reference points for a series of important stocks.

- B_{lim} : Low limit biomass to be avoided to safeguard recruitment to the stock
- F_{lim} : Fishing mortality associated with unknown populations dynamic or stock collapse

Additionally, ICES has suggested precautionary approach reference points for fisheries management:

- B_{pa} : above B_{lim} , to make certain that B_{lim} is avoided (reflects uncertainty)
- F_{pa} : lower F , high probability of not exceeding F_{lim}

PA reference points are set by ICES for several stocks. ICES is still in the process of setting reference points. ICES suggests the PA reference points and invite the management authorities and the industry to discuss their appropriate levels. In order to meet the PA to fisheries management, harvest control rules should be developed for the different stocks, with defined pre-agreed measures to be taken when the stock or fishery approaches or exceeds the reference points.

The case of the Norwegian spring spawning herring
The spawning stock has traditionally fluctuated between 2 and 16 mill tons due to variability in ocean climate and corresponding variations in recruitment and individual growth in the stock. The spawning stock declined from a record level in the mid 1940ies about 16 mill tons, due to gradually less favourable climatic conditions combined with a considerable increase in fishing effort during the same period. In 1972 the spawning stock biomass was estimated as low as 2000

tons. A total ban of fishing was introduced. As the stock increased from the mid 80ies PA management measures were made in order to obtain a high and sustainable yield from the stock:

- minimum legal catch size of 25 cm
- moderate fishing until spawning stock size reach 2.5 mill tons
- agreement on share of total allowable catch between nations
- setting B_{lim} , B_{pa} and F_{pa}

There are good reasons to believe that the PA to the management of the Norwegian spring spawning herring will provide sustainability in the utilisation of this stock, with a low risk of future stock collapse caused by fishing.

With the exception of specific benthic habitats and organisms as well as possible threatened species, over exploitation of fish stocks seems to have more severe effects on the fisheries than on the ecosystem. Pollution and contamination do represent a much more severe threat to the marine ecosystems and do affect the ecosystem on all tropic levels.

Conclusion

Sustainable fishery is a good indicator of a healthy marine ecosystem. Implementation of the PA to fisheries management is therefore a fundamental step towards sustainable fisheries and consequently also an important instrument for improving the quality of marine ecosystem.

Points from questions and comments:

- Has any kind of pollution until today had a significant negative effect on the fisheries? –There is no direct answer to that, but a sneaking accumulation of pollutants over time is considered as a threat along with habitat degradation.

The integration of fisheries and environmental issues:
Evolution of the 'ecosystem approach'

Christopher Hopkins

International council for the Exploration of the Sea (ICES)

Copenhagen, Denmark

The presentation revived the background for developing the 'precautionary approach' in fisheries management, and the further evolution towards an 'ecosystem approach' for handling the integration of fisheries and environmental issues.

Guiding principles for fisheries management:

Implementation of the provisions of the relevant global and regional conventions and agreements

Application of a precautionary approach to man

agement of living marine resources, as set out in the UN Agreement on Straddling Stocks and Highly Migratory Fish Stocks, and the FAO International Code of Conduct on Responsible Fisheries.

Taking into account the interaction among the different components in the food-webs of the ecosystems (multispecies approach) and other ecosystems interactions.

Identification of processes in, and influences on, the ecosystems which are critical for maintaining their characteristic structure and functioning, productivity and biological diversity.

Providing for a chemical, physical and biological environment in these ecosystems consistent with a high level of protection of those critical ecosystem processes.

Integration of environmental objectives into fisheries policy.

Maintenance of viable fishing industries, taking account of interests of producers and consumers.

Involvement of fishermen and other relevant parties in decision-making processes.

Reducing or solving problems in one area (e.g. North Sea) should not add to problems elsewhere

These principles apply to fisheries for human consumption and all industrial fisheries.

The main stages and ingredients in evolution of the 'ecosystem approach':

Development of the 'precautionary approach'

Single species stock assessments for commercial fished species ("target") extended with single species reference points (system of targets and limits) pre-agreements on harvest rules and recovery plans.

Reference points for commercial target species as the foundation.

Quantify effects of fishery on non-target species.
Establish wider-reaching conservation measures.

Establish quality assured databases on species and habitats.

Points from questions and comments:

- It was commented that ICES is an example of an institution working along the lines of the "Malawi principles" and an 'ecosystem approach'

By-catch in fisheries

Karen Weaver

UNEP/CMS, Bonn, Germany

Capture fisheries produce approximately 90 million tonnes of fish annually, about 35% of which is used for animal feeds. World wide, 70% of the fish stocks, for which data are available, require urgent intervention to: a) avoid decline of the fully exploited resources; b) stop decline of overfished resources; and c) to rebuild depleted resources. Discards represent a biological waste of 27 million tonnes, or about 25% of the total catch.

We will never have enough information about fish stocks and fishing activities, to accurately determine and maintain the appropriate level of effort of fishing, therefore the 'precautionary approach' is fundamental. Moreover, sustainability cannot be achieved at species or individual fishermen levels and solutions must be found at the ecosystem and community levels. Sustainable fisheries cannot be built where there is open access to stocks. Management of marine fisheries with awareness of ecosystem properties, is essentially a question of distinguishing the impacts of fishing from those of natural fluctuations in the ocean environment.

By-catch problems are highly correlated with fishing method. Examples include seabird mortality associated with long line fishing, dolphin mortality associated with purse seine tuna fishing and turtle mortality associated with prawn (or shrimp) trawling. Invariably the solutions offered in the short term to by-catch problems involve "technical fixes". Fisheries management will need to confront the by-catch issue now, not only because of the now well established and increasing public profile on the issue, but also as part of international obligations.

An alternate approach to the science-based 'ecosystem approach' is the market-based approach. One such example is the eco-labelling schemes that are being developed as a way to assure customers of the environmentally safe production of fishery products. This will again establish market-based pressures for less destructive fishing techniques.

A trend can be seen running from the general objectives of sustainable utilisation in current binding agreements, to more specific constraints and management methods in subsequent non-binding instruments. Implementation of international environmental instruments will result in the fishing industry being subject to an increasing number of policies that conserve marine areas by restricting vessel access. Similarly, protection and restoration of endangered fish species proscribed by various non-binding agreements will lead to area, fishing method, and by-catch-reducing restriction on fishers. These may not only come from international instruments but will usually be

implemented through national legislation and policy development.

Points from questions and comments:

- The issue of whether by-catch leads to extinctions in the marine environment was seen as missing the main point viz that by-catch leads to ecosystem shift and that the global society must decide how much change is acceptable.

Overexploitation and extinction in the ocean

Ransom Myers

Killam Chair of Ocean Studies

Dalhousie University

Department of Biology

Halifax, Nova Scotia, Canada

Aspects of the biology of extinction and overexploitation in the ocean were discussed in the presentation. There are most certainly extinctions due to overfishing that we probably are not aware of.

Processes whereby local populations can be driven to extinction were described. Among those is the largest skate in the northwest Atlantic, the barn door skate. This species has been driven nearly extinct though most of its former range. It is locally extinct because of by-catch. The barn door skate was once very common, and as distinctive as a bald eagle, and yet its near demise passed without notice.

Further on, the process of overexploitation that led to the collapse of the cod populations in eastern Canada was described. Although several ideas of why the stocks collapsed were introduced i.e. water, foreign fishing and seals, the conclusion in the presentation was that this was mainly due to overfishing by Canadians. Myers criticised the use of subsidies provided for the fishing industry and that this led to an increase in fishing capacity.

By using meta-analysis to estimate population dynamics parameters, it is possible to estimate the conditions under which overexploitation and extinction will occur, and which management actions, e.g. reduced fishing mortality or marine reserves, might allow for the long term viability of marine populations.

Conclusions

- avoid unnecessary subsidies
- rational exploitation
- large protected areas are needed to preserve a sample of biodiversity

Points from questions and comments:

- Could it be an idea to transfer subsidies so the fisheries can change to other species?
-No –There has to be a reduction in the capacity.

- Is the population of seals a reason for the poor recovery of the cod stocks? Can a reduction of the seal population help the cod stock to recover?
-There is also other predators in the system. A reduction of the seal stock may have an effect, but this is not politically accepted.
- What kind of data supports the very large MPAs?
-We need a set of data big enough to see how things work without fishery. To observe this, we need large MPAs

SESSION 8

ECOSYSTEM APPROACH IN FOREST RESOURCE USE

Session Chair: **Thor Larsen**

Ecosystems, timber and biodiversity

Jeffrey A. Sayer

CIFOR

Situgede

Bogor, Indonesia

Classic definitions of "ecosystem management" have emphasised approaches that are heavily based on a technological and deterministic views of how to manage natural resources. However, the real need is for ecosystem management to be flexible, adaptive and experimental as ecosystems are dynamic, complex and unpredictable.

To achieve ecosystem management goals there is a need for radical reform of forest institutions concerning education training, structure and culture. The major challenges for ecosystem managers are:

- Science-based ability to predict impact of management of system
- Minimise power differentials amongst stakeholders
- Facilitate decision making
- Optimise total utility of all products and services
- Ensure that resource assessments represent all interests
- Represent absent stakeholders (minorities, future generations etc.)
- Monitor outputs (indicators) and provide feedback
- Enforce agreed regulations

To improve conservation of biodiversity, ecosystem management must be based on the following; 1) recognition of the full cost, 2) realism about the benefits and 3) the willingness to pay. Ecosystem management could be based on a consensus made from ranking various stakeholders interests in the area in question and primarily be driven by broad agreement on the outcomes that are desired. There must be consensus on how much timber, which non-timber products, which components of bio-diversity are required. Ecological science will be important in determining how these outcomes are achieved but ecologists should not determine the use of the forest.

Points from questions and comments:

- Believe in the emphasis on local/national instead of global/international based ecosystem management.
- The challenges concerning the global ecological crisis versus global economic crisis are important to consider.

Solving the Global Forest Crisis

Richard Steiner

University of Alaska

Anchorage

Alaska, USA

An enormous literature exists regarding the link between global deforestation and the loss of biodiversity. Yet today, deforestation and the loss of biodiversity continues at historically high levels. In the context of the Malawi Principles, global forest management still has along way to go.

There are five principal components to resolving the crisis and bringing human/forest relationships into line with the Principles:

- 1) Expansion of Forest Protected Areas - including all remaining frontier forests
- 2) Sustainable Forestry - practiced on all harvested forests
- 3) Restoration - withdrawal of managed lands for recovery to natural forest
- 4) Plantation Production - carefully managed, to provide wood needs
- 5) Reduced Consumption - of all wood products

Each of these efforts will improve the conservation and sustainable use of forests and biodiversity, but the integration of all five will be necessary to fully resolve the crisis. It is time for world governments to become dehypnotized, acknowledge the extent and severity of the global forest crisis, and implement immediate and aggressive action toward its resolution.

Increasing worldwide demand for wood products, road building, fuel wood, clearing for agricultural purposes, population, climate change, urbanization, fires, corruption and illegal logging, perverse financial subsidies, and ineffective trade policies all combine to continue the decimation of world forests. Just since the Convention on Biological Diversity entered into force on December 29, 1993, the world has lost about 100 million hectares of forest and by many ecologists estimate a minimum of 100,000 species have gone extinct.

While tropical rainforests have received a great deal of attention, the crisis in temperate rainforests is less discussed, yet much more severe. The temperate forests, once covering most of Europe, China, the US, and parts of Canada, Australia, New Zealand, Chile, UK, and Argentina, have been the most extensively altered, with less than 3% remaining today as frontier forests (WRI, 1997).

The UN is recommended to immediately establish a Global Forest Protection and Compensation Fund of at least \$20 billion/yr. to subsidize forest conservation efforts.

Points from questions and comments:

- It is difficult to assess the size of the forest area that needs to be retained. This is mostly a financial problem, but should ideally include as much as possible to avoid unforeseen effects of the disturbance.
- Efforts should be made to buy forest areas from landowners to prevent deforestation.
- Additional efforts to improve situation are to bring waist of wood related to logging to a minimum and increase the number of protected areas.

Underlying causes of deforestation

Hans J.H. Verolme

Biodiversity Action Network (Bionet)
Washington DC, USA

Bionet is partner in a global joint initiative on the root causes of forest loss that attempts to facilitate a dialogue between all relevant stakeholders. The initiative aims to deliver solution-oriented recommendations to the international community that address underlying causes of deforestation and forest degradation.

Over 60 case studies of concrete instances of forest loss were performed in 1998 and the initiative convened seven regional and one Indigenous Peoples' workshop, to conduct a participatory analysis of the chain of causality. These served as background to a global workshop held in Costa Rica in January 1999. At that meeting policy makers met with other stakeholders to develop action-oriented solutions that address the root causes of the forest crisis. He expressed dismay at the IFF's failure to incorporate the key recommendations identified through this process into its work and at government attempts to re-negotiate prior commitments. Amongst others, the following important points were made:

- Full participation of local communities and other stakeholders in decision-making over management of natural resources at the national and international level is required if we intend to reverse the current rates of forest loss.
- Over-consumption / over-production as related to the 'free trade' agenda is a threat to forests.
- Conviction to conserve biodiversity rather than achieving short-term economic benefits is needed.
- Forests are more than just stands of timber. Forests are ecosystems that provide valuable services and have spiritual meaning for individuals, communities and society as a whole.

Further specification of the 'ecosystem approach' is essential to the implementation of the CBD. Implementing the CBD, however, requires both political will and sound scientific basis. Furthermore, implementation primarily takes place at the national level. Commitments entered into at the global level need to be translated into national action plans, with the involvement of those who were often not represented during

the negotiations. This challenge is becoming more pressing as citizens are openly beginning to question the need for further international policy debates that see little implementation and lack compliance.

Points from questions and comments:

- Poverty should not be seen as a root cause of deforestation, since it is driven by other causes such as insecure land tenure.

Boreal forests in Russia

Sten Nilsson

Forest Resources Project

International Institute for Applied Systems Analysis
Laxenburg, Austria

The Sustainable Boreal Resources Project was presented. Forest growth data show no decrease in total growing stock in Russia from 1961 until 1998, but regionally substantial over-harvesting occurs. Harvesting has decreased since the 1990, and the cleared area has decreased from 2.1 mill ha to 0.5 mill ha from 1988 until 1997. Besides over-harvesting, forest fires are a major threat to forest biodiversity. Average annual forest area impacted by fires is 3.5 mill ha. Pests, diseases and other biotic factors affect 4 mill ha annually and abiotic factors impacts 2 mill ha.

There are three fundamental ways to conserve forest biodiversity in Russia: (1) through protected areas; (2) through biodiversity-sensitive forest management; and (3) through efficient landscape management.

Russia has established a very good network of 'protected areas' in the form of so-called *zapovedniks*, or strictly protected areas. These areas are, relatively speaking, large and numerous and are often surrounded by territory that is effectively wilderness. In addition, Russia has *state natural reserves*, *national parks*, and *game parks*. The total area of specially protected areas is about 5% of the total forest resource areas in Russia. These protected areas conserve the majority of rare and endangered species listed in the *Russian Red Data Book*. Russia's conservation of forest biodiversity using protected areas seems rather advanced—at least on paper—and relative to what other countries have achieved. However, the economic decline has seriously deteriorated the management capacities of protected areas.

Our analysis of the Russian forests shows:

- Exploitation of land for timber or other purposes seriously threatens forest biodiversity.
- However, in large-scale uniform landscapes, careful forest management can increase biodiversity.
- Fire suppression may decrease biodiversity.

- More protected areas and a more efficient distribution of protected areas are required to maintain biodiversity.
- Forest biodiversity is directly scale-dependent, and future policies on biodiversity must take into account the interaction between different scales of ecosystems.

Russia has a long tradition of working with different levels of landscapes and thus has excellent platform for biodiversity conservation. Biodiversity can be dealt with at the level of the established network of protected areas and the landscape concept. A full program of forest biodiversity conservation must also deal with forests subjected to timber harvesting and other interventions. Examples of biodiversity conservation treatments include leaving mature and dead trees at harvesting, regenerating with mixed species, and refraining from clear-cutting in all-aged stands of shade tolerant species. These measures are currently rare in Russian forest management.

Biodiversity conservation must be linked with social development. Existing institutional framework cannot support biodiversity protection. Today there is no funding for sustainable forest management.

Points from questions and comments:

- How to conserve biodiversity in Russia? Allocate sufficient funding directly to the areas of concern, not through central institutions.
- Western companies participate in forest over exploitation in Russia. The large forest areas are probably suitable for ecosystem management. Do the western companies implement principles for ecosystem management? International companies are not a big problem in Russia. They now operate very carefully. Opposed to international companies Russian companies are of more concern.

Communities depend on sustainable use: What are the incentives and constraints?

Jeffrey McNeely

IUCN

Gland, Switzerland

Key issues discussed were:

- The scale of sustainability.
- The dimensions of sustainable use.
- The differential value placed on the benefits of biodiversity by the various stakeholders.
- What commitment do the users have to sustainable use?
- How to balance individual and social benefits.
- Defining the rights of the various stakeholders.
- Will the state allow significant commercial benefits to flow to the disadvantaged rural communities.
- Unsustainable use of resources is subsidizing national development, providing goods whose full

costs are not paid. Development options are beginning to narrow as resources become limiting.

Prerequisites.

- Clear tenure rights, including ability to exclude some who may claim rights.
- Sufficient knowledge to manage the resource.
- Feedback between harvesting levels and productivity of the systems.
- Perceived benefit of sustainable use is greater than that of resource transformation.
- Appropriate legislative and policy framework.

Conclusions.

- Sustainable use is a variable, not a constant. It depends on environmental, economic and social conditions at a given time and place.
- Sustainable use may be more attractive than commercial harvest, at least for local people.
- A combination of approaches is needed, ranging from strict protection (=non-harvest) to sustainable use to intensive use.

Points from questions and comments:

- Is local people more interested in sustainable use than in commercial harvest? There are big differences between communities. Some communities have strong leaders who want sustainability. Commercial use is not proven to be sustainable, at least not in the long term. Communities which manage their resources in a sustainable way will survive. Survival of the communities is considered to be more important than money.

SESSION 9 GLOBALISATION VS. DE-CENTRALISATION

Session Chair: **Colin Rees**

Globalisation of nature and culture: the imperative for diversity

Peter Bridgewater

Division of Ecological Science, UNESCO

The first and twelfth Malawi Principles connects environment and society while the other 10 points are more related to technical issues. The report from the Malawi meeting also states that we should take an 'ecosystem approach' to nature conservation, and highlights that:

- The approach helps define the appropriate management level (local, regional, global);
- It places people as a part of the ecosystem;
- It allows integration of traditional/indigenous knowledge and scientific thinking providing conservation solutions.

Globalisation what is it?

The OECD defines the globalisation in terms of opening up of the world's trade and investment regimes, and notes that the process is likely to have a substantial effect on the environment:

- the opening up of the world's trade and investment regimes is more than an economic phenomenon,
- it is a cultural, technological, and now environmental phenomenon,
- yet very few species ever were truly globalisers – with the possible exception of migratory species,
- we now have the new globalisers, exotic species and new ecological combinations.

Institutional response – While environmental problems have become globalised, their potential management solutions have become more localised. Global conventions have tended to create a "lowest common denominator" approach to resource management, which often ignores aspects of cultural diversity. The CSD also contributes to this globalising effect. Perhaps the relation between people and the rest of the biosphere will be better understood after this meeting?

Ecological issues

Ecologists have frequently ignored people whilst social scientists and economists have largely excluded the wider environments in which people and their domesticated species live. People are a species within the biosphere.

The challenges to managing, using, sharing and conserving biological diversity are:

- To contain crises.
- To control the potential for conflict.
- To avoid seemingly simple linear approaches and solutions, by calling on a more integrative creativity.

Scale and diversity – awareness of scale and of the existence of more than one scale. Crucial to the 'ecosystem approach' is to deal with processes operating at a wide range of temporal and spatial scale. There are three basic and interactive elements of diversity: cultural, biological and environmental.

The species with culture

Human species differs from most other species because people have culture. Culture increases ecological complexity. Such complexity is often explained through the identification of cultural landscape. Language is a useful indicator of the health of a cultural landscape. The extinction rates for languages explain the process of biotic and cultural homogenisation of the landscape.

Conclusions

Two central points emerge from this discussion:

- Concern about ecosystem management is really concern about the relationships which exist between people and the rest of the biosphere; and
- While there have been isolated successes, on the whole people have not managed effectively their interaction with the environment and we have a situation with the potential to spin out of control.

The 'ecosystem approach', reflects the gritty reality of conservation. There is a need for:

- Room for more "agreement to disagree" while making progress.
- Room to communicate global ideas in the rapidly dwindling number of languages and cultural morphs.
- More focus on the need for adequate research direction, even if the methodologies are not universally acceptable.
- Less adherence to numbing consensus; better described as inactivity.

Points from questions and comments:

- The elephant issue has now been settled, but it has taken a long time with habitat destruction.
- Local people know their problem better than people from other areas.
- Red list approach could be applied to languages.

Compatibility between the WTO framework, protection of the environment and sustainable development

Jan-Eirik Sørensen

Director, Trade and environment division, The World Trade Organisation (WTO)
Geneva, Switzerland

The World Trade Organisation (WTO) is founded on three basic principles: non-discrimination, predictability and stability, and trade liberalisation. It is a member-driven organisation, where rules are agreed in negotiations, decisions taken by consensus, and new rules to be ratified by each country.

The WTO has a binding dispute settlement mechanism, which is the only one of its kind. The only occasion when a WTO body can have a direct impact on a government's policies is when a dispute leads to a ruling of all Members. In all other respects, the WTO does not dictate to governments to adopt or drop certain policies.

The WTO Agreement recognises the importance of resource management, by including as a key goal 'the optimal use of the world's resources in accordance with the objective of sustainable development'. This is a significant departure from the objective of the former General Agreement on Tariffs and Trade (1947), which referred to 'developing the full use of the resources of the world.'

However, the WTO is not an environmental protection agency and does not aspire to be one. Its competence for policy co-ordination is limited to trade policies, and those trade-related environmental policies with a significant impact on trade. Furthermore, many GATT/WTO Agreements were claimed to already provide significant scope for non-discriminatory national environmental protection policies.

According to the WTO, trade liberalisation and environmental protection can be mutually supportive, in that trade liberalisation (1) has an important role to play in getting global price mechanisms right, (2) that members have the right to set environmental protection standards at the level which they themselves consider appropriate (provided they are not arbitrary, do not discriminate, and are not a disguised restriction on trade) and (3) by addressing what the Brundtland Report (1987) called the 'pollution of poverty', the single most important contributor to environmental degradation.

The best way to avoid frictions between the trade agenda and the environmental agenda is to improve policy co-ordination between trade and environment policy makers. First and foremost, this must take place at the national level, e.g. emphasis the Norwegian Minister of the Environment has placed on this is issue.

It is important to note that the WTO has no rules on biodiversity as such. The discussion of the relationship between the WTO and the Convention on Biological Diversity (CBD) has basically centred around the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs), and how the WTO generally relates to multilateral environmental agreements (MEAs).

Trade measures agreed to amongst parties to an MEA, even if WTO-inconsistent, could be regarded as '*lex specialis*' under public international law, and ought not to give rise to legal problems in the WTO. What remains, therefore, is the issue of trade discrimination against non-parties to MEAs.

Concerning TRIPs provisions on the protection of biotechnological inventions and plant varieties, whether by patents or by "*sui generis*" protection, several issues have arisen, including (1) patent protection to genetic material in its natural state or to inventions which rely on traditional knowledge, (2) the ethical or environmental acceptability of granting patents for inventions of life-forms, (3) access to environmentally sound technology and, (4) a perceived imbalance between the protection accorded to patentable inventions and the protection available for traditional indigenous knowledge.

The spirit of what we understand to be the 'ecosystem approach' is in line with what the Ministers stressed when they signed the WTO Agreement: 'There should not be, nor need be, any policy contradiction between upholding and safeguarding an open, non-discriminatory and equitable multilateral trading system on the one hand, and acting for the protection of the environment, and the promotion of sustainable development on the other'.

Environment and global trade

Ricardo Meléndez-Ortiz

International Centre for Trade and Sustainable Development (ICTSD)
Geneva, Switzerland

A key issue is to make sustainable development a main objective of trade policy-making. The world has agreed to do so on the global arenas for environment (cf. Agenda 21 from 1992) as well as for trade (cf. the WTO preamble).

There are a large number of trade policy influencers, including advocacy groups and business interests, and these all face a number of challenges. These include limited contact and opportunities for contact between trade policy decision makers and influencers, increasing complexity of policies required to address sustainable development, limited understanding of each others' concerns and of issues and limited cohesion and co-operation within the different groups of influencers.

Some elements framing the international debate on environment and global trade during the 1990's are highlighted. One of these is a need for a vision adjustment, where consideration is taken to the objectives of sustainable development on (1) economic growth (through trade liberalisation) as well as (2) conservation, sustainable use and benefit sharing and (3) intra- and inter-generational equity. Furthermore, there are tensions relating to the need for regulation (i.e. state intervention), using subsidiarity (e.g. as in the 'ecosystem approach') or universality ('the global reality of markets') as policy guidance, policing or co-operation and sovereignty or supra-nationality. Another important element was the evolution of very different international regimes in key areas for sustainable development. In the trade regime, a hierarchical set of norms, rules and common principles have been developed, while the development regime builds on variants of income growth-based strategies. The environment regime can again be seen as a proliferation of problem- and resource based instruments, *ad hoc* norms, a diversity of approaches, but with emerging common principles. This results in regimes being incoherent, uncoordinated (including institution building) and unequal, and dialogue between regimes is challenged.

The perception of an 'imposed' debate in the WTO is referred, where two main obstacles from the perspective of developing countries is distrust and lack of inherent capacity. As a result, trade and sustainable development issues are currently locked into a win/lose debate marked by a unidirectional perspective (with too much focus on benefits of free trade at the expense of issues other key factors such as social and environmental welfare) and environment as a negotiation bargain chip (where environment is seen as an opportunity for obtaining higher trade concessions). Against this background, there is a need to include environmental dimensions in all policies, and key positions of developing as well as of developed countries were identified.

Lastly, some elements for reflection on globalisation, decentralisation and the 'ecosystem approach' are provided. On the one hand, there is globalisation that can be seen as a global economic integration of many formerly economies into one global economy, mainly by trade and free trade and capital mobility. While on the other hand the 'ecosystem approach' emphasises societal choice, decentralisation, focus on ecosystem issues and long term objectives.

SESSION 10

PANEL DEBATE:

What chance for local resource management in the times of GATT and WTO?

Moderator: **Ketil Gravir**

Norwegian Broadcasting Cooperation (NRK)

Participants:

Ricardo Meléndez-Ortiz

Jan-Eirik Sørensen

José Sarukhán

Holly Dublin

Subramonia I. Ananthakrishnan

Robert Monro

In the panel debate, which also included active contribution from the audience, the discussion concentrated around the following issues.

The moderator was eager to raise the basic question about the possibilities to connect a global economy and liberated trade with sustainable use and conservation of biodiversity at the local level.

A reasonable and common discussion about issues normally from scientific and management disciplines so far from each other, is really a challenge. The responsibility for changes in one system will inevitably affect the other and, therefore, the responsibility for impacts is broad.

Negative impact of trade must be coped by national efforts to minimise the problems. All these efforts must not result in losing their focus on finding the possibilities to utilise changes for benefits.

The scaling problem was discussed. If we have small scale trade, the local communities have closer connection to the trade and can easier achieve the benefits. Liberated trade enhance large scale and the result can be large scale benefits. The large scale can secure rules that are common and reliable, active and fair rules, but the influence on practise is limited.

Considering the scall problem, the need of local, national and international incentives – green incentives – are to be considered.

Should the WTO take more environmental and biodiversity aspects into the trading regimes? Is that a mechanism to face overexploitation of biological resources and a proper tool to conserve threatened species? The possibility for local and national authorities to achieve the same was discussed.

The need to have harmony between economical independence and ecological independence. Is this a prerequisite for successful management of biodiversity?

Do WTO create problems for use and conservation of biodiversity or did WTO inherit problems which up to now have been difficult to solve?

Trade is about species, our conference focus on an 'ecosystem approach'. Evaluation of this "contradiction" seems uncertain.

From the debate WTO regimes seems to have uncertain and various impact on use and conservation of biodiversity. (i) WTO has a potential to help via common and fair rules (ii) WTO will make local management an illusion. (iii) WTO will accelerate overexploitation of natural or biological resources and extinction of species. (iv) WTO (and WB, IMF, IDB, ...) need to adopt new guidelines and philosophies. (v) WTO can never be fair to obtain sustainable nature management because of the unbalanced economic power in world trade, - we will still have power based trade systems.

The level to have decisions on national policy and development of legislation issues concerning CBD is a national responsibility. The impact of WTO on this and the wishes to include responsibility in WTO for use and conservation of biodiversity were discussed.

Negotiations are crucial in international policy. Are these negotiations fair when e.g. US has and large delegation in CBD matters, even though they are only a signatory to the Convention. What is the power of all small and/or poor countries in such a context?

Following the question for the panel debate the connection between WTO, GATT and local resource management can be invisible. The real world in the local communities is struggling for survival and not focused on international trading regimes.

SESSION 11

SUCSESSES AND FAILURES: CASE STUDIES IN USE OF BIOLOGICAL RESOURCES

Session Chair: **Cecil Machena**

Wildlife Quota Setting : A Campfire Case Study

Norman Rigava and Lillian Dimbi

WWF SARPO

Harare, Zimbabwe.

In the last decade, community based natural resource management programmes have been promoted as an equitable and sustainable approach to conservation. In Zimbabwe, the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) has provided communities with some degree of ownership and control wildlife resources as well as financial benefits. Empowering communities with the knowledge and skills to manage their natural resources is an essential process which allows them to maximise their control over resources within the context of the legal framework.

WWF as part of the CAMPFIRE service providers has been involved in the development, implementation and dissemination of improved community based resource planning and management techniques which are technically robust, cost effective and socially possible. These were developed through a process of Participatory Technology Development (PTD) in which technical assistants worked with selected rural communities to design, implement, test, monitor and refine locally applied management activities. This is consistent with the "ecosystems approach to conservation" which recognises that "technology" together with ecology and human needs are critical elements in the maintenance of bio-diversity. One of the outputs, which aimed to merge both scientific and indigenous knowledge, was a methodology for participatory quota setting.

Previously quota setting was done solely by the Department of National Parks and Wild Life Management (DNPWLM) in a technical and centralized approach with little or no input from the communities and other resource users such as the safari operators. Through the developed participatory quota setting process, all major stakeholders are involved in a facilitated workshop in which qualitative and quantitative information is shared, analyzed, and triangulated to develop the quota. The methodology was disseminated through the production of a quota setting manual, a quota setting tool-box, training course for facilitators and quota setting workshops.

Although DNPWLM was initially reluctant to accept the methodologies, communities have come to understand the importance of biological sustainability and the importance of monitoring key indicators of such as trophy

quality. Lately analyses of recommended and actual quotas has shown a high degree of convergence.

In CAMPFIRE where more than 90% of the financial incentives for CBNRM are earned from sport hunting quota setting is a crucial activity. Through the methodology for participatory quota setting the degree of proprietorship (ownership and control) of communities over wildlife has been enhanced. Proving that communities appreciate and can sustainably manage wildlife within their area, is an important step towards influencing policy for further devolution of legitimate control of wildlife to the ward level (sub district).

Points form questions and comments:

- It was mentioned in the presentation that Participatory Technology Development is a process, expensive and time consuming. Within CAMPFIRE it has been tried and used by WWF to develop socially possible, simple, technically robust and cost effective wildlife management techniques - one of which is Participatory Wildlife Quota Setting. This process was accomplished by working with selected rural communities in the Zambezi Valley of Zimbabwe.
- Quota setting rests on good and reliable data. Participatory wildlife quota setting involves all key stakeholders and is based on adaptive management principles. Wildlife population trend information other than absolute numbers is used in the quota determination process.

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Living Forests, a case study from Norway

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Since 1920 the Norwegian forest volume has doubled. This increase in volume however does not mean that enough is done to ensure sustainability in Norwegian forestry. In the 1980's the focus was therefore put on multiple use of forest resources to balance economical, ecological and social interests. The awareness of using the biodiversity in the forest in a sustainable way increased among several stakeholders including forest owners and government. The Living Forest project is a result of this awareness.

Living Forests is a broadly based project that ran from 1995 to 1998. The main objectives of the project were to create international confidence in the forest industry based on sustainable and environmentally friendly Norwegian forestry. All stakeholders participated in the project, including forest owners, forest industries, Nor-

wegian Government, trade unions, as well as consumers, recreational, women and environmental organisations. Forest owners and forest industries financed half of the project while the Norwegian government financed the other half.

In March 1998, the Living Forests project successfully completed a consensus among all 13 stakeholders on 23 performance level standards for SFM in Norway – the Living Forests Standards. The consensus was based on a thorough and comprehensive development process. The project ran test areas, launched Research and development projects and made comprehensive studies and documents preparing the Norwegian SFM Standards. Certification, skill building and communication (national and international) were also parts of the Living Forests project. The project included in addition market surveys and studies on the competitive climate of wood compared to plastic, aluminium, steel and concrete

Living Forests followed a defined strategy by first concentrating the work on defining how to manage Norwegian forests sustainable, and thereafter addressing the documentation issue. A consensus on how to organise certification in Norway was taken in June 1998. A study programme to implement the Living Forests Standards for SFM in Norway was finalised and launched spring 1999.

See also: <http://www.levendeskog.no>

Points form questions and comments:

- Classifying forest into "diverse forest" and "plantations/monocultures" is important in sustainable forestry and binding of carbon
- There are no plantations in Norway. Very little of the Norwegian forest is, however, untouched by man, i.e. most of the forest is semi-natural and relatively diverse.

Community approach for the conservation of Zombitse Vohibasia in the south of Madagascar: a successful example of community management of natural resources and a basic strategy of eco-regional conservation approach

Bernard Koto

WWF

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The 'Community approach to conservation in the south of Zombitse-Vohibasia' project of Madagascar has tested an original and innovative approach for management of natural resources based upon transfer of responsibilities to local populations and on restoration of traditional structures and values. The communities consist of the autochthonous *Bara* people and migrants. The *Bara* people are naturally involved in forest preservation that allows them to provide pasture for their cattle and to collect what they need (honey, medicinal plants etc). The migrants were originally heavily

involved in forest exploitation through slash and burn maize cropping, charcoal and firewood production. Currently aware of the negative impact of deforestation, they have become active protectors of the forest alongside the *Bara* people.

By their own initiative they have proceeded to formulate and execute a village pact (*dina*). The village pact comprises several clauses and clearly defines the rules and modalities of traditional management of natural resources: prohibition of new land clearing, enforcement of sanctions in the event of violation of the pact, development of follow-up of a collective surveillance system.

Local communities benefit from informal hands-on training and actively participate in a joint management of natural resources within the project. The project uses and restores the value of the local type of forest management and actively collaborates with the *Bara* people in the establishment and follow-up of a conservation system for the Zombitse Vohibasia national park. The project serves as an interface between communities that are able to express their need through design and implementation of micro-projects, and partners that represent potential sources of funding.

The outcome is very promising: skilful management of land clearing and production of charcoal and firewood, operationalisation of surveillance and inspections conducted by local communities. The experiences have been transferred to two other local communities.

Points form questions and comments:

- Mechanisms for resolving conflicts amongst communities are roundtable discussions, bring people together and sit down and discuss the conflict, and educate about the value of preserving the forest. Respect for local traditions is also important.
- The understanding of local traditions must form the basis for any local management plan. The local structure is the starting point, and from this it is possible to build management structures. This is the experience that can be transferred to other countries.
- Multiple users of the area all directly benefit from a living forest which is utilised in a sustainable way.

Community Participation in Coastal Fisheries Management

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It is widely accepted by governments, development agencies, NGOs and people's movements alike that local communities should participate, especially in the management of coastal fisheries resources. States,

especially in the South, have lacked the resources to put into place effective management systems, and this has led to the prevalence of *de facto* open access conditions. Moreover, short-sighted State policies and practice have not been effective in dealing with the problems of resource degradation, overexploitation and overcapitalisation.

Justifications for community participation in coastal fisheries management have been predicated on economic, ecological, technological and socio-cultural considerations. It has been pointed out that the participation of local communities can be very effective, since they have a long-term stake in the sustainability of resources and an in-depth knowledge about the resource base. Besides leading to several ecological, economic and social benefits, community participation can also result in better compliance with management regulations and a more equitable sharing of resources.

However, the 'fishing community' should not be regarded as a homogeneous entity, especially in the present context. This recognition is important since effective participation is dependent on the existence of democratic and equitable institutions at the community level. The absence such institutions can rarely lead to management systems that benefit all and that are socially and ecologically sustainable in the long term. The representation of those who labour at sea and of their families, as well as of men and women fishworkers, has be ensured.

At the same time, the extent to which community participation in the coastal fisheries management is effective will depend on the framework adopted for management of these resources. Whether community-based systems or nested management systems at the local, regional or national level under a fisheries co-management framework, are more appropriate, will depend on the nature of the resource and on the factors that influence it. What framework is appropriate in a particular context is best decided in consultation with local communities. It is also important to take account of traditional rights to access and use these resources (migrant and part-time fishers) while determining the appropriate framework. Denying access to migrant and part-time fishers to use the resource may only be required when this undermines the management system adopted.

Greater participation of communities in coastal fisheries management can be in the interest of States and several initiatives to facilitate and support greater participation can, and need, to be undertaken by them. This would include providing a legislative basis for community participation as well as providing a conducive and support environment for the emergence and sustenance of democratic institutions at the community level.

SESSION 12

FOLLOW-UP OF THE CONFERENCE

Conference chair: **Peter Johan Schei**

Research needs on sustainable use problems

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The Biodiversity challenge to science is to be able to produce results that, after transformation into a policy-oriented framework can be used to improve actions for a sustainable use of Biodiversity on local, national, regional and global scale. A prerequisite for all applied science is the support of basic knowledge and theory. The challenge is threefold, with the following crucial steps:

- To establish a high quality, balanced multidisciplinary (involving both social and natural sciences) cooperation between scientists to address the complex biodiversity issues. This cooperation should not only be 'cosmetic', but truly address the problems of managing biodiversity.
- To transform the scientific results into valid and generally applicable information to be used for policy-actions.
- To get this information accepted and implemented by policy-makers, sectors and other actors.

The role of the 'ecosystem approach' in international fisheries negotiations

Christopher Hopkins

ICES

Copenhagen, Denmark

The 'ecosystem approach' (more or less synonymous to the precautionary principle) contributes to fisheries management at the national level, i.e., vs. the public, the management structure, and administrative levels. This forms a basis for the bilateral and multilateral discussions and negotiations. The transboundary issues figure highly in fisheries management.

The political process needs consensus scientific advice while also recognizing risk, uncertainty, and the differential weighting of the issues. The practical constituents of the precautionary (or ecosystem) approach in fisheries are:

- Single species assessments and management taking into account critical multispecies and environmental interactions.
- Extension into 'ecosystem approach' involving priorities for target species and critical non-target species (e.g., targets and limits; harvest rules agreed among parties; recovery plans).

Investments in research and development must include making the scientific results operational in an advisory context.

We have seen a number of regional responses to the global issues related to sustainable fisheries, dialogue and interactions between "fisheries" and "environmental" commissions, and requests for ecosystem-related advice from countries and commissions.

Science needs to be pragmatic in terms of funding, practicalities and what can be achieved, and they need to maintain credibility among stakeholders.

The role of the 'ecosystem approach' in international forestry negotiations

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Forests simultaneously provide a wide range of social, economic, environmental, cultural and spiritual benefits and values. While some of these benefits are largely local, sub-national and national in scope, others extend beyond the borders of countries to the transboundary, regional and global levels.

A number of factors have contributed to the emergence of forests as one of the priority issues on the international policy and political agendas, including: i) deforestation, ii) degradation of subsistence value, iii) international trade in forest products, iv) environment, v) sovereignty, vi) evolving partnerships, and, vii) international agreements.

These international legal and non-legal conventions and agreements can be grouped in three categories: 1) Agreements devoted to forests and sustainable forest management (IPF) 2) Global environmental issues with a forest-related element (CBD, FCCC) and 3) International trade and sustainable forest management (WTO).

The agreement on Forest Principles and Agenda 21, the consensus reached by the IPF (endorsed by the UN General Assembly in 1997), are considered to be major milestones in the current international dialogue on forest policy. However, many complex and politically sensitive issues remain unresolved and the deliberations continue under the umbrella of the Intergovernmental Forum on Forests. The result of these deliberations is having a profound impact on how we view our forest heritage and on our approaches towards forest management.

Intense discussions in various international fora during the past years since the Earth Summit, have led to a consensus on a number of common elements of sustainable forest management world-wide, including the following:

- Forests and wooded lands should be viewed as ecosystems and managed for multiple benefits.

- Sustainable forest management includes sustained social, economic and cultural benefits as well as environmental values and services.
- There is a need to strengthen national and sub-national institutions that address matters related to forests.

This consensus is further developed at regional level (e.g. within the Pan-European process on the Protection of Forests in Europe) where criteria, indicators and guidelines for sustainable forest management were adopted. In Norway these criteria, indicators and guidelines form the framework for the national criteria, indicators and standards for sustainable forest management recently agreed upon within the programme called Living Forests.

Sustainable management of forests is an exceedingly complex task, particularly in countries that lack adequate scientific, technical and institutional capacity and strong political commitment. The decision-makers in many countries face difficult choices and dilemmas linked to their need to achieve economic development. Attaining sustainable forest management world-wide is complex and involves many challenges:

- To recognize diversities of priorities, approaches and capacities.
- To learn from our "experiments" with policy and with nature (adaptive management).
- To share our experiences with others, both successes and failures.
- To understand that political and policy time horizons are not synchronous with forestry and environmental time-horizons.
- To advocate cross-sectoral policy harmonisation; for example most stresses and negative impacts on forests and wooded lands are external to forest sector and originate in other policy areas such as agriculture, energy, transport and mining.
- To maintain forests and wooded lands of the world in a healthy and productive state in the collective interest of the global community.

The past experience with the international forest policy dialogue provides some important insights, including the following:

- Sustainable forestry is closely related to the level of economic development in a country.
- The ability to protect the forest resource is related to economic value.
- Sustainable forestry is a societal responsibility involving harmonisation of forest policy with policies of other sectors such as agriculture, energy, trade, environment and tourism.
- Forest policy may serve as an indicator of a country's commitment in that it involves long-term, in many cases future generations, perspective and planning horizon, cross-sectoral policy harmonisation and strong political commitment.

- Sustainable forestry is a collective global responsibility.

During the past years, intense international, regional and national deliberations, on forest policy and on approaches to sustainable forest management, have underscored the complexity of the task facing policy makers and forest managers.

Together with the concept of 'ecosystem approach', the concept of sustainability is the core concept in the international forest policy deliberations. Sustainability without any conditions attached is a powerfully attractive concept, but will be impossible to achieve in the absence of consensus on preferences and values amongst different interest groups, an additional challenge will come from changes in these preferences over time

Points for questions and comments:

- Given that the various international forest issues have such similar agendas the processes should be united into one.

Integrated Ecosystem Assessments: Catalytic Tools for the Ecosystem Approach

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Integrated ecosystem assessments provide an important tool for the 'ecosystem approach' to the sustainable use of biodiversity. An international steering committee has been established to explore the possibility of launching an international ecosystem assessment—the 'Millennium Assessment'—to help meet the information needs of the international environmental conventions and as a way to foster the use of ecosystem assessment approaches at local and national levels.

An ecosystem assessment is an analysis of the capacity of an ecosystem to provide goods and services important for human development. It includes both ecological and economic analysis and it considers both the current state of the ecosystem and its future potential. An ecosystem assessment could be conducted at a single site, for an entire country, or globally. Two fundamental features of an ecosystem assessment are: i) the assessment is spatially-based, ii) the assessment is multi-sectoral.

One of the most significant benefits of an 'ecosystem approach' to assessment is that it enables explicit treatment of the interlinkages, synergies, and trade-offs among both the factors changing the ecosystem and the impact of ecosystem change on the array of goods and services produced by the ecosystem. By looking at the entire array of goods and services provided by ecosystems wise decisions can be made that address the interlinkages among them. Analysis of

these trade-offs among ecosystem goods and services will become more and more important as human societies place ever greater demands on ecosystems for various goods and services. Sectoral approaches made sense when trade-offs among goods and services were modest or unimportant. But they are insufficient today, when ecosystem management must meet conflicting goals and take into account the interlinkages among environmental problems. Integrated, multi-sectoral assessments of the condition of ecosystems are becoming more and more feasible and they are likely to become an essential tool for resource management.

The goal of the proposed 'millennium assessment' (MA) is to improve the management of ecosystems around the world by helping to bring the best available information and knowledge about the condition and future prospects of ecosystem goods and services to bear on policy and management decisions. The two defining features of the MA are its substantive focus and its institutional relationships:

- The MA substantive focus is an analysis of the capacity of ecosystems to provide goods and services important to human development.
- The MA would be structured institutionally so that it would serve an IPCC-like function where the primary users of its findings, especially the international environmental conventions, would identify the information needs to be filled while independent experts would conduct the assessment and peer review and publish the findings. (The Intergovernmental Panel on Climate Change, IPCC, is an science body established independently of the Framework Convention on Climate Change that provides the FCCC parties with the state-of-the-art scientific information related to climate change.)

The first Assessment, planned to be undertaken between 2000 and 2004 would address:

- Current ecosystem extent and condition. What is the condition and value of ecosystem goods and services? What is the distribution of various types of ecosystems and what is the land- or resource-use pattern associated with them?
- Forecasting ecosystem change. What will be the impact on ecosystem goods and services of various changes in ecosystems such as increased nitrogen supply, climate change, biodiversity loss, more abundant invasive species and land use change?

The Millennium Assessment would emphasize ecosystem conditions at the turn of the millennium to provide baseline information for future assessments. The ecosystem assessment would be repeated at 5 to 10 year intervals and become a regular part of the activities of the international community. The Assessment would not set goals or advocate specific policies or practices (policy relevant but not policy prescriptive).

It would assess the natural and social science information underlying various scenarios or policy options, it would explain the implications of uncertainty for policymaking, but it would not make policy recommendations.

The 'ecosystem approach' to the sustainable use of biodiversity can be fostered by providing decision-makers with better information on the interlinkages and trade-offs among various ecosystem goods and services. Ecosystem assessments are a useful means of obtaining and disseminating that information. An international steering committee is now exploring the utility of launching an international ecosystem assessment process that could provide the international environmental conventions needed information on ecosystem goods and services while simultaneously fostering the use of ecosystem assessments at local and national levels.

Conclusions and recommendations: concluding remarks from the Conference chair (see also page 7 and 48)

Peter Johan Schei

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At this third Trondheim Conference on Biodiversity I have been encouraged by the way the presentations and discussions have consolidated and have developed further the Malawi principles on 'Integrated Ecosystem Approach'. We have also seen that there are already a number of examples of practical implementation of this type of balanced and inclusive strategy for the management biological resources. The 'ecosystem approach' has already adopted as the preferable implementation approach under the CBD, and this conference has confirmed that this approach, as outlined in the Malawi principles, may significantly contribute to the achievement of the broad, three-fold objectives of the convention. At the same time, we recognize the need that this approach is further developed by SBSTTA-5 and finally adopted by COP-5 in Nairobi next year.

It is also clear that close cooperation between the scientific community and local people/communities pays off tremendously when implementing this type of approach, and should be taken into account in future development and implementation of the CBD. The socioeconomic context has to be at the forefront in any assessment of biodiversity status and trends, and in order to be able to apply effectively methods and technology. To ensure the concerned and supporting participation of local stakeholders in implementation of the convention, 'there must be something in it for them'.

The findings of the Conference are also summed up in the 'Conclusions and Recommendations'-section on page 7 which was adopted by consensus and will sent to the secretariat of CBD. In addition to this summary,

there is an appendix on page 48 which sums up the findings of a working group on 'Problem oriented, case-based suggestions for programs applying the ecosystem approach'.

Closing address, Norwegian Minister of International Development and Human Rights

Hilde Frafjord Johnsen

In her closing statement, Hilde Frafjord Johnsen addressed the following issues:

Conservation and sustainable use of biodiversity are fundamental to fostering viable, long-term development. Conserving biodiversity is not just a matter of protecting wildlife in nature reserves. It is a matter of safeguarding the natural life-support systems on Earth - purifying the waters, recycling oxygen and carbon, maintaining the fertility of the soil.

At the threshold of a new millennium, the continuing loss of biodiversity is a telling measure of the imbalance between human needs and wants and nature's capacity to supply them. The more we learn about the functioning of nature, the more clearly we see the limits to the disruption that the natural environment can endure.

More ecologically based management systems offer a way of balancing short-term human interests and long-term ecological considerations. The Malawi principles, adopted by the parties to the Biodiversity Convention, provide a very useful framework for a holistic, integrated approach to conservation and sustainable use of biodiversity. But the knowledge base of this approach needs to be further developed.

In so doing, due respect must be paid to the fact that the major part - perhaps as much as 90 per cent - of the world's biodiversity and genetic material is to be found in developing countries. Thus the policy choices made in developing countries, and the action taken there, are decisive for preserving biodiversity. This in turn means that *development cooperation* - a means of influencing these choices - plays a key role.

Against this background, I would like to highlight a few of the issues discussed in the last few days, issues which I consider to be of fundamental importance. They are:

- the importance of attitudes and values,
- the need for effective institutions,
- the call for equitable sharing of benefits,
- the necessity of international cooperation, and
- the imperative of national implementation.

First, the role of **attitudes and values**. As a rule, what we do not value we do not protect. Unless we fully appreciate how important the ecosystems are for the quality of our lives - and, in some cases, for our ability

to maintain life at all - we are unlikely to make many of the hard choices and decisions needed to protect them. Societies must choose between alternative uses of the natural environment. Should a given wetland be preserved, or should the land be drained and converted to agricultural use? Should a particular forest be maintained in its current state, or should it be opened for logging? Should a park be maintained or converted to a parking lot? These are difficult questions. The way they are answered is of critical importance for the survival of species in the habitat involved, and for the functioning of the complex ecosystems of which they are a part - and we all are a part.

To make rational choices, we need to know both which ecosystem goods and services are provided by the environment and what those services are worth to us. The first item lies in the realm of fact, the second in the realm of value. Whenever we choose between alternative uses of the natural environment, we indicate, at least implicitly, which alternative is worth more to us.

Second, there is the need for effective **institutions at the international, national and local levels**, that is: institutions that can cope with existing and future challenges. Implementing the 'ecosystem approach' will require extensive changes in the way we manage our natural resources and ecosystems nationally. Conservation and sustainable use of biodiversity must become an integral part of social and economic development. It must be mainstreamed into all sectoral and cross-sectoral policies, programs and projects, wherever it is relevant. This will require much closer cooperation and coordination than is usual in the traditional sectoral approach to management of natural resources. Cooperation, coordination and coherent policies must be ensured at all levels, from local authorities through ministries and research institutions to international organizations.

Successful conservation and sustainable use of biodiversity depends on knowledge, resources and active participation by all the relevant stakeholders. This can only be achieved through transparent and democratic institutions that encourage participation in policy development, planning and implementation. Locally, nationally and internationally. And unless developing countries are fully integrated into our common efforts, our work will be largely futile.

Third, the **fair and equitable sharing of the benefits** we obtain from biodiversity is, in the context of the CBD, particularly related to genetic resources and relations between countries. On the global scale, certain groups of people are now living at the expense of others. This is readily apparent in the disruption and over-exploitation of the world's open-access resources and waste sinks. In many cases, allocation of land and water for different activities involves zero sum games. But ecosystem approaches and multiple-use manage-

ment can also result in *win-win* situations – improvements in both living conditions and the environment. Hopefully, this conference has broadened our knowledge base in this respect.

From my vantage point, the 'North-South' aspects of sustainable development and biodiversity conservation are crucially important. In my view, much more attention should be paid to the issue of technology transfer to developing countries. Fair and equitable sharing of benefits related to the use of genetic resources *originating in developing countries* represents another formidable challenge. We need to establish appropriate mechanisms to this end.

Fourth, continued **international cooperation** is essential in order to make the Biodiversity Convention an effective management regime. The practical and full implementation of the Convention requires further development of principles and guidelines. Moreover, and very importantly, its objectives and principles need to be integrated into the work of other international organizations and processes, wherever relevant. We must make sure that our policies are coherent and that our various efforts are coordinated, whether we are working through the UN system, the multilateral financial institutions, the WTO, NGOs or the private sector.

With regard to patents, the Norwegian Government's position is that the member states should maintain the right to exclude plants and animals from patentability. For us, this is an important principle in its own right. Given the geographical distribution of genetic material, sticking to this principle is also a matter of protecting the interests of developing countries. Moreover, in order to secure agro-biodiversity and food security, the access to genetic material should be as open as possible.

Fifth, the achievements the objectives of the Biodiversity Convention will ultimately depend on what we do at **the national level**. National development plans must take account of the value of biodiversity goods and services, and policies that lead to depletion must be corrected. Some years ago, the Norwegian Government adopted a truly multisectoral strategy for implementing the Biodiversity Convention. We are currently in the process of reviewing this strategy, and preparing a more detailed national biodiversity action plan. This will include specific action plans for all the relevant ministries, including my own - the Ministry of Foreign Affairs.

One of the main objectives of **Norwegian development cooperation** is to contribute to conservation and sustainable use of biodiversity. I have already given you one good reason why: this is matter of long-term global life-support. Moreover, poor people will always suffer the most and be the first to be adversely affected by environmental degradation.

Preserving biodiversity ultimately remains a *national responsibility* - not a donor responsibility. But in real life, many developing countries need a helping hand, in this field as in others. To help preserve biodiversity in developing countries, Norway's development assistance is heavily focused on *capacity building*. We support systems of information management, so that planning and management can be based on adequate, up-to-date knowledge. We stress the importance of a precautionary approach to the management and harvesting of biological resources. We support the active participation of developing countries in global efforts to manage biodiversity. We focus more on the *sustainable use* of natural resources than on traditional conservation.

Our dream for tomorrow is not merely to save the bare essentials of our planet, but to perpetuate its atmosphere, climate, landscapes, and diversity of life forms in a way that allows human life to prosper. As early as in 1910, Theodore Roosevelt put it like this: *'The Nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired, in value'*. Almost 90 years later, in the era of globalization, this challenge is a heavy weight upon our shoulders. It requires us to preserve natural systems that are rich and healthy enough to continue to support human welfare and economic activity, not only for the next decade, but for the next century and beyond. And only through science-based, sustainable use of natural resources can we safeguard the interests of future generations.

ANNEX I

WORKING GROUP ON SESSION 6 – CASCADING EFFECTS OF RESOURCE EXPLOITATION ON ECOSYSTEMS AND SESSION 7 – ECOSYSTEM APPROACH IN MARINE RESOURCE: PROBLEM ORIENTED, CASE BASED SUGGESTIONS FOR PROGRAMMES APPLYING THE ECOSYSTEM APPROACH

1. Building from, but also moving beyond the Malawi Principles, there should be a programme of work to integrate 'ecosystem approaches' into everyday management. Everyday management is done by people who work at many scales, from individual fishers, farmers, or forest harvesters through communities, NGOs, district governments, nations, private corporations, large eco-regions, and global organizations. There are already significant cases of success that will provide major input into the programme.

Everyday management works every day. It does not stop and wait for advice. The programme on the 'ecosystem approach', to be practical, should be opportunistic. It should offer advice, point out, or push into particular problems whenever it can help. This entry point could arise during any of the planning, monitoring, impact evaluating, resource allocating, or negotiating processes tied to a particular problem. The programme should develop and use:

- concrete cases,
- lessons learned, and
- guidelines

to assist everyday managers. [It could be named the Practical Ecosystem Approach Programme or PEAP.]

The programme should select problem entry points carefully. Managers should immediately see the benefits of using the approach to understand ecosystems and make better decisions.

2. To assist managers better, and to promote the 'ecosystem approach' by wider and wider ownership of shared concepts, the programme should define an "ecosystem" firstly by its trophic structures, flows, processes, and functions. This starting definition will focus the power of the approach by enabling managers at any scale to see new things about their problem, make clearer decisions, and choose better solutions.

Most ecosystem functions related to a problem are performed by a relatively small number of functional groups (or guilds) of species. Small means: on the order of ten rather than 100 or 1000. Managers from one field up through policy makers can analyze their problem in terms of ten (or fewer) functional groups and learn to apply the 'ecosystem approach' by themselves.

Cases:

- Coastal invertebrates in Chile
- Coral fish nurseries and choking algae in Caribbean islands
- Soil-building fungi and invertebrates in Brazilian conservation tillage systems
- Arthropods in Asian irrigated rice fields
- Savannas in Southern – Eastern Africa

3. The programme should prioritise action that supports managers in local communities. These communities are usually small (<1000 people). They have direct experience with and direct access to the functional groups of the ecosystem they will analyse when applying their own 'ecosystem approach'. These communities should usually act with mutually benefiting partners like, local government units, committed academics, neighbouring communities or NGOs. The programme should encourage local scientists and developers of technology in the communities to emerge, obtain new knowledge and act.

The programme should promote scaling up to regional and national levels led by these local communities, and based on their successes. Problem-specific partnerships can be the organic starting point for commu-

nities to build regional, national, and international alliances and movements applying the 'ecosystem approach'.

Cases:

- Caletas in communities of fishers in coastal Chile
- Partnerships of coastal communities with NGOs near coral reef fisheries in Philippines and Jamaica
- Pastoralists in Southern – Eastern Africa
- Rice-growing communities in Asia
- Organic cotton- farming cooperatives in West Africa
- Organic farming communities in the Himalayan foothills

4. One group of examples of applying an 'ecosystem approach' demonstrates the opportunities offered by consumer – producer alliances. Consumers buy selectively and support producers (and distributors) that conserve ecosystem functions in their production practices and supply chains.

Cases:

- Large scale forest management in Sweden based on ecosystem approaches certified by the Forest Stewardship Council
- WWF-Unilever initiated Marine Stewardship Council certified responsible fisheries
- Sainsbury's (UK) eco-labelling responding to consumer pressure for IP (integrated production) or organically produced foods from a number of suppliers in many countries
- Campbell's Soup 95% pesticide reduced production rules for intensive vegetable growing in Mexico and the USA
- Chocolate industry associations in Europe and North America supporting small scale sustainable production of cacao in West Africa and South America

5. 'Ecosystem approaches' help policy reforms at local, national, and eco-regional levels. These reforms include identifying and eliminating perverse subsidies, providing ecosystem-conserving incentives, re-allocating funds or other resources to empower local communities, or decisive national and international measure for rehabilitation of collapsed ecosystem functions.

Cases:

- Identifying ecosystem function-disrupting subsidies for:
 - reforestation with alien species
 - high tech, species or geographic range expanding, yield increasing fishing vessels and gear;
 - remote sensing of fish stocks;
 - agricultural pesticides in grant aid packages;
- moratoria and strict enforcement of the precautionary approach to rehabilitate collapsed fish stocks in Northeast and Northwest Atlantic [e.g. Canada and Norway]
- prohibition on use of *P. contorta* in Swedish forestry;
- local set aside areas for "loco" shellfish in Chile
- removing national and local pesticide subsidies to rehabilitate multispecies populations of arthropod predators in agricultural ecosystems in Asia and Africa
- local farmers campaigns leading to re-scheduled irrigation water delivery by national agencies for insect pest control in Java, Indonesia



The Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity is the third Trondheim Conference on Biodiversity and is hosted by the Norwegian Ministry of Environment in collaboration with the United Nations Environment Programme (UNEP). The organization and sponsoring of the Conference is a joint venture between the Norwegian Ministries of Environment, Agriculture, Fisheries, and Foreign Affairs.

The Conference is organized by the Norwegian Directorate for Nature Management (DN), which

is the executive body of biodiversity management under the Ministry, in cooperation with the Norwegian Institute for Nature Research (NINA), both based in Trondheim.

The preparations for the Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity (EASUB) is led by a Conference Steering Committee, chaired by Peter Johan Schei of the Norwegian Directorate for Nature Management. Mr. Schei is presently Negotiations Director and Senior Adviser to DN and the Ministry of Environment. In 1996-97

he was chairman of the Subsidiary Body on Scientific, Technological and Technical Advice (SBSTTA) under the CBD.

The Conference Secretariat is led by Conference Director Odd Terje Sandlund. He is presently Research Director at NINA's Division for Conservation Biology, and has been a member of the Norwegian delegation to all the SBSTTA meetings.

Further information is available at <http://chm.naturforvaltning.no> and <http://www.ninaniku.no>

The Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity. September 1999 - Trondheim, Norway