



**THE NORWAY/UN CONFERENCE ON THE ECOSYSTEM APPROACH FOR SUSTAINABLE USE OF BIOLOGICAL DIVERSITY: 6-10 SEPTEMBER 1999**

**BACKGROUND**

This Trondheim Conference was the third in a series on biodiversity. The first Trondheim Conference, held in May 1993, provided important scientific input into the first Intergovernmental Committee meeting of signatories to the Convention on Biological Diversity (CBD). The second, held in July 1996, addressed scientific and management problems related to alien invasive species and provided input into the second meeting of the CBD's SBSTTA and the development of the Global Invasive Species Program. The Trondheim Conferences focus on the multidimensional nature of CBD implementation, aiming to enhance cross-sectoral dialogue on biodiversity research and management and to contribute a solid basis for policy and management decisions.

**REPORT OF THE CONFERENCE**

**OPENING SESSION**

Peter Johan Schei, Norwegian Directorate for Nature Management and conference chair, introduced Guro Fjellanger, Norwegian Minister of Environment. Fjellanger addressed the inadequate state of knowledge on biodiversity's functions and the need to improve dialogue among politicians, policy-makers and scientists. She stressed coordination of action at the local level and supported local stewardship of resources. She noted that Norway is currently working on a second generation of its National Biodiversity Action Plan, soliciting input from a range of ministries to develop a tool for coordinated policy-making. Fjellanger, along with Anne Katrine Slungård, Mayor of Trondheim, welcomed participants to the city of Trondheim and officially opened the conference.

Kåre Gjønnes, Norwegian Minister of Agriculture, emphasized that an ecosystem approach to the sustainable use of forestry resources is a central topic of the conference and that it is Norway's aim to establish greater clarity in the balance between commercial use and long-term conservation of forestry resources.

Johannes Nakken, Norwegian Ministry of Fisheries, addressed national fisheries management and its significant contribution to Norway's economy. He outlined international agreements relevant to marine resources management, including the UN Convention on the Law of the Sea, the UN Agreement on Fishing on the High Seas, regional seas agreements and the CBD. On the issue of harvesting whales and seals, Nakken noted Norway's commitment to balanced use and ecosystem management, as well as its long-standing cultural traditions.

Shafqat Kakakhel, Assistant Secretary-General of UNEP, emphasized that the conference should contribute to the Malawi Principles. He specifically mentioned the work of the Ecosystem Conservation

The Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity took place in Trondheim, Norway, from 6-10 September 1999, and was attended by approximately 300 participants from 95 countries, representing governments, intergovernmental and nongovernmental organizations, and scientific and academic institutions. The conference was hosted by the Norwegian Ministry of Environment in collaboration with the UN Environment Programme (UNEP) and organized by the Norwegian Directorate for Nature Management and the Norwegian Institute for Nature Research.

The conference sought to build upon the results of the Workshop on the Ecosystem Approach held in Lilongwe, Malawi in January 1998, which developed a set of twelve principles and characteristics of the ecosystem approach to biodiversity management (the Malawi Principles). The conference's three objectives were to: contribute to a sound scientific knowledge base on issues related to the sustainable use of biodiversity; further develop the concept and principles of an ecosystem approach to sustainable use; and provide a forum for cross-sectoral and multidisciplinary dialogue between scientists and policy-makers on research and management issues related to the sustainable use of biodiversity, contributing to ongoing deliberations in other relevant fora.

Over the course of the week, participants met in nine substantive sessions on: the ecosystem approach and sustainable use; decentralization of resource management; management in dynamic environments; the socio-economics of sustainable resource use; cascading effects of resource exploitation on ecosystems; the ecosystem approach in marine resource use; the ecosystem approach in forest resource use; globalization versus decentralization; and case studies in the use of biological resources. There was also a panel debate on local resource management in the context of the WTO and GATT. A closing session on follow-up to the conference reviewed the recommendations and conclusions gathered from presentations, participant comments and informal discussions throughout the week. The outputs of the meeting will include: a brief summary of conclusions and recommendations; a Chair's Report; proceedings of the workshop, including presentations; and a peer-reviewed collection of scientific papers. These materials will provide input into the fifth meeting of the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and other relevant fora.

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Group, which has been instrumental in bringing together UNEP, FAO, UNDP, CBD, IUCN, WWF, UNESCO and the World Bank to address the objectives of the ecosystem approach at the global level.

Jeff McNeely, IUCN's Chief Scientist, highlighted the need for ecosystem approaches, recognition of ecosystem services and products and management at different geographic scales. He stated that the ecosystem approach is applicable to many sectors, human impacts, multiple uses and ecosystem restoration, while being more cost-effective than species management. Constraints to implementation include: market failures, insufficient knowledge, bureaucratic and political obstacles, lack of trust among stakeholders and conflicts of interest.

Laszlo Miklos, Slovakian Minister of Environment and Chair of the CBD's Fourth Conference of the Parties, emphasized the importance of an integrated approach to land resources management and the need to incorporate the entire landscape at the geo-ecosystem level.

Hamdallah Zedan, Executive Secretary of the CBD, noted previous Trondheim meetings' contribution to CBD implementation and stressed this conference's value for the next SBSTTA meeting, which will address the ecosystem approach and sustainable use. He stressed the need to continue developing the Malawi Principles and other guidance for implementing policy and management decisions. He recommended that participants also consider conservation and benefit sharing in the ecosystem approach, along with other cross-cutting issues under the CBD, such as indicators, incentives, alien species and taxonomy.

### **INTRODUCTORY NOTES – THE ECOSYSTEM APPROACH AND SUSTAINABLE USE**

Herbert Prins, Wageningen Agricultural University, reviewed the Malawi Principles for the ecosystem approach. Taking into consideration the CBD's objectives and the properties associated with ecosystems, Prins outlined the 12 characteristics of the ecosystem approach to biodiversity management that were identified at the Malawi workshop. They include, *inter alia*, that: management objectives are a matter of societal choice; management should be decentralized to the lowest appropriate level; ecosystems must be managed within the limits of their functioning; the ecosystem approach should be undertaken at the appropriate scale; and management must recognize that change is inevitable. In addition, he highlighted that the Principles are interlinked, and that those involved in implementing the ecosystem approach should remain accountable to their constituencies. Prins concluded by saying that the ecosystem approach should be utilized to overcome the shortcomings and deficiencies often found in classical nature conservation approaches, yet it is meant to supplement, not replace, other management options.

Edward Maltby, IUCN Commission on Ecosystem Management and Royal Holloway Institute for Environmental Research, talked on moving the ecosystem approach from principles to practice. He noted that the approach is not a static model, but provides a process for engaging stakeholders in managing biological resources. He stressed that it should integrate the conservation, sustainable use and equitable benefit sharing of genetic resources. Maltby listed deficiencies of classical conservation approaches, including, *inter alia*: failure to recognize the importance of ecosystem functioning, sectoral interests and linkages between nature and culture; a narrow focus on species or protected areas; lack of stakeholder participation in management; and an inappropriate distribution of costs and benefits. He outlined a number of constraints to implementing the ecosystem approach, including market and economic distortions, traditional social practices, natural forces of change and economic and social development. Citing examples of the use of the ecosystem approach, Maltby outlined a number of lessons learned on the need for, *inter alia*: close relationships with local stakeholders; investigation of sectoral interests; practical demonstration of simple techniques; guidance and support measures for local actors; and work at the appropriate scale. He recommended that scientists develop

knowledge for enhancing predictive abilities and contribute to the understanding of ecosystem structure and function, as well as spatial and temporal dynamics.

In the ensuing discussion, one participant stressed the difficulty of maximizing the interests of all stakeholders and the need to find a balance between achieving the Malawi Principles and existing realities. Responding to a question on how to implement the approach nationally, Maltby suggested starting with inter-agency communication and interaction and the use of independent authorities to coordinate such activities. Other questions addressed the constraints of national and administrative boundaries, land ownership and tenure and the physical limits of modifying ecosystem structures.

Bror Jonsson, Norwegian Institute for Nature Research, spoke about sustainable use, citing population growth, finite resources, over-exploitation and increasing resource consumption as major challenges. He also noted that unsustainable use can result from time constraints, a conservative management system and scientific uncertainty. He said the CBD provides a political and administrative approach for managing resources but questioned whether it is sufficient to secure the sustainable use of biodiversity. He emphasized that resource management and sustainable use can be improved by: limiting access to commonly owned resources, requiring cooperation among users, increasing flexibility through adaptive management and encouraging multi-sectoral strategic planning.

Responding to a participant's question on the increasing gap between rich and poor and its effects on sustainable use, Jonsson stressed that it is important to stabilize resource consumption in light of increased demands on biodiversity from rapid population growth.

Harold Mooney, Stanford University, spoke on biodiversity and ecosystem functions, presenting examples from marine and agricultural ecosystems that illustrate the complex interaction between human impacts and species. He noted that conservation efforts can have detrimental effects on other locations or species. Mooney reviewed scientific research examining links between such factors as species richness, resilience, functional groups, habitat fragmentation and nitrogen fixation. His general recommendations for managing ecosystems included maintaining species redundancies for provision of specific ecosystem services, protecting important functional groups and careful monitoring of keystone (or indicator) species. He called attention to invasive species, which will continue their encroachment given such favorable conditions as increased ecosystem disturbances and fragmentation, increased commerce and their adaptability to global change. He recommended, *inter alia*, paying more attention to complex systems, treating each management exercise as an experiment, linking ecosystem functioning with services and ensuring that scientific approaches address management needs.

In the discussion, one participant provided an example of one case in which Asian rice farmers manage their fields as ecosystems, thereby underscoring the potential contributions of agriculture. Another noted the difficulties of designing a policy-making system flexible enough to respond to adaptive management techniques. Others highlighted the fragmentation of scientific knowledge and the importance of taxonomic work.

### **DECENTRALIZATION OF RESOURCE MANAGEMENT**

Madhav Gadgil, Indian Institute of Science and the GEF's Scientific and Technical Advisory Panel, discussed promoting adaptive participatory management. Such management involves stakeholders in determining management goals, visualizing alternative management strategies, understanding system behavior on the basis of historical observations, monitoring and fostering stewardship. He suggested exploring new institutions and capacities to address the issue, such as adaptive management for the scientific and technical community, monitoring techniques for environmental managers, information manage-

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ment for industry and participatory management for local communities. He also noted the importance of linking planning and management at the local level with higher spatial scales.

In the following discussion, one speaker agreed with the importance of new institutions and capacities, especially for monitoring the sustainable use of biodiversity. Another inquired about how to define "stakeholder." Gadgil agreed that this issue should be further explored. Another participant stressed that conservation is most effective at the community level, considering that the bulk of biodiversity is found in rural areas.

Vivienne Solis Rivera, IUCN-Regional Office for Mesoamerica, spoke about the challenge of community-based management in Mesoamerica, noting the region's vulnerability to natural, social, cultural, economic and institutional factors. She highlighted and reinterpreted three of the Malawi Principles related to community-based management. On recognizing the inevitability of change, the ecosystem approach should also recognize and utilize the heterogeneity of social and cultural factors affecting natural resource use. On considering all relevant information, the focus on traditional knowledge should shift away from intellectual property regimes toward incorporating aspects of traditional and community management strategies. On incorporating all relevant sectors of society, practitioners should examine state and civil society interaction and strengthen democratic systems to promote participation, while recognizing environmental rights and obligations. She stressed the importance of equitable benefit sharing and the need to ensure the principles of prior informed consent, distribution of benefits and consensus on what constitutes ethical behavior. Solis presented information on the Mesoamerican Biological Corridor and its land use plans, as well as the recent Costa Rican Biodiversity Law and its approach to sectoral involvement, community rights, distribution of benefits and access to genetic resources. She noted the potential of the ecosystem approach for conservation, but only if it incorporates sustainable use and benefit sharing in the overall development process.

In the ensuing discussion, one participant asked how to balance the rights and obligations of local communities and how to achieve enforcement if decentralization fails. Solis noted that the process is long-term and adaptive, and that full stakeholder involvement in policy development should decrease the need for enforcement measures. Another participant inquired about the relation of intellectual property to the ecosystem approach. Solis stressed the need for a broad perspective, taking into account not just natural resources, but also knowledge of those resources and their management.

Rashid Sumaila, Norwegian Michelsen Institute, presented a study on the biodiversity and economic decentralization of fisheries. The objective of the study was to examine the interaction between biodiversity and human activities, with a focus on biodiversity concerns in fisheries. He cited biodiversity conservation, equity and distributional concerns, and optimal economic utilization as three main management goals for fisheries. Sumaila described a theoretical and computational framework that can be used to analyze the impact of different management scenarios (e.g., centralized versus decentralized models) on biodiversity conservation in a bio-economic model. He said this approach can aid examination of trade-offs between biodiversity conservation and economic and social considerations.

### MANAGEMENT IN DYNAMIC ENVIRONMENTS

Kenton Miller, World Resources Institute, explained the conceptualization and application of the bioregional approach. Miller described a bioregion as a territorial unit of planning and management defined by the geographical limits of human communities and ecological systems, which is large enough to maintain the integrity of the region's biological communities, habitats and ecosystems, yet small enough for local residents to consider it home. Bioregional management seeks to establish a political and institutional framework for cooperation among governments, communities and other stakeholders, with a planning process

that incorporates available information, goal setting, and evaluation and adaptation of management approaches. Within bioregions, Miller stressed the identification and effective management of core protected areas, buffer zones and corridors, and highlighted the range of ecological, economic, socio-cultural, spiritual and educational values, products and services that bioregions provide. He underscored the need to act now, while also preparing for environmental change from pressures such as climate change, population growth and invasive species.

During the discussion, participants noted the contribution of complementary activities such as WWF's work on ecoregion-based conservation and UNESCO's Biosphere Reserves. One participant commented that synergies to address interlinked environmental problems are developing among the Rio Conventions but that more progress is necessary at the national level. Another noted problems with administrative boundaries and management scale, as species have different migrational patterns and habitats that may not intersect with socially defined bioregions.

Rowan Martin, consultant, spoke on adaptive management as a tool for decentralized systems. According to Martin, adaptive management recognizes the inevitability of management interventions in higher order systems and that such interventions are characterized by inherent uncertainties. He added that adaptive management requires: a statement of provisional objectives for a system, a tentative plan for management interventions, a monitoring plan for data gathering and a feedback system that permits revision of management activities and objectives. He compared adaptive management to the classical blueprint approach, which assumes that it is possible to determine a set of cause and effect relationships that will enable the use of resources, knowledge or technology for desired changes. He emphasized that the latter requires considerable study in advance, whereas adaptive management allows for the immediate inception of a project. Although the blueprint approach still dominates mainstream methodologies, Martin said that biodiversity conservation at the ecosystem level cannot be achieved without adaptive management practices. Favoring a bottom-up, cascading institutional approach, he cited the setting of quotas for international sport hunting in Zimbabwe's communal lands as a successful example. Martin stressed that adaptive management should be decentralized to the lowest appropriate level and should be seen as an important research method and management tool.

Mike Sinclair, Fisheries and Oceans Canada, addressed adaptive management in Canadian fisheries, using the example of Ocean Management Areas (OMA) around Nova Scotia. Canada's 1997 Oceans Act requires fisheries to be managed within the broader context of integrated ocean management, taking into consideration multiple uses, ecosystem features and the precautionary approach. He noted the challenges of addressing different sectoral priorities (e.g., marine transport, aquaculture, oil and gas, commercial fishing, tourism) and integrating those, along with existing fisheries plans, into an overall ocean management plan. In Sinclair's example, three OMAs were created based on administrative and community boundaries, while recognizing that specific transboundary environmental issues would require decision-making at higher levels. Sinclair discussed the need to define ecosystem objectives, such as maintenance of biodiversity and habitat productivity, as well as relevant performance measures and reference points. Regarding governance, Sinclair stated that the different fisheries advisory councils and sector boards were asked to identify ecosystem objectives. That input would be provided to an overarching OMA council that could evaluate achievement of ecosystem objectives, ensure cross-sectoral representation and perform periodic assessments. He further stressed the need to build on present management structures, while recognizing that contentious issues, such as allocation and equity, might require top-down decisions from the ministerial level.

In the following discussion, one participant noted that pragmatic social definition of boundaries allows for local political mobilization and empowerment. Another asked about possible governance measures

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to address transboundary resource conflicts, and a final speaker asked how the CBD could address such disputes. Sinclair stressed the need to resolve transboundary problems before solving internal jurisdictional issues, and another speaker explained that Article 5 of the CBD requires Parties to cooperate on areas beyond national jurisdiction and on other matters of mutual interest.

Ian Cresswell, Australian National Land and Water Resources Audit, spoke on enhancing understanding of ecosystem conditions in order to maintain productivity and conservation through environmental auditing. He stated that the Australian National Land and Water Resources Audit was established to provide a better understanding of vegetation and broader ecosystem conditions to inform management at a landscape scale. He said the key focus of the Audit is to contextualize the status and trends in resource conditions within current management responses and to generate options for remedial action, development and protection. He also emphasized that the Audit's purpose is to build a sector-wide information base to meet natural resource management needs in such areas as: policy assessment and development, natural resource investment decisions, evaluation of program and policy performance and direct resource management. The Audit addresses such themes as water availability, dryland salinity, vegetation management, rangeland monitoring, agricultural productivity and sustainability, capacity for change and ecosystem health. Regarding the vegetation information system, Cresswell stressed the need to translate existing data, increase the system's flexibility and make it more responsive to user needs. On natural resource information management, he noted the importance of information access, exchange and management, as well as protocols and fundamental data sets. He emphasized that integration of a broad range of natural resource data is the key to providing useful tools for management and policy decision-making.

### **THE SOCIO-ECONOMY OF SUSTAINABLE RESOURCE USE**

Charles Perrings, University of York, spoke on the economy of fluctuating resources and the use of economic theory to assist ecosystem policy-making. He stated that ecosystems can be envisioned as complex dynamic systems with properties such as path dependence, sensitivity to initial conditions, non-linearities and discontinuous change around threshold values. He stressed that evaluation of environmental projects should entail a cost-benefit approach accounting for spatial and temporal externalities, and that valuation techniques need improvement. In assessing human impacts and ecosystem sustainability, Perrings presented a model noting two points of equilibrium for a given resource, such as fish stock. One point represents a condition prior to collapse, and the other reflects maximum sustainable yield. He said that the point of maximum sustainable yield is preferable as it can withstand greater ecosystem stresses and shocks. Finally, he stated that scientists should get more out of existing and unconventional data.

In the ensuing discussion, one participant suggested that economic information and traditional knowledge can provide long-term data useful for analyzing ecosystems. Another participant asked about the positive and negative aspects of property rights for meeting ecosystem objectives. Perrings stated that the scale of property rights (e.g., individual versus collective) needs to be appropriate for the issue, while cautioning that private property can be either a solution or a hindrance to solving environmental problems.

Daniel Janzen, University of Pennsylvania, spoke on biodiversity and ecosystem development as the primary tool for the survival of tropical wildlands. Janzen described the "gardenification" of nature, whereby humans cultivate and utilize natural ecosystems for products and services. He added that sustainable biodiversity development needs to combine the traditional park conservation approach ("save it"), the scientific and academic approach ("know it") and the commercial approach ("use it"). Using the Guanacaste Conservation Area in Costa

Rica as an example, Janzen asserted that a complex system of tropical wildland biodiversity can be managed as a multi-crop, multi-use and multi-tasked area. He also added that such ecosystems can be managed similarly to other socio-economic sectors through planning, investment, compensation, reinvestment, custodianship and technical upgrading. He cited orange peel decomposition in the conservation area as one example of an economic service that benefits the area's biodiversity and the people who use it. He further stressed the need for two sets of regulations in biodiversity conservation: one for the agricultural landscape and one for wildland areas. Overall, he advocated a "planning by doing" strategy and emphasized the need for a self-sustaining and decentralized wildland management process.

Regarding a question on the significance of the orange peel example, Janzen said that it exemplifies how one can establish a contract outside the norms of conservation management. Another participant asked about determining and maintaining the price of wild-life commodities. Janzen responded that to get a fair price one should negotiate as any commercial business would to sell a product.

Mary Shetto, Tanzanian Ministry of Agriculture and Cooperatives, addressed the institutional requirements for community-based management of land resources (CBMLR) in Tanzania. She showed a video on human pressures leading to environmental degradation and desertification in Tanzania's dryland ecosystems and community-based efforts to combat them. She noted that past conservation efforts focused mostly on soil and water, ignoring the social issues of food security and gender discrimination. Shetto then described the different stakeholders involved in land use, including rural households, village communities, urban dwellers/commercial sector, government and public institutions and the international community. She outlined their specific demands on and contributions to the management of terrestrial resources according to three land use classifications (reserved, village and general use). However, she noted that the land use demands of local communities and rural households are directly linked to their livelihoods, whereas other stakeholders can find alternatives. After describing the major constraints and conflicts in CBMLR, Shetto outlined the range of village and district level institutions necessary to promote effective management, including traditional institutions, village councils, farmers' groups, women's and youth groups, primary schools, religious groups and larger political bodies able to communicate local concerns to the national level.

During the discussion one participant noted the diversity of "communities" even at the same level. Regarding questions on tenurial security, Shetto responded that tenure is a key community need, as are alternative sources of livelihood, clear economic benefits and fair markets.

### **CASCADING EFFECTS OF RESOURCE EXPLOITATION ON ECOSYSTEMS**

Doris Soto, Universidad Austral de Chile, discussed the relevancy of ecosystem approaches in managing salmon populations and environmental services. Citing work in southern Chile, Soto noted the economic importance of salmon farming and its two key ecosystem needs: nutrient reutilization and proper water quality. She reviewed management efforts to enhance these services, coupling salmon farming and sport fishing with biodiversity use and management. She discussed efforts in freshwater and marine environments to increase bivalve and benthic populations in order to improve water quality and provide opportunities for sport fishing and mussel harvesting. Soto reviewed the successes of artificial freshwater and marine reefs in increasing species richness and biomass, restoring and sustaining longer food webs and enhancing nutrient recycling. She also noted the importance of surrounding forest ecosystems for maintaining water quality and availability.

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Responding to a question on the impacts of salmon on the ecosystem, Soto stressed the need to examine the issue at a regional or global scale. She also mentioned the need to consider national comparative advantages, such as fish meal production, and innovative aquaculture technologies to reduce adverse impacts.

Jean Carlos Castilla, Pontificia Universidad Católica de Chile, talked on the future of coastal marine communities and ecosystem approaches in invertebrate multi-species management and on the need for spatial "take" and "non-take" networking and connectivity areas. He focused on benthic marine invertebrates, small-scale fisheries and single and multi-species management plans. He noted some of the key elements of new management practices for small-scale benthic resources in Chile, including: the institutionalization of traditional fishing practices; supporting legislation; involvement of the fisheries industry; and territorial use rights in fisheries (TURFs). Since fisheries legislation was enacted, Castilla emphasized that Chile has integrated marine conservation units with TURFs through a spatially connected model for multi-species and ecosystem management. He highlighted that the initial experiment with a small spatial scale approach for TURFs has expanded to 160 units at the national scale. According to Castilla, this up-scaling presents new challenges, such as the implementation of direct stock assessments, larval transport and connectivity and ecosystem co-management approaches.

In response to a question regarding whether he had taken note of IUCN protected management categories for marine protected areas (MPAs), Castilla responded that he had not and stressed he was more interested in a country's needs than in definitions. When asked about the role of community monitoring, Castilla said that local communities were being trained to do assessments.

John Munro, International Center for Living Aquatic Resource Management, spoke about the impact of fisheries on coral reef systems. He reviewed different forms of reef systems and their species, along with a variety of reef fishing methods. He noted that coral reefs are mostly fished by small-scale users from impoverished areas, generally as a last economic resort. According to Munro, catch value in conventional economic fisheries generally increases, peaks and then decreases, while both fishing activities and costs continue to increase. He stated that coral reef fisheries are different since the cost curve is not as steep, given simpler methods; thus there is no economic brake on overfishing. Citing studies from Jamaica and Tortuga, he noted that populations of larger fish tend to decline first, so smaller species tend to predominate in such systems. Munro stated that species stocks with longer pelagic larval lives have a better chance of survival, as they can be replenished from spawning grounds in upstream areas. He further noted that upstream species depletion may prevent restoration of downstream stocks, possibly resulting in a cascade effect on other populations. Munro stressed the need for MPAs to facilitate fish stock restoration and mitigate human stresses on reefs.

Responding to a question on introducing larvae into depleted areas, Munro stated that such fish stock enhancement has not yet been done in the context of coral reefs, but could be a tool to be combined with MPAs. Munro mentioned other impacts (e.g., global warming, sedimentation, effluents) on coral reefs, although their interaction is still not understood.

Michel Loreau, Ecole Normale Supérieure de Paris, covered issues relating to the implications of ecological and evolutionary species and ecosystem interactions for conservation. He emphasized that species and ecosystems are bound together by mutual ecological constraints and a shared evolutionary history, and that in the long term it may be impossible to conserve one without conserving the other. Using the evolution of plant-herbivore interactions as an example, Loreau noted that even though herbivores have a direct negative effect on plants through biomass consumption, they could have a positive effect on plants through nutrient recycling. He underlined that the positive ecological

effect of this interaction contributes to evolutionary mutualism. He also raised the issue of biological invasion and the major threat it may pose to the biodiversity and preservation of ecosystems. He noted that local invasions in plant ecosystems generally fail, but exotic species introduction can replace entire resident communities. He added that by understanding evolutionary constraints, one can realize the adverse impacts of biological invasion. Loreau stressed the importance of developing an ecosystem approach to preserve species while also focusing on species conservation in order to protect ecosystems.

In the discussion that followed, comments were made about the rate at which species respond to evolutionary changes. Loreau responded that scientists were only beginning to understand rates of evolution, but evidence shows that larger animals can respond faster to environmental changes.

### **THE ECOSYSTEM APPROACH IN MARINE RESOURCE USE**

Åsmund Bjordal, Norwegian Institute of Marine Research, spoke on applying the precautionary approach to sustainable fisheries management. He noted that current fishing capacity exceeds net production of marine resources, and thus creates a need for tools to improve decision-making so as to avoid fisheries collapse. Bjordal described reference points for determining levels of sustainability, including: the lowest biomass limit for maintaining a fish stock; a precautionary limit to ensure that the lowest limit is avoided; a fishing mortality limit beyond which population dynamics are unknown or a stock collapses; and a precautionary fishing level to prevent exceeding the mortality limit. Sustainable fisheries management aims to keep biomass over the precautionary biomass limit and fishing levels under the precautionary extraction level. He provided the example of the Norwegian spring-spawning herring, which collapsed in 1972 due to a large annual catch and unfavorable environmental conditions. After a ban on fishing, the stock recovered and a regional agreement was signed to moderate catch size. Bjordal asserted that responsible fisheries management necessitates concrete objectives, quality biological advice, informed catch limits and control measures to prevent overshooting limits and by-catch. He stressed that sustainable fisheries are both indicators of and tools to improve the health of marine ecosystems. In closing, he noted that pollution is currently the most severe threat to marine ecosystems and the use of their living resources.

In the discussion, speakers mentioned the negative impacts of land degradation, siltation and other human activities on marine ecosystems. Responding to questions on long-term effects of pollution versus overfishing, Bjordal emphasized that fish stocks can recover faster from over-fishing through proper management techniques.

Christopher Hopkins, International Council for the Exploration of the Sea (ICES), addressed integration of fisheries and environmental issues in relation to the evolution of the ecosystem approach. He provided background on developing the precautionary approach in fisheries management and integrating fisheries and environmental issues. He noted that principles guiding fisheries management include: utilization of the ecosystem in a manner consistent with sustainable development; biodiversity conservation; implementation of relevant global and regional agreements; application of the precautionary approach to the management of living marine resources; further integration of fisheries and environmental protection; integration of environmental objectives into fisheries policy; and involvement of fishers and other relevant stakeholders. Hopkins then emphasized that commitment to action requires the maintenance of spawning stock biomass, protection of species and habitats, control and enforcement, consideration of science and technology and economic impacts, implementation and review of progress. He stated that further evolution towards the ecosystem approach requires, *inter alia*: reference points for commercial target species, quantification of fisheries' effects on non-target species and the establishment of broader conservation measures, including MPAs.

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Regarding a question on the complementarity of the ICES process and the CBD's objectives, Hopkins responded that there was no conflict with ICES or its approach for providing scientific advice. Another participant added that the Biosafety Protocol and other agreements need to be taken into consideration when dealing with adverse environmental impacts on fisheries.

Karen Weaver, Convention on Migratory Species, spoke on by-catch in fisheries and sustainable fisheries management. She stressed that access rights should be secured and open access regimes reformed, and that management should shift their focus from fisheries to human activities. She noted that type of by-catch generally correlates with particular fishing methods (e.g., seabirds with longline fishing, turtles with shrimp trawling). Weaver stated that responses to reducing by-catch have generally been technical in nature and due to external pressure, rather than taken at the fishing industry's own initiative. She then reviewed international legal instruments and the growth of an international environmental consciousness focused on icon species (e.g., seals, dolphins, whales). She also cited examples of domestic legislation with trade implications, eco-labeling programmes such as "dolphin friendly" labeling, and third party verification systems such as the Marine Stewardship Council. She briefly reviewed Australia's oceans policy, which includes a framework for assessment, allocation and management, and the development of regional plans incorporating MPAs, sectoral conflict resolution and long-term security for resource users.

Responding to a question about whether by-catch causes species extinction, Weaver queried whether extinction is the appropriate criterion and suggested that the question should be what level of ecosystem change is acceptable. On the issue of shifting to more sustainable fishing technologies, she noted that fishers have generally responded more to political and social driving forces and less to economic forces.

Ransom Myers, Dalhousie University, spoke on over-exploitation and extinction in the ocean. He described how many local populations of fish have nearly been driven to extinction, such as the barndoor skate. He also mentioned the collapse of other fish stocks, such as cod, haddock and salmon. In some cases, Myers reported that certain sub-populations of fish have become extinct. He dismissed the belief that collapses were caused by such phenomena as cold water conditions, foreign fishing and seals, and said that they were primarily due to domestic over-fishing. He criticized the amount of subsidies provided to the fishing industry, citing Canada as an example, and said that such subsidies compound environmental damage by increasing fishing capacity. By using meta-analysis, the compilation of world data on fish stocks, to estimate population dynamic parameters, Myers said it is possible to estimate conditions under which over-exploitation and extinction could occur and determine which management actions (e.g., reduced fishing mortality, marine reserves) could support the long-term viability of marine populations. He concluded by saying that the extinction of fish stocks can be prevented through rational exploitation strategies, by eliminating subsidies and creating large MPAs to preserve samples of pristine ecosystems.

### **ECOSYSTEM APPROACH IN FOREST RESOURCE USE**

Jeffrey Sayer, Center for International Forestry Research, discussed the application of ecosystem management to forests. He stated that humans once managed forest ecosystems sustainably, but lost this ability as resources and capacity were over-stressed or societies broke down. He said that recent attempts to return to ecosystem management have generally relied on a scientific and technology-driven vision of management. Sayer supported a plurality of management approaches that incorporates flexibility, adaptability and experimentation. He contrasted existing assumptions and characteristics with a potential new management paradigm, in terms of: simplified versus complex systems, predictability versus unpredictability, steady state versus dramatic change, management units versus landscapes, components versus systems, maximum versus optimum yield, single versus multiple prod-

ucts, externalities versus environmental services and single best way versus multiple choices. Sayer stressed the need to move from command and control management to collaboration and adaptation. He listed a number of key recommendations for managers, including, *inter alia*, to: minimize power differentials amongst stakeholders, facilitate decision-making, ensure transparency, optimize total utility of all products and services, eliminate free-riders, represent the interests of absent stakeholders and minorities, enforce the law, collect taxes and represent all interests fairly in resource assessments.

Richard Steiner, University of Alaska, spoke of the global forest crisis and the tragedy of government inaction. He stressed that the forest/biodiversity crisis is one of the most important issues of today, citing coastal temperate rainforests as one of the world's most extensively degraded ecosystem types. He said that the crisis is resolvable, but is impeded by governmental inertia, the dominance of short-term industrial interests and public apathy. In a series of recommendations, Steiner called for: an official CBD declaration of the global forest crisis; protection of all remaining frontier forests; restoration of at least 20% of harvested forest lands; implementation and enforcement of sustainable forestry in all managed forests; improvement of plantation management to increase intensity of wood production; reduction of forest product consumption; resolution of environmentally-related trade issues; establishment of a global forest protection fund; and establishment of a World Environmental Organization or an increase in UNEP's authority.

When asked about the difficulty of extending protected forest areas in developing countries, Steiner suggested that this could be a role for a global forest conservation fund. One participant commented that the forest crisis has been highlighted by the Intergovernmental Forum on Forests (IFF) and that a global conservation fund has been advocated in the past, but the international community is not prepared to create a new funding mechanism.

Hans Verolme, Biodiversity Action Network, addressed the underlying causes of deforestation and forest degradation. He reviewed an international process, involving seven regional and one indigenous peoples' workshops which led to a Global Workshop in Costa Rica in January 1999, that provided input on this subject to the IFF. He expressed dismay at the IFF's failure to incorporate the key recommendations and concerns identified through this process into its work and at government attempts to re-negotiate prior commitments. The process identified concerns around four major themes, including: land tenure, resource management and stakeholder participation (inequitable distribution of costs and benefits, land tenure inequities, indigenous rights, role of government versus other stakeholders, dominance of industrial interests, lack of participation, corruption, military dictatorship); trade and consumption (over-consumption, over-production, impacts of free-trade); international economic relations and financial flows (inappropriate development strategies, debt generation, weak governance, perverse subsidies, private capital flows); and valuation of forest goods and services (non-recognition of non-timber forest values, failure to incorporate traditional knowledge, inadequate legislation and management capacity, inadequate data for resource assessments). Verolme noted the need to operationalize the ecosystem approach and other CBD commitments in national action plans, especially with regard to sustainable use and benefit sharing. He listed some key challenges, including identifying stakeholders, developing a strategy for research objectives, creating ownership of results, linking local realities and international policy, and utilizing existing information and research better.

Sten Nilsson, International Institute for Applied Systems Analysis, spoke on boreal forests and biodiversity in Russia. In identifying future sustainable development options and policies, Nilsson noted that forest biodiversity in Russia could be conserved through protected areas, biodiversity-sensitive forest management and efficient landscape management. He said that Russia has a good network of specially protected nature reserves, *zapovedniks*, yet the country is now experiencing major forest disturbances from fires, pests and disease, soil erosion, sulfur and

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nitrogen deposits, land use change and timber harvesting. He also cited other obstacles to forest conservation, such as inconsistencies in current environmental legislation, lack of participatory mechanisms and little stakeholder dialogue. He noted that forest biodiversity is scale-dependent in Russia and future biodiversity policies must address the interaction between different ecosystem scales. He concluded by emphasizing the importance of social and economic considerations when dealing with forest management issues.

Responding to a question on suggestions to help Russia conserve its biodiversity, Nilsson expressed support for direct funding of specific projects or managed areas. When asked if Russia could implement large-scale industrial forest management practices, Nilsson affirmed that it could, but said such practices would have to incorporate principles relevant to Russia.

Jeff McNeely, IUCN, spoke about incentives and constraints related to communities dependent on sustainable use. He noted that rural people living in poverty are the most directly dependent on biological resources, yet least able to tap into the market. He stated that conceptions of sustainability must embrace ecological, economic and socio-cultural factors and that sustainability also varies according to the stakeholder, location and time. He listed other pertinent issues, including user commitment, the balance between individual and social benefits, stakeholders' rights, the state's willingness to allow significant commercial benefits to disadvantaged communities and subsidization of unsustainable use for national development. McNeely provided a number of prerequisites for sustainable use at the community level, including clear tenure rights, sufficient knowledge for managing a resource, feedback and adaptive management, appropriate legislative frameworks and social pressure. He concluded by asserting that sustainable use is a variable, not a constant; that it may be more attractive than unsustainable commercial harvesting for local subsistence; and that a combination of approaches is needed, ranging from strict protection to sustainable and intensive uses.

In the discussion some speakers noted that local communities often choose commercial harvesting over sustainable use. McNeely stressed that the question is whether such actions will be sustainable in the long-term.

### GLOBALIZATION VERSUS DECENTRALIZATION

Peter Bridgewater, UNESCO, discussed the globalization of socio-cultural values and the ecosystem approach. He stressed the importance of cultural diversity and the consideration of the cultural dimensions of biodiversity management, conservation and use. He added that management is a matter of social choice and that the ecosystem approach should involve all relevant sectors of society and scientific disciplines. He noted that globalization is not just an economic phenomenon, but also a cultural, technical and environmental one. Bridgewater stated that globalization tends to contribute to a lowest common denominator approach, thereby ignoring aspects of cultural diversity. He emphasized that there is a need for more sensitivity to cultural issues, and that the key to the ecosystem approach is peoples' relationship to the biosphere and the way that relationship is managed.

Responding to a question on building international consensus, Bridgewater noted that although it is important, it is also necessary to agree to disagree. Regarding local landscapes, one participant noted the need for a "red list" of languages in danger of extinction as a way of highlighting cultural dimensions.

Jan-Eirik Sørensen, World Trade Organization (WTO), addressed the compatibility between the WTO framework and environmental agreements. He briefly outlined the WTO's major principles of non-discrimination, trade liberalization and removal of barriers to trade, as well as its dispute settlement system. He noted WTO preambular language on the optimal use of natural resources and sustainable development. He listed parameters for mutually supportive trade and environmental measures, including: the positive role of trade liberalization

in proper pricing; the right to set environmental protection standards provided that they are not discriminatory; and the WTO's openness to integrating developing and least-developed countries into the world economy. He noted that discussion around the WTO and CBD has generally focused on the Agreement on Trade-Related Intellectual Property Rights (TRIPs) and specifically Article 27.3(b), which addresses biotechnological inventions and plant varieties. He listed areas of contention, including the definition of *sui generis* regimes for such protection, the patenting of life-forms and genetic material, access to environmentally sound technologies and the protection of traditional knowledge. He asserted that TRIPs could be a powerful instrument for benefit sharing in the area of traditional knowledge.

Ricardo Melendez-Ortiz, International Center for Trade and Sustainable Development (ICTSD), spoke on the issue of trade and environment within the context of globalization. He stressed the need to make sustainable development a main objective of trade policy-making and the trade system. He described the trade regime as a pyramidal, hierarchical set of norms, rules and common principles; the environmental regime as a proliferation of problem-based, *ad hoc* norms and diverse approaches; and the development regime as a variant of income growth-based strategies. Overall, he said the different regimes were comparatively incoherent, uncoordinated and unequal. On transparency, he emphasized relations with civil society, coordination with other international bodies, and compatibility between WTO provisions and actions related to environmental protection in the framework of regional and economic integration. He concluded by noting that the challenge ahead lies in pushing the trade system to agree on a shared vision with the environmental regime.

### PANEL DEBATE: WHAT CHANCE FOR LOCAL RESOURCE MANAGEMENT IN THE TIMES OF GATT AND THE WTO?

The panel debate, moderated by Kjetir Gravir (NRK Radio), included Ricardo Melendez-Ortiz (ICTSD), Jan-Eirik Sørensen (WTO), Jose Sarukhan (Mexican National Committee for the Knowledge and Use of Biodiversity), Holly Dublin (WWF-East Africa Regional Office), Subramonia Ananthkrishna (FORUM) and Robert Monro (Zimbabwe Trust). On the issue of bringing environmental issues into the WTO, Ananthkrishna noted that environment-trade conflicts need to address root causes, such as subsidies. Sørensen agreed, citing the potential of the WTO to address subsidies in areas such as fisheries and agriculture, which are price distorting and environmentally damaging. Monro argued that trade is not necessarily the issue, as national policies and practices are often the cause of unsustainable resource use. Melendez countered the perception that developing countries are being dragged into the WTO framework, stating that they are looking for a rule-based system to protect them in international markets and that any discussion of environmental matters also needs to address economic development. Sarukhan noted that global markets generally support productive efficiency over resource efficiency, and that this compromises sustainable use efforts. Monro asserted that biodiversity is the biggest comparative advantage of developing countries, and highlighted the double standard of calling for devolution of management while prohibiting commercial production by local users. He added that if local communities are not allowed to profit from their surrounding biodiversity they will replace it with products that do have market value, such as monoculture crops. Dublin noted that in environment-trade issues the most affected stakeholders are often left out, as in the case of the ivory trade. She stressed the importance of scale, noting that local trade is often sustainable and that local examples of sustainable trade could provide a basis for addressing resource management through the WTO.

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### *SUCSESSES AND FAILURES: CASE STUDIES IN THE USE OF BIOLOGICAL RESOURCES*

Norman Rigava, WWF–Southern Africa Regional Office, talked about wildlife quota setting in Zimbabwe's Communal Areas Management Program for Indigenous Resources (CAMPFIRE). He detailed CAMPFIRE's efforts to improve the well-being of rural communities in response to centralized planning's failure to protect wildlife resources. He discussed WWF's process of participatory technology development (PTD), which incorporates scientific and indigenous knowledge to develop simple, cost-effective and socially acceptable technologies and management techniques. He reviewed the adaptive process of wildlife quota setting through PTD, which uses several data sources such as aerial surveys, trophy quality, ground counts, and stakeholder information. Such information is triangulated and presented in visual form at district level participatory workshops, where quotas are readjusted based on data trends. The Zimbabwe Department of National Parks and Wildlife Management reviews the revised quotas and provides technical input for approval. Rigava noted that participation in quota setting provides financial incentives and a rationale for communities to monitor wildlife populations and sport hunting, while empowering them by developing skills and knowledge. He stressed that efforts for community-based natural resource management should maximize local incentives and local control within a legal framework.

One participant noted ongoing efforts in Zimbabwe's agricultural sector, where local communities are combining their knowledge with scientific data for adaptive management of cotton farming. He asserted that such processes empower communities to develop defensible scientific positions vis-à-vis governments and other external actors. Another speaker raised the issue of data quality, stating that use of poor indicators may complicate the quota setting process.

Berit Sannes, Norwegian Forest Owners Federation (NORSKOG), presented a case study on the Living Forests sustainable forest management project in Norway. She said the project, started in 1995, was established to develop national performance standards for sustainable forest management in Norway and included such stakeholders as forest owners, the forest industry, government, trade unions, consumers and NGOs. She noted that the project consisted of several working groups that addressed issues relating to market demands, competence building, information and criteria and indicators for sustainable forest management. According to Sannes, Living Forest standards incorporate guidelines on, *inter alia*, forest area protection, water protection, long-term wood production, cultural landscapes, ecological processes in forested areas and heritage sites. She highlighted that one of the project's main criteria called for the maintenance, conservation and appropriate enhancement of biodiversity. She said that the Living Forests project also reached a consensus on criteria for certification, the main objective of this being to contribute toward achieving sustainable forest management in Norway and improving market access for products from Norwegian forest industries.

Responding to a question on distinguishing between plantations and "real" forests in Norway, Sannes responded that plantations are not a realistic alternative for sustainable forest management. She stated there are no plantations in Norway, but rather semi-natural forests.

Bernard Koto, WWF–Madagascar, spoke about a project employing a community-based approach to conservation in Madagascar's Zombitse-Vohibasia National Park. He reviewed regional social dynamics between the traditional Bara people and migrant communities who have increased pressures on natural resources. He also described the legal and institutional framework for this adaptive ecoregion-based approach, specifically the Gelose Law, designed to increase community responsibility over natural resource management. He stressed the project's strategy to empower local communities and their traditional chiefs and to increase respect for traditional values and structures, such as the *dina*, a social pact for communal management within villages.

Koto emphasized that sustainable development requires participation of local communities, alternative development activities and sources of income, and partners for realization of community micro-projects. He noted a number of important components for sustainable management, including: transfer of responsibilities to local communities; respect for traditional values, culture and structures; engagement of the state and its legal and institutional frameworks; partnerships for implementation; information sharing; flexibility; multi-disciplinary ecoregion conservation teams; and continual learning.

Responding to a question on conflict resolution mechanisms, Koto emphasized bringing stakeholders to the table and going into the fields to identify and understand community priorities. He also stressed the need to identify traditional management structures and develop mutual confidence between project staff and communities.

Chandrika Sharma, International Collective in Support of Fishworkers, spoke on community participation in coastal fisheries management. She stressed the need for communities to be involved in all aspects of fisheries management, and for greater understanding of the nature of community, public participation and principles of fisheries management. She also cited several justifications for communities' involvement in coastal fisheries management, including: their long-term stake in sustainability; their in-depth knowledge of resources; and their need for effective enforcement of management regulations, equitable access to resources, and ecological, economic and social benefits.

Sharma emphasized the importance of identifying the primary stakeholders involved in fisheries management, particularly seasonal and migrant fishers, and also the role of women. She stressed that governance frameworks are important for effective resource management and that they must distinguish between property rights and traditional rights and access. She noted that the State could improve fisheries management by developing and strengthening institutional capacity at the community level, giving subsidies to help fishing communities and providing communities with the best available science.

Responding to a question on the relevance of women in coastal fisheries, Sharma responded that women tend to be invisible in the management process, but are an important part of the fisheries sector and need to be taken into account.

### *FOLLOW-UP TO THE CONFERENCE*

Tor-Björn Larsson, Swedish Environmental Protection Agency, talked about biodiversity research priorities and needs within the European Union. He stressed three steps in enabling research programs to support the CBD: multi-disciplinary cooperation, transformation of scientific results into policy-relevant information and acceptance of such information by policy-makers. He discussed the research agenda of the European Working Group on Research and Biodiversity, established in 1996, which examined biodiversity valuation, threats to biodiversity, relevant scales and measures, sustainable use and management. Larsson also detailed specific focus areas in the EU Biodiversity Strategy, addressing agriculture, fisheries, forestry, natural resource conservation, tourism and hunting, regional and spatial planning, energy and transport. He noted this year's research program priorities of global change in climate and biodiversity, as well as sustainable marine ecosystems.

Christopher Hopkins, ICES, spoke on the role of the ecosystem approach in international fisheries negotiations. He noted different levels of negotiation: national engagement levels and infrastructural organization (public, scientific, administrative/managerial); bilateral agreements (country to country); and multilateral agreements (international regulatory commissions). Hopkins stressed the importance of transboundary issues, such as the temporal and spatial nature of fish, fisheries and environmental effects, and highlighted the need to strengthen the relationship between scientific information and political decision-making at the international level. He said the political process needs consensus on scientific advice, while also recognizing levels of

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risk, uncertainty and the range of issues. He added that one of the best ways to achieve consensus is to develop agreed resolutions with terms of reference and then use expert working groups and peer reviews. Hopkins emphasized a regional response to global issues through such institutions as FAO at the international level and regional fisheries bodies and commissions. He concluded by saying there is further need for national and regional exchange of knowledge and capacity-building.

Knut Øistad, Norwegian Ministry of Agriculture, discussed the role of the ecosystem approach in international forestry negotiations. He reviewed several issues related to international forest discussions, such as deforestation, international trade, ecological services and benefits at different spatial scales, sovereignty over economic development, evolving international partnerships and the role of international agreements. He noted three tracks of policy deliberation, on: international trade (World Trade Organization, International Tropical Timber Agreement, Convention on the International Trade of Endangered Species); sustainable forest management (Agenda 21, Forest Principles, Intergovernmental Panel on Forests and Intergovernmental Forum on Forests); and global environmental issues (Conventions on Biodiversity, Climate Change and Desertification). Øistad suggested that a framework of institutional development priorities incorporate national forest programs, build political commitment, formulate and apply criteria and indicators, promote participatory processes and develop monitoring and assessment measures. He noted key challenges for policy-makers, including: recognizing a diversity of priorities, approaches and capacities; learning from experience, in both success and failure, in order to enhance adaptive management; coordinating political decision-making time horizons with the reality of forest problems; and harmonizing cross-sectoral policies, especially with agriculture, transport, energy and mining.

Walter Reid, World Resources Institute, discussed integrated ecosystem assessments as catalytic tools for the ecosystem approach. He highlighted the efforts of the Millennium Assessment of the state of the world's ecosystems. It focuses on assessing the capacity of ecosystems to provide goods and services important for development, as well as directly linking scientific assessment findings to users. Reid recognized trade-offs between goods and services as a key issue of ecosystem assessments and underlined some future projections that incorporate such trade-offs. These projections address issues such as food production, water services, timber fiber, wood fuel, carbon sequestration and biodiversity services. He noted that the Millennium Assessment features: scientific independence and peer review; a dual focus on capacity-building and analysis; demand-drivenness; and involvement of the best natural and social scientists. He also said that its exploratory Steering Committee includes several international institutions, such as UNDP, UNEP, UNESCO, IUCN, GEF, FAO, the World Bank and others, and has input from the scientific community. According to Reid, the Assessment focuses on the condition and value of various ecosystem goods and services, and information and tools for forecasting the future consequences of today's actions.

Conference chair Peter Johan Schei, Norwegian Directorate for Nature Management, presented the conclusions and recommendations to participants (summarized below). They were assembled from conference presentations, participant comments, survey forms, informal group discussions and a plenary discussion held earlier in the day. The recommendations were approved by applause. Schei noted four outcomes to be produced: a brief summary of the conclusions and recommendations, a Chair's Report, proceedings of the workshop, including presentations, and a peer-reviewed collection of scientific papers. He indicated that these materials would be provided as input into the fifth meeting of the CBD's SBSTTA.

Hilde Frafjord Johnsen, Norwegian Minister for International Cooperation and Human Rights, delivered the closing address. She noted that the overall objective of the Trondheim Conference is to establish the best possible scientific basis for action and to promote cross-sectoral

dialogue on biodiversity research and management. She stressed that the continuing loss of biodiversity reflects the imbalance between human needs and wants and nature's ability to supply them. She listed five areas of fundamental importance: recognition of diverse attitudes and values, equitable benefit sharing, effective institutions, national implementation and international cooperation. Johnsen noted that Norwegian development cooperation focuses on capacity-building with an emphasis on information management, the precautionary approach and participation of developing countries at the global level. She also stressed the Ministry's concern with poverty alleviation, the role of women in natural resource management and local participation.

Schei thanked the organizers and support staff, presenters and participants, and adjourned the conference at 4 pm on Friday.

### **BRIEF SUMMARY AND SYNTHESIS OF "CONCLUSIONS AND RECOMMENDATIONS"**

The conclusions and recommendations from the highlights of the Norway/UN Conference on the Ecosystem Approach for the Sustainable Use of Biological Diversity provide a brief overview of the conference's background and include five central themes with several additional concrete recommendations for future action.

First, on biodiversity and ecosystem functioning, the recommendations note the need to apply the precautionary principle or risk-management approaches when undertaking activities that may impact ecosystem structure and composition. Additionally, there is a need to learn more about biodiversity's functional relationships, human impacts and spatial and temporal dynamics. Second, on benefits and services, the ecosystem approach should ensure that environmental services are distributed equitably at all levels, local through global, and captured revenues should contribute to ecosystem management by local communities. Proper valuation of such services, removal of perverse subsidies and promotion of positive local level incentives are necessary. Third, on decentralization, ecosystem management should be devolved to the lowest appropriate level, while recognizing the balance between local and central management needs. Accountability, transparency and supportive policy and legislative frameworks are also crucial components in decentralized ecosystem management. Fourth, on intersectoral cooperation, there is a need to overcome sectoral divisions at all levels. This could be facilitated by inter-ministerial bodies and the creation of networks for sharing information and experiences. Finally, on adaptive management, flexible methodologies and practices that provide feedback through monitoring should be incorporated into policy-making and implementation. Learning by doing is also an important means for gaining knowledge in order to evaluate management practices and goal attainment.

Specific recommendations include:

- implementation programs should be designed to adjust to the unexpected;
- capacity development, monitoring, information and adaptive and participatory management should be accorded high priority;
- further knowledge of ecosystem structure, function and process should be generated, and countries should simultaneously implement the ecosystem approach;
- scientists and local communities should be integrated into decision-making processes; \*socio-economic considerations should be linked to ecosystem functions at the management level;
- potentially adverse effects of global trade should be monitored and analyzed, and cost-effective mitigation measures should be developed;
- ecosystem management should recognize the diversity of social and cultural factors affecting natural resource use;
- methodologies to value biodiversity and ecosystem services should be developed;
- the ecosystem approach should be integrated into agriculture, fisheries, forestry and other production systems affecting biodiversity; and possibilities for ecosystem restoration should

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be further explored, along with cost-effective restoration techniques.

**THINGS TO LOOK FOR**

**FAO/NETHERLANDS CONFERENCE ON MULTIFUNCTIONAL AGRICULTURE AND LAND MANAGEMENT:** 13-17 September 1999, Maastricht, The Netherlands. Contact: Lucas Janssen, FAO/SDRN, Rome, Italy; Tel: +39-6-5705-2287; Fax: +39-6-5705-3369; Internet: <http://www.fao.org/sd/agr99>.

**INFORMAL CONSULTATION ON THE PROCESS TO RESUME THE EXTRAORDINARY MEETING OF THE COP TO ADOPT THE PROTOCOL ON BIOSAFETY:** 15-19 September 1999, Vienna, Austria. Contact: CBD Secretariat; World Trade Center, 393 St. Jacques Street, Suite 300, Montréal, Québec, Canada H2Y 1N9; Tel: +1-514-288-2220; Fax: +1-514-288-6588; E-mail: [chm@biodiv.org](mailto:chm@biodiv.org); Internet: <http://www.biodiv.org>.

**ECONOMIC AND POLICY SOLUTIONS FOR ECOSYSTEM CONSERVATION TRAINING FOR CONSERVATION LEADERS IN LATIN AMERICA AND THE CARIBBEAN:** 19-22 September 1999, Washington, DC, USA. Contact: Christopher Ros; Tel: +1-202-357-4793; Fax: +1-202-786-2557; E-mail: [cir@ic.si.edu](mailto:cir@ic.si.edu); Internet: <http://www.conservationstrategy.org>.

**1999 SOCIETY FOR ECOLOGICAL RESTORATION INTERNATIONAL CONFERENCE:** 23-25 September 1999, San Francisco, CA, USA. Contact: Society for Ecological Restoration, 1207 Seminole Highway, Suite B, Madison, WI 53711 USA; Tel: +1-608-262-9547; Fax: +1-608-265-8557; E-mail: [ser@macc.wisc.edu](mailto:ser@macc.wisc.edu); Internet: <http://www.sercal.org/ser99>.

**CONFERENCE ON SUSTAINABLE LAND USE MANAGEMENT - THE CHALLENGE OF ECOSYSTEM PROTECTION:** 28 September - 1 October 1999, Salzgau, Germany. Contact: Uta Schauerte, Ecology Center, Schauenburgerstrasse 112, D-24118 Kiel, Germany; Tel: +49-431-880-4022; Fax: +49-431-880-4083; E-mail: [Utas@pz-oekosys.unikiel.de](mailto:Utas@pz-oekosys.unikiel.de); Internet: <http://www.ecology.unikiel.de/slm99>.

**EXPERT PANEL ON ACCESS AND BENEFIT SHARING:** 4-8 October 1999, San Jose, Costa Rica. Contact: CBD Secretariat, World Trade Center, 393 St. Jacques Street, Suite 300, Montréal, Québec, Canada H2Y 1N9; Tel: +1-514-288-2220; Fax: +1-514-288-6588; E-mail: [chm@biodiv.org](mailto:chm@biodiv.org); Internet: <http://www.biodiv.org>.

**FIFTH INTERNATIONAL CONFERENCE ON CULTURAL LANDSCAPES:** 21-23 October 1999, Banska Stiavnica, Slovakia. Contact: Laszlo Miklos, Ministry of the Environment, Namestie L Stura 1, 812 35 Bratislava, Slovakia, Tel: +42-1759562458, Fax: +42-1756592457.

**REGIONAL SESSION OF THE GLOBAL BIODIVERSITY FORUM (SOUTH AND SOUTHEAST ASIA):** 24-26 October 1999, Colombo, Sri Lanka. Contact: P. Balakrishna, IUCN - The World Conservation Union, 48, Vajira Road, Colombo 5, Sri Lanka; Tel: +94-74-510-517; Fax: +94-1-580-202; E-mail: [pbala@sltnet.lk](mailto:pbala@sltnet.lk).

**THE INTERNATIONAL CONFERENCE ON TROPICAL AQUATIC ECOSYSTEMS: HEALTH, CONSERVATION AND MANAGEMENT:** 25-30 October 1999, Nainital, India. Contact: Brij Gopal, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110067 India; Tel: +91-11-617-2438/610-7676 ext. 2324; Fax: +91-11-6165886; E-mail: [brij@jnuv.ernet.in](mailto:brij@jnuv.ernet.in) or [nie99@hotmail.com](mailto:nie99@hotmail.com); Internet: <http://www.members.tripod.com/nielandia/index.htm>.

**INTERNATIONAL CONFERENCE ON SUSTAINABLE MANAGEMENT OF COASTAL ECOSYSTEMS:** 3-5 November 1999, Oporto, Portugal. Contact: Tel: +35-2-550 82-70 / 550-67-10; Fax: +35-2-550-82-69; E-mail: [pduarte@ufp.pt](mailto:pduarte@ufp.pt).

**FIFTH MEETING OF THE SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL ADVICE:** 31 January-4 February 2000, Montréal, Canada. Contact: CBD Secretariat, World Trade Center, 393 St. Jacques Street, Suite 300, Montréal, Québec, Canada H2Y 1N9; Tel: +1-514-288-2220; Fax: +1-514-288-6588; E-mail: [chm@biodiv.org](mailto:chm@biodiv.org); Internet: <http://www.biodiv.org>.

**INTERNATIONAL CONFERENCE ON THE CONSERVATION OF BIODIVERSITY IN ARID REGIONS:** 27-29 March 2000, Kuwait. Contact: Mohammad Al-Sarawi, Chairman, PO Box 24395, Safat, Kuwait 13104; Tel: +965-565-0554; Fax: +965-565-3328; E-mail: [muna@epa.org.kw](mailto:muna@epa.org.kw).

**FIFTH MEETING OF THE CBD COP:** 15-26 May 2000, Nairobi, Kenya. Contact: CBD Secretariat; World Trade Center, 393 St. Jacques Street, Suite 300, Montréal, Québec, Canada H2Y 1N9; Tel: +1-514-288-2220; Fax: +1-514-288-6588; E-mail: [chm@biodiv.org](mailto:chm@biodiv.org); Internet: <http://www.biodiv.org>.