

Horst Korn, Jutta Stadler, Edward Maltby, Alexander J. Kerr (Eds.)

**Report of the scientific workshop on
“The ecosystem approach -
what does it mean for European ecosystems?”**

**at the International Academy for Nature Conservation Isle of Vilm,
Germany, November 26/27, 1998**



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German Federal Agency for Nature Conservation 1999

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For editors` addresses see "List of Participants

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EXECUTIVE SUMMARY

“The Ecosystem approach - what does it mean for European ecosystems?”

The scientific workshop was convened by the German Federal Agency for Nature Conservation at the International Academy for Nature Conservation, Isle of Vilm from November 26-27, 1998. 16 experts from international bodies and national institutions of European countries took part.

What is the ecosystem approach?

The **term ecosystem approach**, as used in relation to the Convention on Biological Diversity (CBD), is a broad concept implying a holistic, integrated approach to the conservation and sustainable use of biodiversity. It seeks to achieve a satisfactory balance between conservation and development.

Objectives of the workshop

A number of decisions of the Conferences of the Parties (COP) of the CBD refer to the ecosystem approach without detailed specification of the concept and using a variety of terms.

Relating to the request of COP4 (Decision IV/1B) **to advance the debate on the ecosystem approach**, the meeting built upon the 12 **“Principles of an ecosystem approach”** worked out at an international workshop held in **Malawi** in January 1998. The participants discussed the specification of these principles and their possible implementation in the European context.

The programme of the workshop

Next to background information on the history and the development of the concept within the CBD process, in the program of the workshop **a strong emphasis was put on the presentation of case studies on the implementation of the ecosystem approach in Europe.**

Discussions and results

The **Vilm workshop** was regarded as **one important step in line with other activities** that are aimed at further elaborating the ecosystem approach.

The discussions showed that there is an urgent **need for the clarification of the term and its underlying concept**. It was considered to be of major importance **not to confuse the ecosystem approach as synonymous with a biome-by-biome approach only**. In addition, **cross-cutting issues** of the Convention should be approached in an integrated and holistic manner.

Participants agreed on the necessity of **developing, *inter alia*, guidelines for different audiences** (e.g. politicians, decision-makers, managers, interest groups etc.) on **different levels** (from international bodies to individual persons) and the **documentation of lessons learnt from case studies**. This last point turned out to be a vital tool for the implementation and better communication of the concept. The **case studies clearly showed that there already are a lot of good examples of how the ecosystem approach is applied without a specific reference to the term itself.**

Participants generally **supported the results of the “Malawi workshop”** but preferred to use the term “elements” rather than “principles”. Furthermore, it was pointed out that even though for an area or a theme all “elements” are equally important, it might well be that different target groups (like scientists, managers, politicians etc.) consider some “elements” more useful for their purpose

than others. It is probable that the relevance of different “elements” will vary on a case by case basis.

The plenum agreed on focussing on more basic questions instead of discussing the detailed wording of each of the 12 “Malawi principles”.

The participants pointed out the long and profound human impacts on nature as one of the **specific conditions** of the whole of **Europe’s environment**. But they also saw **distinct differences between the European countries**. Therefore, implementing the ecosystem approach in Europe has to cope with a highly diverse set of environmental and social conditions.

The workshop participants identified both **constraints to implementation** and **positive aspects that enable the application of the ecosystem** approach while taking into consideration both the characteristics of the European situation and - more general - features which are important but not unique to Europe.

It was recognized that there is a need for continued work to be able to develop and operationalize the ecosystem approach. Therefore - as an additional result of the workshop - **priority actions related to key target audiences** were proposed.

INTRODUCTION

The ecosystem approach can be considered as a framework for analysis and implementation of the objectives of the Convention on Biological Diversity (CBD). It takes into account all components of ecosystems (including humans) and their complex interactions as well as the interconnectedness of the ecosystems. A number of decisions of the Conferences of the Parties (COP) of the CBD refer to the ecosystem approach without detailed specification of the concept and using a variety of terms¹.

To further elaborate on the concept and to explore its applicability, the German Federal Agency for Nature Conservation organized a scientific workshop entitled: “The ecosystem approach - what does it mean for European ecosystems?” which was held at its conference centre, the “International Academy for Nature Conservation, Isle of Vilm”, from November 26-27, 1998.

Relating to the request of COP4 (Decision IV/1B) to advance the debate on the ecosystem approach, experts from EU and PHARE countries as well as the European Commission were invited to the workshop on Isle of Vilm via the respective National Focal Points of the CBD. In addition the Secretariat of the Convention on Biological Diversity and several international organizations active in the field were requested to participate.

The meeting was intended to build upon the 12 “Principles of an ecosystem approach” worked out at an international workshop held in Malawi in January 1998 and to discuss their specification and possible implementation in the European context.

As a starting point for the discussion the workshop participants were asked to respond to the following questions:

- ▶ Do the “Malawi principles” cover all aspects of an ecosystem approach?
- ▶ Are the “Malawi principles” adequate for the special conditions of European natural or cultivated landscapes? (e.g. do we need further specifications or special adjustments?)
- ▶ To what extent is the ecosystem approach realized in existing projects in Europe?

¹ Recognizing that there are many synonymous terms such as “ecosystem process-oriented approach”, “ecosystem management approach” and “ecosystem-based approach” we will continue to use the term “ecosystem approach” as it was used in the “Malawi “paper.”

- What kind of difficulties may arise from the specification and implementation of these principles in an European context?

The workshop was divided into four sections with a strong emphasis on the second one:

1. Introduction, background and state of the discussion in other fora
2. Case studies on the implementation of the ecosystem approach in Europe
3. Working groups
4. Final discussion and summing up

The workshop was attended by 16 experts from environmental ministries, scientific institutions, biosphere reserves, the Secretariat of the Convention on Biological Diversity (CBD), the EU Commission, the World Conservation Union (IUCN), the International Commission for the Protection of the Rhine (ICPR) and UNESCO's Man and the Biosphere (MAB) Programme. The meeting was chaired by Dr. Horst Korn, the working groups by Prof. Edward Maltby and Mr. Alexander Kerr. Ms. Jutta Stadler finished the report with written input from the Chairs and Mr. Carlos Martin-Novella.

SUMMARY OF PRESENTATIONS AND DISCUSSIONS

The workshop was opened by Dr. Hans-Dieter Knapp, head of the International Academy for Nature Conservation Isle of Vilm, a branch of the German Federal Agency for Nature Conservation. He welcomed the participants and underscored the importance of elaborating the specification of the “Ecosystem approach” as a major step in the CBD process. He pointed out that discussing the ecosystem approach at a European level would be helpful to clarify whether the ecosystem approach is applicable to the specific natural and political conditions in EU and PHARE countries and which adjustments will be needed.

The first session was opened by Dr. Horst Korn. He introduced the objectives of the workshop and gave an **overview of the ecosystem approach** in the light of decisions of the Conference of the Parties (COP) to the CBD and background papers.

The term ecosystem approach was introduced to the CBD process at the first meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). The discussions led to the adoption of Recommendation I/3 which states that “Conservation and sustainable use of biological diversity and its components should be addressed in a holistic manner, taking into account the three levels of biological organization and fully considering socio-economic and cultural factors.” This recommendation was reaffirmed later by the Conference of the Parties in Decision II/8. Thereafter “the ecosystem approach should be the primary framework of action to be taken under the Convention.” From thereon the concept of the ecosystem approach was introduced in the general discussion (with a focus on the assessment of biological diversity and indicators), ecosystem related issues (like agricultural, forest and coastal and marine biological diversity and inland waters) as well as cross cutting issues (like alien species and incentive measures). The ecosystem approach has also been addressed in various workshops at several Global Biodiversity Fora (GBF). In January 1998 a workshop on the ecosystem approach was held in Malawi which led to the development of principles characterizing the ecosystem approach. As stressed by the Conference of the Parties in its Decision IV/1B the 12 “Malawi Principles” should be a basis for further discussion and elaboration. Parties are encouraged to build upon these findings (for further details see page 21).

A participant of the “Malawi Workshop”, Dr. Monica Hammer, introduced **the “12 principles of an ecosystem approach” and the rationales behind them** to the audience (see also page 111). Her example of the Baltic Sea Drainage Basin pointed to the complexity of administrative levels in Europe and the often occurring miss-match between ecosystem and administrative boundaries. Matching these scales and boundaries is one of the major issues in implementing the ecosystem approach.

Prof. Edward Maltby, also a participant of the “Malawi workshop” and chair of IUCN’s Commission on Ecosystem Management (CEM), gave a brief **overview on IUCN activities related to the ecosystem approach within the CBD process**. He introduced the “Ten principles for ecosystem management” which were worked out at the First Sibthorp Seminar in June 1996 (see also page 85). These guiding and operational principles contributed to the discussions at the “Malawi Workshop” whose results were endorsed at the 10th Global Biodiversity Forum in May 1998 in Bratislava. He pointed out that the Vilm workshop has to be seen in line with these activities as part of a world wide effort aiming to clarify and implement the ecosystem approach in the CBD context.

He pointed out some specifically European characteristics which *inter alia* have to be taken into account:

- the numerous and diverse sovereign countries,
- the varied national and regional priorities,
- the range of capacity and institutional mechanisms for implementation,
- the EU as a supranational body with legal instruments and
- the generally effective governments.

The “Tamar 2000 Support Project” served as an example of a small scale application of the ecosystem approach in England (see also page 27).

The work of the International Commission for the Protection of the Rhine, presented by Dr. Anne Schulte-Wülwer-Leidig, is an example of the international co-operation which is needed in order to manage the entire catchment area of one of the major rivers in Europe. It underlined the point made by Prof. Maltby that the ecosystem approach can embrace a mosaic of different but inter-related habitat types such as forests, rivers and agricultural land. Additionally, the Action Plan

for Flood Protection showed the strong interlinkage between ecological and economic aspects (for further details see page 38).

After explaining some theoretical models for the integration of systems, Mr. Ruzicka focused on the important issue of selecting the appropriate scale (global, regional and local) when addressing the ecosystem approach. This was explicitly shown in his **case study on the ecological criteria for the construction of water reservoirs** in the Turcek area, Slovak Republik.

The case study on the protection of the Swan mussel *Anodonta cygnea* in SE Poland, presented by Ms. Katarzyna Zajac, illustrated the growing awareness of the need to view species protection programmes in a broader context. The restoration of natural dynamics of the river system, taking into account ecological as well as economic aspects of a whole region, has proved to be vital for the survival of the species (for further details see page 44).

Ms. Linda Hedlund **reported on the “Workshop on the Ecosystem approach to the Management of the North Sea”**, held in Oslo, Norway, in June 1998 (for further details see page 93). She pointed out that during that workshop it had not been possible to arrive at a satisfactory definition of the “ecosystem approach”, as a means of achieving a common understanding of the concept.

The biosphere reserve concept, elaborated by UNESCO, was explained by Mr. Alexander Kerr who also examined the Malawi Principles from the standpoint of a manager being asked to incorporate them into his management practices. Since biosphere reserve managers have been implementing the concept for many years now and since it has much in common with the ecosystem approach, biosphere reserves are an important resource for those who want to understand what is involved in the practical application of the approach (for further details see page 52).

A case study on Swedish Forestry management, which has been part of an Information Document to SBSTTA on “an ecosystem approach to the management of northern coniferous forests”, was presented by Ms. Linda Hedlund. She compared the forestry management strategies of some nordic countries, showing the difference in approaching goals like sustainable use and protected areas.

Ms. Tatiana Kluvankova presented the results of her case study on economic valuation of ecological factors of the Mala Fatra National Park, Slovak Republik (for further details see page 66). She developed a **stakeholder concept as an instrument to achieve adaptive management and sustainable development at the local level.**

The case studies and the plenary discussions showed that there was a wide range of views among the participants as to what the ecosystem approach implies, depending on the respective background and experience. The general discussion started with some comments on the phrase “ecosystem approach”. Even though a different terminology might be more precise, the participants agreed to continue using the term because it is already accepted in international discussion. Nevertheless, the debate showed the urgent need to clarify the general concept. Further clarification and interpretation of the “Malawi Principles” as a first step towards the application of the ecosystem approach was felt to be equally important. Also, it was felt that work should focus on these issues from the different perspectives of scientists, managers and politicians.

To further advance understanding of the rationale behind the ecosystem approach, the plenum agreed that the working groups should focus the debate on the following topics:

1. Clarify the concept
2. The European perspective
3. The audience which should be addressed and targets for application
4. Guidelines and other tools
5. Agenda / next steps

Among the participants differences were seen in the goals to be achieved in using the ecosystem approach depending on the status of biological diversity within the different countries. Whereas in the western countries the improvement of the situation of biological diversity would be the main goal, eastern countries wish to preserve their remaining biological diversity.

A major point of debate was the question which audience is addressed by the “Malawi Principles” and which scale is appropriate for their implementation. The workshop participants felt that these primary questions had to be discussed first before looking at the wording and terminology of each “principle” in detail, even if this would be a difficult exercise. It was suggested that the use of the word “elements” in place of “principles” might make the “Malawi principles” more readily acceptable to a broad audience. Even though for an area or a theme all “elements” are equally important, individual key persons (like scientists, managers, politicians etc.) consider some “elements” more useful for their purpose than others, depending on their respective responsibility.

When viewing the case studies presented and comparing their personal evaluations participants found that there are enormous differences in the implementation of the ecosystem approach between the countries and, within countries, between different sectors.

Participants from PHARE countries pointed out that the period of transition had positive and negative effects on nature conservation and sustainable use. Often the uncertainties of this period were used to overexploit natural resources because of the fear of losing newly gained rights. On the other hand, there was the opportunity to create new structures and legal instruments for ecosystem management and planning.

RESULTS AND RECOMMENDATIONS

1.) Establishing clarity

In accordance with decision II/8, which stated that the ecosystem approach should be the primary framework for action, we suggest that this framework should be structured in a clear and understandable way.

In building this framework it is important that we

- develop a mutual understanding on what the ecosystem approach actually means,
- examine how the ecosystem approach might be applied at different scales, in different regions and related to different issues - such as might be achieved through the development, *inter alia*, of guidelines and the documentation of lessons learnt from case studies,
- establish the necessary institutional mechanisms and capacity to implement an ecosystem approach at different levels such as international, national, and local.

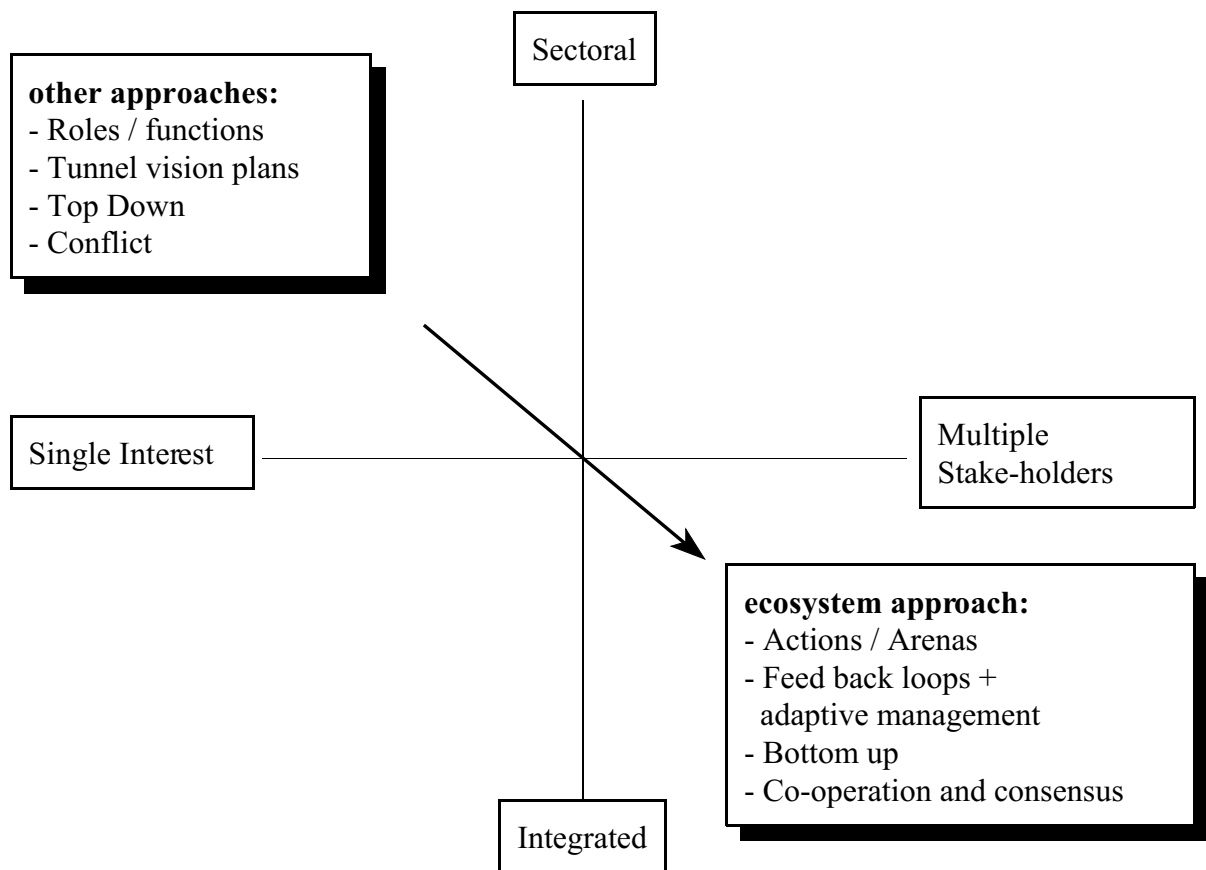
The work of the Convention includes a biome oriented perspective and cross-cutting issues. The need to adopt an “ecosystem approach” is to provide an overarching framework in order to achieve the three objectives of the Convention: conservation of biological diversity, sustainable use of its components and the fair and equitable sharing of the benefit.

Therefore it is important not to confuse the “ecosystem approach” as synonymous with a biome-by-biome approach only. The ecosystem approach provides the basis for integrated management essential to achieve the Convention’s goals. In addition, implementation of the ecosystem approach might provide a better basis for assessment of the effectiveness of the Convention by Contracting parties.

The term ecosystem approach, as used in relation to the Biodiversity Convention, is a broad concept implying a holistic, integrated approach to the conservation and sustainable use of biodiversity. It seeks to achieve a satisfactory balance between conservation and development.

The following diagram was found helpful in creating an understanding of how the ecosystem approach differs from others. One axis deals with the spectrum of organisational activity. Many organisations operate entirely within the confines of a narrow sector and pay no heed to the needs of

other sectors, let alone sustainability of natural resource use. The ecosystem approach encourages all sectors to move towards a more integrated level. The other axis deals with the involvement of individuals having an interest in an ecosystem. Again there is a spectrum of activity ranging from simple self-interest, pursued at the expense of others for short-term gain, to a holistic view which recognises the interests of others and seeks the long-term good of all. The key attributes of these approaches are summarised in the top left and bottom right quadrants.



Participants recognised that integrated and holistic approaches to the management of land had already been adopted despite the fact that the “ecosystem approach” is a new term. Biosphere reserves may serve as one model for an application of the approach. However it was thought

essential to examine the range of cases where the ecosystem approach might be already applied but not described as such, as a means of assisting in the elaboration and promotion of the approach.

Instead of discussing the detailed wording of each of the 12 “Malawi Principles” the participants agreed to focus on more basic questions which arose during the workshop. These concerned the audiences, the appropriate scales and the applicability of the principles. Participants generally supported the results of the Malawi workshop but preferred to use “elements” rather than “principles”. Furthermore, it was pointed out that even though for an area or a theme all “elements” are equally important, individual key persons (like scientists, managers, politicians etc.) consider some “elements” more useful for their purpose than others, depending on their respective responsibility.

2.) A European perspective

The nature and pattern of biodiversity in Europe has been particularly heavily impacted by human activities. However there exist

- (1) reasonably reliable inventories of biological diversity achieved by various instruments such as country studies, National Biodiversity Action Plans, CORINE, integrated catchment management plans and Local Environment Action Plans (LEAPS) among others. These provide examples of appropriate knowledge about various competing interests that otherwise may damage biodiversity.
- (2) relatively good information at the continental scale about the status of and threats to the various elements of biological diversity (e.g. the Dobris Assessment) and consequences of impacts.

The workshop participants identified both constraints to implementation and positive characteristics that enable an application of the ecosystem approach. These features are important but not unique to Europe. They provide an indication of important considerations on any future agenda and should be elaborated with the aid of examples.

Constraints and positive aspects for the implementation of the ecosystem approach in Europe.

Constraints:	Positive aspects:
- Market / Economic distortions	- Strong NGO network
- Sectoral organisation of governments	- Efficient / accountable governments
- Competitive and uncoordinated interest groups impacting biodiversity	- Empowerment of local populations
- Limited availability of funding for implementation	- Pressure from individuals
- Traditional culture / social practices	- Supranational instruments e.g. Directives/Regulations
- Economic / social development	- Dynamic processes of change
- Limited capacity in some parts of Europe	- Awareness of need for action
- Habitat fragmentation	- Enforcement capacity

3.) Targets / Audience

It is essential to address the ecosystem approach to decision-makers and interest groups at different levels. These include *inter alia*:

1. Conference of Parties of the CBD and other global instruments / institutions
2. Contracting Parties of the CBD
3. Supranational institutions
4. Government agencies and individual sectors
5. Commercial interests
6. NGO's
7. Local communities
8. Private landowners and individuals

The wording used to transfer the message should be appropriate to the audience.

4.) Guidelines and other tools

Workshop participants considered that the development of guidelines for and in consultation with users were vital requirements for implementation of the ecosystem approach. Such guidelines should take into account:

1. The analysis of pressures and responses which influence ecosystem structures and functioning to better define decisions and actions required in the context of the Convention
2. How to achieve sectoral integration and mechanisms for revising the functioning of organisations.
3. Means of realising a redistribution of ecosystem management costs and benefits which is considered essential to ensure widespread implementation.
4. How to distil the practical lessons from case studies (e.g. from the Rhine and the Tamar) to address the different scales from international to local.
5. The experiences gained from the numerous cases that actually apply the ecosystem approach without referring to it in those terms. Biosphere reserves may serve to illustrate this point.
6. How to prepare public awareness documents and educational material.

Table of priority actions aimed at winning support and understanding from key target audiences

Target group	Politicians	Natural resource managers	School children
and reason for action	To make progress quickly	To share experience and provide demonstrations	To invest for the future
Methods	1. Identify options for quick wins 2. Produce an executive summary of key needs and priorities 3. Encourage the creation of model regions for applying the approach (EU funding?) 4. Set priorities for effective action in Europe (Sofia process?)	1. Set up a European network for innovation 2. Provide a manual setting out key actions 3. Organize training in the use of “tools” such as communication skills, stakeholder analysis, brainstorming, negotiating, conflict resolution	1. Generate a “learning for life” syllabus 2. Seek an integrative approach in the school system 3. Establish an appropriate curriculum for pilot schools on a pan-european basis

5.) Agenda / next steps

Since there is a need for a further discussion of the ecosystem approach, wide participation is needed in order to take the best advice forward to COP through a suitable consultation process, taking into account appropriate activities which may be planned already as well as additional ones which may be necessary to provide the secretariat with the information needed. This might include additional workshops and aim to produce case studies to make lessons learnt elsewhere available to those seeking to implement an ecosystem approach.

The “ecosystem approach” in the light of COP decisions and background papers

The aim of this short introduction is to show how the term “ecosystem approach” evolved within the CBD process and what are the main points of discussion which will be addressed in this workshop.

Recognizing that there are many synonymous terms as “ecosystem process-oriented approach”, “ecosystem management approach” and “ecosystem-based approach” we will stick to the term “ecosystem approach” as it was suggested in the “Malawi “paper.

The term “ecosystem approach” was introduced to the CBD process at the first meeting of SBSTTA. The discussions led to the adoption of Recommendation I/3 (UNEP/CBD/COP/2/5 Annex) paragraph 1: ”Conservation and sustainable use of biological diversity and its components should be addressed in a holistic manner, taking into account the three levels of biological organization (genomes, genes, species, communities, ecosystems, habitats and landscapes) and fully considering socio-economic and cultural factors. **However, the ecosystem approach should be the primary framework of action to be taken under the Convention.**”

Also in recommendation I/3 (paragraph 2 (ix)) was mentioned that there is a special need to: ”encourage Governments to carry out case studies to learn about ecosystem management efforts, identifying barriers to implementing the ecosystem approach as well as ways and means of overcoming such barriers. Major issue areas influencing the effectiveness of the ecosystem approach may be examined in such studies, including, inter alia, budget issues, institutional issues, public participation, science and information as well as legal authorities.“

The recommendation was reaffirmed by the Conference of the Parties in **decision II/8** and therefore builds the basis for all further discussion and elaboration. From thereon the concept of the “ecosystem approach” was introduced in

- **the general discussion** (with a focus on assessment of biodiversity and indicators)
- **ecosystem related issues** like agricultural biological diversity, forest biological diversity, coastal and marine biological diversity and inland waters as well as
- **cross cutting issues** like alien species and incentive measures.

1. Assessment of biological diversity / Indicators

SBSTTA noted in its recommendation II/1 (UNEP/CBD/COP/3/3Annex) the need for flexibility in the approach to assessment, national reporting and indicator development in response to widely varying ecological conditions and national capacities. **Regional or ecosystem approaches** to the development of guidelines and indicators were stressed and their development considered an important task.

But although the assessment of biological diversity at the levels of ecosystems, habitats, species and genes has to be carried out, related to decision II/8 of the COP the consideration of ecosystems and habitats is particularly important (UNEP/CBD/COP/3/13 paragraph 27).

The importance of the ecosystem approach within the work on indicators was stressed again by decision IV/1 of the COP . (It was proposed that “further work on indicators by the parties or SBSTTA should take account of ... the ecosystem approach”).

2. Agricultural Biological Diversity

At the second meeting of SBSTTA the importance of taking **an ecosystem approach** in the work on agricultural biological diversity was clearly stated (UNEP/CBD/SBSTTA/2/10 paragraph 2). The enhanced explanation was: “**An ecosystem approach to understanding the impact of agriculture on biological diversity is necessary because the effects of agriculture are felt throughout the agroecosystem, and often far beyond its borders in organisms completely unrelated to agriculture.** These impacts vary greatly as one moves along the continuum of intensity indicated above. Thus the impacts on ecosystems have increased over time as agricultural systems intensified around the world. In addition, domesticated plants, animals and associated micro-organisms have been transported across and between continents, where they often radically change the environment into which they are introduced.”

At a joint workshop of FAO and the CBD Secretariat on Farming Systems for the sustainable use and conservation of agricultural biodiversity and agro-ecosystems (UNEP/CBD/SBSTTA/3/Inf.10) the working groups concluded:

- Integrated agro-ecosystem approaches to planning and natural resource utilization will provide the future framework for agricultural production.
- A holistic cross sectoral approach including biological, social and economic issues is needed to assist policy makers to weigh up the different impacts of different production systems and make effective decisions.

The issues coming up in the above mentioned workshop were later integrated to the programme of work on agricultural biological diversity (UNEP/CBD/COP/4/6 paragraph 33.):

“Parties have agreed that the ecosystem approach should be the primary framework of action under the Convention. Accordingly, the first aim of the multi-year work programme is to promote the positive effects and mitigate the negative impacts of agricultural practices on biological diversity in agro-ecosystems and their interface with other ecosystems.”

3. Forest biological diversity

In the annex to decision II/9 the “COP recognizes the need to develop and implement methods for sustainable forest management which combine production goals, socio-economic goals of forest-dependent local communities, and environmental goals, particularly those related to biological diversity. ... **Sustainable forest management should take an ecosystem approach and aim at securing forest quality as related to the CBD...**”

An explanation on an ecosystem approach to forestry management is given in a background paper to SBSTTA 2 on “an ecosystem approach to the management of northern coniferous forests “ (UNEP/CBD/SBSTTA/2/Inf.6). It means:”to consider a large number of values, to emphasize a number of scientific disciplines, to incorporate local and traditional experiences and to be constantly aware of the consequences of our practices within forest ecosystems.”

Besides this the discussion focusses on in-situ conservation and the ecosystem approach: “ The provisions of the Convention entail a **more holistic, ecosystem approach to protected areas** than has generally been the case”.(UNEP/CBD/SBSTTA/2/11) In close relation to the work of the IPF the SBSTTA recommends that additional inputs be sent to the IPF(UNEP/CBD/COP/3/3 Recommendation II/8):

-... strategies for sustainable forest management should be based on an ecosystem approach, which will integrate conservation measures (e.g. protected areas) and sustainable use of biological diversity.

Identified research priorities as the following:

- Assessing ecological landscape models, the **integration of protected areas in the ecosystem approach to sustainable forest management** and the representativeness and adequacy of protected areas networks.

In decision III/12, concerning the medium-term programme of work the COP endorses SBSTTA recommendation II/8 and further requests to: ”Facilitate the application and integration of the objectives of the CBD in the sustainable management of forests at the national, regional and global

levels, in accordance with the ecosystem approach.” The decision was integrated in the draft programme of work for forest biological diversity as lined out in UNEP/CBD/COP/4/7 which specifies further research activities and later included in the work programme as lined out in COP Decision IV/7 (Annex).

A workshop at the 8th GBF on forests and biological diversity mainly discussed the elaboration of the draft version of the programme of work. One of the topics was defining the ecosystem approach for forest biological diversity. In the discussion some important shortcomings of the programme were detected, e.g. that the ecosystem approach as presented in the draft programme did not consider social, institutional and historical aspects.

In contrast to the “definitions “ of the ecosystem approach which were mentioned above a working document prepared for the meeting of the liaison group on forest biological diversity (UNEP/CBD/SBSTTA/3/Inf.22) focused the explanation of the ecosystem approach in a manner which is more oriented at natural science: paragraph 10: “An ecosystem approach emphasises the complexity and interdependencies of biological communities and their dependencies on the abiotic site-specific (edaphic) factors. Furthermore, the concept introduces the importance of natural disturbance regimes and regeneration mechanisms as factors involved in maintenance of biological diversity over large landscapes. Finally, an ecological perspective notes the spatial organisation of communities and ecosystems as life-zones, formations, ecoregions, biogeographic zones/realms and biomes.

Paragraph 16: The ecosystem approach on conservation and sustainable use of forest biological diversity is further based on integration of site specific biotic and abiotic conditions, natural forest regeneration regimes and consideration on the biogeographic status of the forest in question.”

4. Coastal and marine biological diversity

At the second COP a representative of India stated that “ the **holistic approach to ecosystems**, recommended by the 1st meeting of SBSTTS and endorsed by the 2nd meeting of the COP, should be emphasized. The draft decision on marine and coastal biological diversity should be approached in the spirit of such a basic principle.” (UNEP/CBD/COP/2/2). This task was implemented in Annex II to decision II/10 where the roster of experts shall be used to “identify options for a **pragmatic but comprehensive approach in addressing marine and coastal biological diversity on the basis of an ecosystem approach**, including its components at the levels of species and genetic resources, distinguishing regions at relevant scales.” The decision gets specified in document UNEP/CBD/SBSTTA/2/14. There an ecosystem-based approach “indicates the maintenance of ecosystem integrity, including critical ecosystem functions and processes as the

principal management objective. This approach places priority on the classification, mapping and monitoring of marine and coastal ecosystems. A comprehensive approach entails extensive and continuing assessments to formulate a diversity of interventions (e.g. research, management, policy, economic, social and legal measures) covering a wide range of sectors (e.g. coastal tourism, industrial development, agriculture, fisheries, forestry etc.)” Guidance for carrying out a global assessment of marine and coastal biodiversity concerning the concept of **an ecosystem management approach** is given there, too.

In the programme of work on marine and coastal biological diversity (as suggested in Recommendation III/2 and worked out in decision IV/5 (Annex)) The ecosystem approach is explicitly mentioned under programme element 2: marine and coastal living resources and is therefore strongly related to sustainable use (e.g. “To promote ecosystem approaches to the sustainable use of marine and coastal living resources, including the identification of key variables or interactions, for the purpose of assessing and monitoring, first, components of biological diversity, second, the sustainable use of such components and, third, ecosystem effects”).

5. Inland waters

The reason why the ecosystem approach is important when dealing with biological diversity of inland waters is outlined in document UNEP/CBD/SBSTTA/3/2: “In addition to those activities that directly utilize inland water biological diversity, various activities in sectors as diverse as agriculture and energy depend on inland waters and are causing disruption within natural ecosystems. Moreover, socio-economic factors, such as population density and pressure, land tenure, the degree of knowledge and education as well as public services and policies, influence inland water ecosystems. **An ecosystem approach to understanding the human impacts on inland water biological diversity is considered necessary because the effects of these various activities are interlinked and felt throughout the entire water system, from the catchment area through to the river mouth and out to the sea.**”

Particularly the interlinkage to agriculture is later stressed again, as well as the need to use an ecosystem approach in this and other sectors which have an impact on inland water biodiversity, too.

During a workshop on Inland water systems and biodiversity held at the 8th GBF the experts stressed the particular importance of the ecosystem-based approach to the management of inland waters at different scales. But they also expressed the need that the ecosystem-based approach should be reviewed, clarified and explained. Therefore they suggested e.g. to look for examples and to develop operational, regional guidelines.

Another workshop at the 10th GBF was held with the intention to provide COP4 with recommendations concerning the development of an *modus operandi* of an ecosystem approach under the Convention and the programme of work on the biological diversity of inland waters. The need for a more effective implementation of an ecosystem-based approach was noted. As well as the need for the CBD to clarify the distinction between ecosystem-based and biome-based approaches.

A programme of work was adopted by the COP (decision IV/4) which highlighted the significance of the ecosystem approach and the importance of designing integrated watershed, catchment and river basin management strategies.

Besides the sectoral issues related to ecosystems the ecosystem approach is a basic concept of cross cutting issues like

6. Alien species

The “importance of taking a precautionary and ecosystem approach when dealing with issues related to alien species” is stressed (decision IV/1 C.).

7. Incentive measures

The ecosystem approach is relevant for the designing of incentive measures, too. (decision IV/10).

The most important document concerning the conceptual elaboration of the ecosystem approach itself is the report of the workshop on the ecosystem approach held in Malawi in January 1998.

In decision IV/1 B. the issue of the varying terminology was raised again and the importance of the ecosystem approach was underscored. **Similarly the need for a workable description and further elaboration of the ecosystem approach was stressed.**

Some European perspectives on the ecosystem approach

The Convention on Biological Diversity has adopted and regularly re-affirmed the importance of an 'ecosystem approach' in addressing its effective implementation. Unfortunately, there is no universal understanding or clear consensus as to what this terminology actually means. There is general agreement that the ecosystem approach is of fundamental importance in the delivery of the objectives of the Convention. However, discussion commonly reveals that 'experts', including national representatives to the Convention, often have widely divergent views of what this entails. The need for clearer direction to Contracting Parties was elaborated at an informal meeting of experts at SBSTTA 3 in Montreal (September 1997) which explored the requirements for a *modus operandi*. This present workshop at Vilm, generously hosted by the German Federal Agency for Nature Conservation, should be placed into the context of a number of recent activities, which amongst others have been focused more or less explicitly on questions of the ecosystem approach (Table 1). In addition, there has been considerable effort in the United States emanating in particular from the Inter Agency Ecosystem Management Task Force. Although not related explicitly to the Convention, their work contains material of considerable practical relevance (INTERAGENCY ECOSYSTEM TASK FORCE, 1995). In addition there is a growing literature on ecosystem management, far too extensive to review here. We should, therefore, view our discussions here as another step in a sequence of actions, which may contribute to better understanding, and effectiveness of the ecosystem approach.

The World Conservation Union (IUCN) places high priority on clarification of the concept not least because of the special importance attached to the work of the Convention as central to the Union's own mission. The IUCN itself has a large and varied constituency comprising both government and non-government organisations in its global membership. Together with members', individual and collaborative activities, the Union supports programme priorities from an increasingly regionalised secretariat. In addition, a range of technical networks attempts to provide the membership with the most up-to-date thinking on key conservation and environmental management issues. The greater part of these networks are embodied within the six Commissions of the Union, comprising cohorts of volunteer experts variously organised under the themes of protected areas, species survival, ecosystem management, law, education and communication and social and economic policy.

Table 1: Some milestones in discussion of the ‘ecosystem approach’ in the context of the Convention on Biological Diversity.

June 1996	Sibthorp Seminar, UK (funded by IUCN, Sibthorp Trust & WWF UK)	Questions conventional thinking and traditional approaches to conservation and sustainable development. Distils 10 Principles of Ecosystem Management. Maltby et al (Eds) 1999
September 1997	SBSTTA 3 Informal Meeting	Concentrates on a <i>modus operandii</i> and legal implications. Examines meaning, principles, implementation, underlying assumptions and need for methodology.
January 1998	Malawi Workshop (funded by governments of Netherlands & Malawi)	Distils 12 Principles, which build on the output from the Sibthorp Seminar and draws on other experience to introduce new elements. Analysis presented - UNEP/CBD/COP/4/Inf.9
May 1998	Global Biodiversity Forum 10, Bratislava (funded by part of UK government)	Presentation and discussion of ‘Malawi Principles’, exposing new issues and need for further work.
November 1998	Vilm	Examination of the European Context.

At present there is technical debate within IUCN on the concept of the ‘Ecosystem Approach’ and in particular with the relationships between this concept and the ideas expressed by other terminology such as ‘bioregional planning’ and ‘biosphere reserves’. This debate will continue to develop and it is important that the Union seeks to define more precisely the practical benefits, and the particular added value, which the organisation can contribute to the discussion and implementation of its findings. In the meantime there have been at least two main areas in which contributory activities have been taking place

Clarification of the meaning, purpose and application of the approach in the CBD context.

Development of guidance and analysis of experiences of how the approach might be implemented and the benefits that might be achieved compared with other approaches.

The Sibthorp and Malawi workshops and the Bratislava GBF have provided significant fora for the first of these activities and the outputs in the form of ‘principles’ have provided a basis for considerable discussion. Preparation for the World Bank by IUCN of ‘Ecosystem Management:

Lessons from around the world' (PIROT & MEYNELL 1998) has brought together examples of ecosystem management across wide environmental, socio-economic and cultural spectra but is significantly limited on European examples.

Defining the Ecosystem Approach

There have been numerous attempts to explain the meaning of the ecosystem approach. No attempt is made here to review the literature but it is useful to cite the definition of the INTERAGENCY ECOSYSTEM MANAGEMENT TASK FORCE (1995) and the description independently agreed to in Malawi.

Definition (1995)	Description (1998)
The ecosystem approach is a method for sustaining or restoring natural systems and their functions and values. It is goal driven, and is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.	The ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organisms, which encompasses the essential processes and interactions among organisms and their environment. The ecosystem approach recognises that humans are an integral component of ecosystems.

It is worthwhile identifying a number of salient points from these statements:

1. There is no single or unique ecosystem approach.
2. It is either explicit or implicit that the final goal of the approach acknowledges human participation and interests.
3. Emphasis is on the interactions within and functioning of natural systems with the possibility of a wide range of scales of application.
4. There may be many instances and experiences of applying an ecosystem approach without it ever being referred to in those terms.

Following these points, it is highly appropriate to consider applications in a specific European context. Indeed one of the major challenges to the Convention will be to provide guidance, which takes sufficient account of regional variation in the ecological, natural environment as well as socio-economic and cultural contexts.

European context

In many ways the questions raised in developing the concept with a European focus epitomise the challenge to be met more globally in applying the ecosystem approach. A summary checklist of considerations essential in this conceptual development might include: existence of numerous and diverse sovereign nations, complex transboundary political issues and natural systems, varied national/regional priorities for biodiversity management and socio-economic development, range of capacity and institutional mechanisms for implementing policy, a supranational body interacting with nation states, together with rapid social and economic changes throughout the continent. Of particular interest are the questions posed by 'accession' countries intending to join the European Union and the associated requirements in complying with the policy and regulatory framework of the EU. Enlargement of the European Union offers arguably one of the greatest tests and opportunities for implementation of the ecosystem approach to biodiversity management. This arises not least as a result of major agricultural reform together with unparalleled opportunities for transboundary co-operation. Many of these considerations are not unique to the European region and thus their examination may contribute to better general understanding of the concept.

Clarifying the approach

The ecosystem approach *per se* does not mean tackling biodiversity conservation under the CBD simply on an ecosystem by ecosystem, biome by biome or habitat by habitat basis. However, some specific concerns and measures might be appropriate to a particular ecosystem, such as maintaining the hydrological integrity of raised bogs by limiting public access or protecting the endemic species of a particular lake ecosystem by prohibition of fishing. Such examples are clearly ecosystem-based but do not contribute in themselves to the application of the ecosystem approach. Clarity is required to ensure more general understanding of the distinctive meaning of the concept and the particular significance of as well as constraints to its implementation.

There is still much confusion about the ecosystem approach and the scientific community has done little to date to assist in clarification, either for the CBD Secretariat or contracting parties. In practical terms, it is important to develop guidance with particular reference to how we manage biodiversity in relation to balancing productive and protective ecosystem functions, maintaining the fragile linkages across the terrestrial - aquatic continuum as well as major earth systems such as drainage basins, inland seas and large marine bodies (usually requiring an international scale). There is also the need for guidance on reporting procedures under the terms of the Convention and specifically how to indicate progress in application of the approach. In the case of Europe cross-cutting issues such as grant or tax-based incentive schemes for conservation and management of ecosystems need to be examined critically in terms of lessons learned or guidance for future policy.

Providing guidance

An attempt is made in Table 2 to indicate the type of guidance, which might be required by appropriate implementing agencies in applying the ecosystem approach in a European context.

Table 2: Examples of guidance required for implementation of an Ecosystem Approach in a European context.

- 1. Defining the constraints to adopting an Ecosystem Approach**
 - Market/economic distortions (agriculture)
 - Conflicting traditional social practices e.g. fishing, peat-cutting
 - Natural forces of change (climate, sea-level)
 - economic/social development (technological change, desire for higher level of living)
 - Existing land use constraints (e.g. settlements)
- 2. Identify alternative mechanisms to remove constraints on adoption**
 - Redistribution of costs and benefits to better reflect the efforts of management
 - Agricultural subsidies review
 - New environmental incentives to promote positive actions
 - Regulatory mechanisms to reduce damaging impacts
- 3. Develop implementation strategy (at different scales, regional contexts, and range of specific objectives)**
 - Engage Stakeholders
 - Awareness and Capacity Building
 - Use of Examples
 - Link Policy to the requirements for delivering an ecosystem approach
 - Support from EC R&D to develop appropriate tools and protocols.

Tamar 2000 - a UK example of ecosystem approach in practice

Tamar 2000 SUPPORT (SUStainable Practices Project On the River Tamar, Devon, UK) is a pathfinder project which works closely with farmers, riparian owners and the wider community to develop and implement, sustainable land management practices. The overall aim is to conserve and restore environmental quality for both people and wildlife while delivering economic gains. This has

embodied a number of key objectives which include (i) optimising farm inputs such as use of fertilizers and employment of best management practices (ii) management and restoration of river and wetland habitats with benefit for water quality, fisheries and other wildlife, linked to recreation and tourism development (iii) identification and implementation of practical demonstration projects such as wetland buffer zones to reduce pollution loads to the river, and (iv) delivery of the approach at modest cost and use of methods which might be easily transferable to other river catchments.

Changes in land use such as farm management and cropping patterns, fertiliser use and drainage operations over the last 30 years have resulted in widespread habitat destruction and pollution affecting the water resources and associated species diversity and density throughout South West England. The River Tamar, over 75km in length with a catchment of 928 km², is one of the most affected as is indicated by increased diffuse pollution, sedimentation of important salmonid spawning gravels and conversion of wetlands and riverine habitats to farmland.

The Tamar catchment is located on the South-West peninsular of England and has a climate characterised by mild winters and cool, moist summers, with localised more severe conditions in upland headwaters. The drainage network is established on a remnant plateau with gentle slopes (generally now intensively farmed grassland) and broad open valleys of headwaters experiencing exposure from the prevailing south-westerly winds. The headwaters of the main channel are located at about 200m above sea level close to the Atlantic coast of north Cornwall and north-west Devon. On progressing down the catchment streams of the middle section have developed deeper frequently wooded valleys with moderate or occasionally steep slopes, at the base of which a seepage zone of discharging shallow groundwater may occur. In the lower catchment steep valley sides directly adjoin the relatively narrow floodplain system which finally terminates in an extensive 'drowned' estuary. Previous attempts to restore environmental quality have generally failed because they have lacked a catchment scale, have not integrated diverse sectoral interests and in particular have not engaged the local people fully. The approach of Tamar 2000 has attempted to rectify these shortcomings by providing a co-ordinated, integrated, large-scale, practical and on-going demonstration of what can be achieved by applying techniques already proven at a smaller scale. The basic tool for implementation is an integrated farm and river based management plan combined with a series of support measures, which include buffer zones, wetland recreation, tree planting and funds for riverbank fencing.

The project is co-ordinated by the West Country Rivers Trust in partnership with the Wetland Ecosystems Research Group (Royal Holloway Institute for Environmental Research, University of London), BDB Associates (experts in land and water management) and Silvanus (experts in woodland management). This provides an essential combination of scientific and environmental management skills. Most importantly, while there is active support from, and close linkage with statutory bodies such as the Ministry of Agriculture, Fisheries and Food (MAFF) and the Environment Agency (EA),

together with commercial interests such as South West Water Plc, the implementing partnership is completely independent of statutory and regulatory agencies of government. This has proven to be a vital asset in building the confidence and securing the engagement of landowners and farmers, otherwise fearful of prosecution or inspection as a result of visits from such bodies.

The £1.6 million project runs from 1997 to 2000 and receives about half its funding from MAFF and the European Union. The remainder comes from a variety of private sources. Free field visits are made by advisors who develop specific integrated management plans. The information is collated to provide a catchment-wide assessment of potential and priority works to realise overall environmental improvements. Landowners are encouraged to undertake any necessary work on their own land themselves and financial support is provided where necessary from either project funds or from the normal grant aiding agencies. An indication of the targets met in the first phase of the project is given in table 3.

Table 3: Some of the Achievements of Tamar 2000 Project in Phase One (1997-98)

Training and Advice	8 Farm advisors, 3 River Advisors, 1 assistant, 1 post-graduate received training. 250 landowners/farmers visited 150 receiving guidance 150 integrated farm management plans completed
Environmental Improvements	312 ha river corridor restored 169 km main river surveyed 190 km tributaries surveyed 26 km fencing created 8 ha woodland planted 9 km riparian woodland coppiced 871 ha wetland identified and recorded 22 potential wetland treatment areas agreed with farmers 5 wetland treatment areas completed 15 km ditches for re-vegetation agreed to reduce nutrient and sediment contamination. 81 sites of accelerated erosion identified and control measures implemented at 62 sites. 2 demonstration sites agreed; 1 operational 79 spawning sites de-silted 16 habitat improvement sites completed 20 buffer zones established
Employment	150 job sustained through delivery of integrated management plans (>273 people employed on farms visited). 36 Part-time job equivalents created equivalent to £391,415 benefits per annum after employment costs.

Derived from West Country River Trust Tamar 2000 Phase I Report to MAFF (1998)

Some lessons for applying an ecosystem approach

Implementation of the Tamer 2000 project was not achieved by specific linkage to the Convention on Biological Diversity or overt promotion of the ecosystem approach. Yet in essence the project embodies fully the concept of the approach and provides a strong practical example of its application. A preliminary analysis of the lessons learnt from the project highlights a number of key elements which underpin success:

- (i) Strong and effective working partnerships managed by a steering group, which can identify and react to problems.
- (ii) Fundamental importance of voluntary participation rather than by enforcement and regulation.
Effective publicity and continuing good communications
- (iii) One to one relationships between advisor and farmer.
- (iv) Wide technical skill base to support the project but matching available resources.
- (v) Clear potential for the community of farmers and landowners to accept actions, which will bring about environmental improvement alongside economic benefits.
- (vi) Value of providing advice and plans, which are non-prescriptive but emphasise practicality and include the vision of the farmers in decision-making.

Notwithstanding the acknowledged progress of the project, evidenced by the increase in the number of farmers wishing to be included in the second phase, there are still some overriding factors which limit success. There is still reluctance on the part of some individuals to reverse the received-view of agricultural 'best practices' such as drainage of wetlands. There is a major effect also of market distortions e.g. subsidies for flax cultivation which continue to lead to environmentally damaging land practices such as ploughing close to the river channel. It is unlikely that such contradictory effects will be eliminated totally without a fundamental alteration in the distribution of costs and benefits of environmental management. This surely is one of the major challenges to be addressed by application of the ecosystem approach in a European context.

How could IUCN add value?

The World Conservation Union could assist in the application of the ecosystem approach within a European context in a number of possible ways.

- (i) Provide a 'neutral' forum for debate and specific examination of different perspectives of the approach.
- (ii) Conduct an independent assessment of the constraints derived from EU and government policies on development and application of an ecosystem approach.
- (iii) Gather experience from its extensive European membership and experts in Commissions.
- (iv) Link the wide range of concerned organisations, including government, non-government and supra-government bodies.
- (v) Assist in linkage among Conventions including especially CBD, Ramsar and CSD.
- (vi) Provide technical assistance in particular to accession countries.
- (vii) Assist in dissemination of guidance, communication and capacity and awareness building.

Conclusion

Implementation of the ecosystem approach within the framework of the CBD offers an opportunity to manage the planet's biodiversity in a way, that also recognises the wider concerns of human societies. The concept terminology is still unfamiliar to many who will be challenged to implement the ecosystem approach. It is essential that we make best use of existing experience in the field and create a more universal understanding of its meaning and methods of implementation.

References

INTER-AGENCY ECOSYSTEM MANAGEMENT FORCE (1995): The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies. National Technical Information service, Department of Commerce, Springfield, US.

MALTBY, E., HOLDGATE, M., ACREMAN, M., WEIR, A. (eds) (1999): Ecosystem Management: Questions for Science and Society. Royal Holloway Institute for Environmental Research.

PIROT, J. AND MEYNELL P, (eds) (1998): Ecosystem Management: Lessons from around the world. A Guide for Development and Conservation Practitioners. IUCN Gland, Switzerland.

UNEP/CBD/COP/4/INF.9 (1998): Report of the Workshop on the Ecosystem Approach, Lilongwe, Malawi. Submission by the Governments of the Netherlands and Malawi.

WEST COUNTRY RIVER TRUST (1998): Tamar 2000 Phase I Report to MAFF.

Ecosystem approach for the Rhine

The Rhine Action Programme – Salmon 2000

On 1 November 1986 a serious industrial accident occurred at Basel in Switzerland. Nearly 30 tons of toxic chemicals (insecticides, fungicides and herbicides) spilled into the Rhine. Pictures of thousands of dead eels floating between Basel (Km 159) and the Loreley (km 560) were seen around the world. Besides the death of different fish species and macroinvertebrates, mercury contained in the fungicides polluted the sediments many kilometers downstream of the city of Basel. Following this event the Ministers of the countries bordering the Rhine adopted the Rhine Action Programme (RAP) on October 1st, 1987 to accelerate efforts to upgrade water quality and improve the state of this ecosystem. The goals to be achieved by the turn of the century are

- the ecosystem of the Rhine must become a suitable habitat to allow the return to this great European river of the higher species which were once present here and have disappeared, such as salmon;
- the use of Rhine water for drinking water production must be guaranteed;
- a substantial decrease of pollution by toxic agents must be achieved in particular with respect to the sediments;
- the North Sea must be protected against pollution.

Ecological Master Plan for the Rhine

In the view of the first named objective of environmental policy, the International Commission for the Protection of the Rhine (Members: CH, D, F, L, NL, EG) elaborated an “Ecological Master Plan for the Rhine“ (1991) focusing on two points: (1) the restoration of the main stream as a backbone of the complex Rhine ecosystem, with its main tributaries as habitats for migratory fish (sea trout, salmon, allice shad and other); and (2) the protection, preservation and improvement of ecologically important reaches of the Rhine and the Rhine valley, with a view to increasing the diversity of the indigenous animals and plants. An overall plan for the reintroduction of the long-distance migratory fish is being worked out. It lists those water bodies considered to be particularly promising for the return of the migratory fish (e.g. salmon) as well as the rehabilitation measures absolutely necessary for this purpose and their costs. The salmon was thus given a symbolic character and as far as possible it serves as an indicator for the amelioration/restoration of the entire Rhine ecosystem. It is well known that the salmon formerly passed through the Rhine catchment area and reached the Rhine Falls at Schaffhausen, as well

as the tributaries of the Aare (Switzerland) and that fishermen depended essentially on salmon fishing for their livelihood. The whole sanitation programme for the Rhine is meanwhile worldwide wellknown under the catchword “SALMON 2000“

If conditions are such that the salmon thrives, many endangered species also profit from the situation. The main stream must again become an efficient habitat for migratory fish, which means that unhindered fish migration upstream towards the spawning grounds and downstream towards the sea must be possible. Since the Rhine has become a waterway for large ships, with obstacles such as barrage weirs, power stations and dams, free migration is no longer possible.

The overall plan for the reintroduction of salmon explains the different improvement measures including re-establishing and re-stocking of previous habitats and their accessibility, which are necessary to be realized. For the support and realization of the project “SALMON 2000“ two applications for support within the EU-LIFE-Programme were approved. The result can be described as follows:

Until the end of the year 1998 some 180 returning salmon were seen in the Rhine catchment coming back to their spawning grounds. This result is evaluated by experts as a good starting point for a self-reproducing salmon population, an objective, which is not yet reached.

Ecological observation system “Rhine“

In the view of the objective “Salmon 2000“ of environment policy, ICPR has introduced an ecological observation system “Rhine“ which complements the monitoring of the water quality practised so far. Apart from an inventory of fish fauna, macroinvertebrates and plancton in 1990, 1995 and 2000, it includes analysis of toxic substances accumulated in aquatic organisms, particularly in fish, because only a systematic and continuing examination of the latest biological conditions of the river over the whole length will allow us to recognize changes in the ecosystem and links within it. Furthermore it enables us to follow the effects of pollution, to judge their ecological consequences and to plan and implement appropriate environment protection measures.

According to our analysis in 1995 45 of the former indigenous fish species and cyclostomata have returned to the Rhine. However the sturgeon is still missing. None the less, a few relatively unspecialized species such as European roach, bleak and bream predominate and represent 75 % of animals present. The analysis also reveals that, compared to the middle of the river (i.e. the shipping channel), habitats near to their natural state (lateral waterbodies and oxbow lakes of the Rhine etc.) have a significantly larger species diversity. There is no denying that these habitats are most important for the fish fauna. About 170 species of macrofauna have been detected in 1995. Compared with the number of species at the time of the highest pollution at the early 1970s, where only 27 species could be found, a considerable

increase could be stated. But nowadays there are a number of immigrants (neozoa) and sensitive species formerly resident in the Rhine (many insects, in particular stonefly larvae) that have disappeared – the community structure has changed. This is certainly a result due to the morphological changes of the water bodies.

Habitat patch connectivity

The Ecological Master Plan and the Salmon 2000 programme are the first successful steps towards protecting, preserving and improving ecologically important reaches along the Rhine. However, since the former network of all habitats, a so-called habitat patch connectivity no longer exists, there is a definite need for action in this field. On the occasion of the Ministers Conference in January 1998 the ICPR recorded all reaches of ecological importance along the Rhine and presented first proposals for improvements. The ICPR Rhine atlas cartographically presents the areas of ecological importance along the Rhine. The area of consideration is as follows:

- High Rhine: valley bottom and natural flood plain including ecologically valuable adjacent areas important for the development of a network
- Upper Rhine: natural flood plain according to the monograph of the River Rhine of 1889
- Middle Rhine: valley bottom and natural flood plain including ecologically valuable areas along the tributaries which are important for the development of a network
- Lower Rhine: natural flood plain with regard to the flood of 1926
- Delta Rhine: existing flood plain including ecologically valuable adjacent areas and/or adjacent areas which are important for flood retention.

Firstly the ICPR developed an “**Overall concept of the Rhine**”. This “vision” is described as followed: A river landscape in which large and ecologically valuable areas near to their natural state form the core areas of a global network. Within this network the crossing over of individuals from one habitat to the next is possible, which is essential for the maintenance of species diversity and population density. The aquatic as well as terrestrial areas of the Rhine, including the river bottom, the banks and the flood plain form an intact habitat for fauna and flora. The numerous other ecologically very valuable areas reach a minimum size for ecologically intact areas and are part of the network of biotopes.

Secondly the ICPR defined so-called “**development objectives**” for the flood plain and the river bed:

Flood plain of the Rhine

- The biotopes of the natural and cultural landscape in the flood plain of the Rhine are complementary and form an ideal network along the entire river. The size of biotopes and distances from one biotope to the next are ideal for the network.
- The protection of ecologically important areas is granted. Apart from habitats typical of the flood plains other biotopes may be worth protection which have emerged due to man-made changes of the water regime (e.g. extreme drought sites) but which have been classified as worth protection due to their rareness and make-up.
- Agricultural land situated in the flood plain is managed environmentally compatible as extensive grassland. Farming must be reduced to those parts of the flood plain which are rarely flooded. The structural variety of the flood plain in agricultural areas has for example been increased by creating and maintaining ditches, shrubberies, runs, humid hollows.
- Along the entire Rhine a sufficient number of landscape features typical of the flood plain, adequate in size and ideal with respect to their state of development exists or has developed, such as soft- and hardwood floodplain forests, reed areas, backwaters and torrents. These features are partly of natural origin and have partly been developed due to measures taken in the field of nature restoration. Their use respects nature and they are not being adversely influenced by adjacent uses.
- Waters in the flood plain such as backwaters and flooded gravel pits have been restored and developed on the basis of development plans.
- Adequate habitats have developed or have been created with a view to forwarding biocoenoses typical of the flood plain of the Rhine. The populations of species typical of the flood plain of the Rhine are steady.
- Wherever possible flood defences have been moved back or their management is environmentally compatible. All in all the part of the flood plain that may be inundated has been significantly increased compared with today's state.
- In the flood plains the built-up and surfaced areas have not been increased compared with today; wherever possible construction and paving have been reduced (e.g. by evacuating detached farms).
- Here and there an extensive natural flood plain landscape has developed in certain sparsely populated areas. These areas are governed by the river dynamics so that greater floods may give rise to important changes. These areas are highly protected.

River bed

- Many biocoenoses typical of the Rhine have again returned to the Rhine and its tributaries. The populations of typical species such as salmon and sea trout are self-reproducing.
- The biological patency from the Rhine to its tributaries and backwaters is granted.

- The Rhine continues to be a navigation route as far as Rheinfelden. As far as possible no further weirs are constructed. The existing ones are equipped with fish ladders so that the entire river system may function as migration route. This is also true of the tributaries.
- Stretches of freely running water have been maintained. In many parts the river bed presents a natural structural variety (e.g. banks, islands, scours) which is preserved and supported by appropriate management. Due to their ecologically sensible structure and management the numerous structures of anthropogenic origin (e.g. groyne fields) are complementary to the natural variety of structures.
- Except for urban areas and the embankments along the Upper Rhine the river banks of the Rhine have been transformed to a natural state. The river banks have been improved to such an extent that aquatic and amphibian biocoenoses have developed. Plant communities typical of the habitats and the landscape grow on both sides of the river. Apart from few sites where no other development was possible the river bed is skirted by a sufficiently broad riparian zone. Appropriate measures based on development plans.
- Wherever possible, the natural morphodynamics of the river is restored.

As strategy for reaching the development objectives it is being recommended:

- to elaborate development concepts for each section of the Rhine designed for an ecological revalorization and the creation of an ecological network. These development concepts are the basis for the further elaboration of concrete plans for habitat development. It must be looked into whether coordinating authorities must be set up or whether existing bodies can be charged with the implementation of the development concepts.
- to integrate these development concepts into guidelines for spatial planning and to take them into consideration within planning procedures or permissions.
- to integrate statements on priority measures, costs and a timetable of implementation into the plans of habitat development to be drawn up.
- to invite local interest groups and bodies to take part in the drawing up of plans of habitat development at an early stage. This will promote the required acceptance as well as a rapid implementation of isolated measures.
- to delegate ecological experts to existing decision-making bodies. This will improve an early awareness and integration of ecological questions even on a higher political level.
- to formulate individual agreements with users (groups of users) concerned. Apart from a certain legal security this may contribute to securing targets achieved in the medium or long term and permit long term ecological development processes.
- to consequently apply existing protection regulations. This is believed to be a great potential for short-term implementation of development targets aimed at protecting ecologically highly valuable sites.

- to determine possible subventions (European Union, German Länder, etc.) in order to be able to successively implement the proposed measures.
to develop possibilities in the field of extensification of agricultural use in order to be able to draw on or establish programmes for compensatory payments
- to establish periodical discussions for the members of all authorities concerned. For the different sections of the Rhine these discussions will be held separately and will contribute to a continued cross-border exchange of views which will above all have positive effects on future spatial planning. It should be examined whether mediators should be included.
- to interlock the proposed development targets and measures with existing and new programmes (e.g. “Action Plan for Flood Defence” aimed at an improved flood prevention) and to implement them simultaneously.
- to intensify targeted public relations. This will promote the general awareness and sensitise the target groups for ecological matters.
- to develop pilot projects in the different sections of the Rhine and to link them by partnerships. This symbolic act would underline the importance of the Rhine river system and the of network between the river and its flood plain.

With a view to restore the habitat patch connectivity, local as well as a large number of common actions to ecologically upvalue and connect habitats are necessary. In many cases specific local measures are important, but they have to be bundled up in order to aim at a habitat patch connectivity along the Rhine. The ministers charged the ICPR to rapidly supply more details on the further working steps towards a habitat patch connectivity along the Rhine. At the same time, the required criteria, a detailed calendar and success control are to be fixed. Many measures aimed at an improvement of the Rhine ecosystem must be linked with measures within the Action Plan on Flood Defense and should be carried out simultaneously in order to grant efficient action. This integrated approach is part of the Action Plan on Flood Defense: “The measures of the Action Plan must go hand in hand with on-going or planned measures for the protection and restoration of aquatic and terrestrial habitats in general, particularly in the Rhine valley. The improvement of the ecological situation must equally be integrated into all interdisciplinary plans in order to compensate for the ecological deficits of the past.”

From species to ecosystem approach - the case study on the swan mussel *Anodonta cygnea* from the Nida river valley, southern Poland

Abstract: The large freshwater mussel *Anodonta cygnea* inhabits biotopes (eutrophic ponds, oxbows, old river beds and sections of rivers with slow current), which have become rare due to hydrotechnic changes in river valleys. To find successful protection measures for *Anodonta cygnea* in modified landscape, the case study was carried out in the Nida river valley. Comparison of waterbodies, occupied and unoccupied by *Anodonta cygnea*, shows that species seems to prefer larger oxbows or old river channels with slow current. Physicochemical analyses of water indicate possibility of the lower conductivity, higher concentration of Mg^{+} and lower concentration of Ca^{+2} preferences in the mussel sites. The *Anodonta cygnea* seems to avoid water with high content of Ca^{+2} and SO_4^{-2} ions (occurring together). Distribution of the mussels on the bottom of waterbodies indicates that the largest concentrations of the mussel beds are on the slope of the bottom, about 2-10 m from the bank. The species prefers unpolluted oxbows and old river channels in early stage of succession, which are created and maintained only by the river activity. Thus, conservation measures cannot be based on just conservation of the small water bodies but must be focused on the protection of the natural geological activity of the whole Nida valley.

Key words: Swan mussel, *Anodonta cygnea*, habitat requirements, river valley, ecosystem approach, freshwater mussel conservation

1. Introduction

Some people are aware that certain types of aquatic ecosystems are disappearing. A decline in aquatic organisms is much greater than that documented for terrestrial species. Many threatened and endangered species are associated with river system. Mussels belong to this group of animals which are particularly threatened, due to their sensitivity to contaminants.

Poland freshwaters are inhabited by 28 species of mussels (6 species of the family *Unionidae*, 21 species of the family *Sphaeriidae* and 1 species of the family *Dreissenidae*). The freshwater mussels from the genus *Anodonta* (*Bivalvia: Unionidae*) play an important role in Polish fresh waters as the filter feeding animals. They are responsible for decreasing of suspended particles in water and significantly contribute to water purification. They are often a dominating component of the benthos biomass in the lowland rivers, lakes and ponds because of their large body size (e.g. the average measurements of *Anodonta cygnea* shell are: length 125 ((14 SD) mm, height 62 ((6 SD) mm, width 39 ((5 SD) mm) (PIECHOCKI, DYDUCH-FALNIOWSKA 1993).

In the 80-ties species from the family *Unionidae* were under strong antropogenic pressure, resulting in a significant decrease in their populations. Some negative qualitative changes in populations as decrease in body size, changes of the shell shape, changes in the vertical distribution of individuals in the waterbodies were also observed (DYDUCH-FALNIOWSKA 1989). The main cause of threat seems to be a change in the physical and chemical properties of the water habitats.

Generally, in the past six common species of *Unionidae* occurred in the waters of Poland. Three of them are now not very common and three, very rare. It is necessary to work out the strategy of the mussel sites conservation. Lack of the activity in this area may lead to serious threats, like in the case of Polish population of the freshwater pearl mussel *Margaritifera margaritifera*, which became extinct in Poland in this century (BAUER 1988, DYDUCH-FALNIOWSKA 1992a).

The large freshwater mussel *Anodonta cygnea* is seriously threatened with extinction in Poland (DYDUCH-FALNIOWSKA 1992b). It is protected by law (DECREE ON THE ANIMAL SPECIES PROTECTION - Dz. U. nr 13, poz. 65, 1995). Detailed information about the distribution of *Anodonta cygnea* is scarce. Generally, the species occurs in the lowland part of Poland but many water bodies have not been inspected. The existing data illustrate only the geographical range of species distribution.

The swan mussel is restricted to disappearing biotopes, - mainly eutrophic ponds, oxbows, old riverbeds etc. Most of the river habitats are affected by pollution (pesticides, fertilizers and municipal sewages). Changes in the physicochemical properties of waters frequently result in their degradation and they are main cause of the decline in numbers of the species. River training and drainage of the river valleys are

other threats to the *Anodonta* biotopes. Its adaptation to very specific habitats is a cause of the present decline.

2. Materials and methods

To find successful protection measures for *Anodonta cygnea* in the fragmented, modified landscape, the case study was carried out in southern part of Poland. The study area was located in the Nida river valley (southern Poland, fig. 1.).

This natural river valley, only partly regulated, comprises many natural and degraded habitat of the swan mussel. There are very diversified water bodies in different stages of the biological succession. In the 80-ies *Anodonta cygnea* was relatively common species in this area. In 1995-1996 I made an inventory of *Anodonta cygnea* occurrence as well as the inventory of all water bodies in the study area. I have found there many sites suitable for *Anodonta cygnea* but not all of them are inhabited now. To discover a cause of this phenomenon I compared the inhabited and not inhabited waterbodies with regard to geomorphology, stages of the biological succession and water chemistry.

Figure 1: Distribution of the swan mussel sites in the middle Nida River Valley

Figure 1 is available in the printed version of this report only!

I checked the swan mussel occurrence in the all waterbodies and compared numbers of specimens. In the reservoirs with alive individuals of swan mussel I mapped the vertical distribution of the species in order to determine microhabitat requirements. I measured depth, distance from the bank, kind of bottom, thickness of mud, availability of oxygen and food as well as a risk of predation for each place with the mussel bed.

In the studied waterbodies the water chemistry was measured. Conductivity, oxygen saturation, temperature and pH were measured in the field by microcomputer's meters. The samples of water were collected for the laboratory analysis. Some characteristics of water like hardness, alkalinity, oxidability, BOD5 (biological oxygen demand), ionic composition (N-NH₄, N-NO₃, N-NO₂, PO₄, SO₄, K, Na, Cl, Ca, Mg, trace metals - Cu, Cd, Pb) were measured in lab for the comparison of the chemistry compounds in the waterbodies, with and without swan mussel.

3. Results

Stage of succession

The inventory of 30 waterbodies occurring on 25 km section of the Nida river valley was made. Alive individuals of *Anodonta cygnea* were recorded in 10 sites (fig. 1, 3).

In the Nida river valley we can recognise two groups of waterbodies (fig. 2.):

- created in the course of meandering processes,
- created in the anastomosing processes (where the river ramifies its bed).

According to the stage of the development the meandering river creates:

- backwaters - partly cut meanders/curves of the river,
- oxbows - completely cut meanders,
- water eyes - shallow, small water bodies.

The adequately anastomosing river creates:

- shallowing branches with slow current,
- old river beds without flow,
- water eyes, too.

Channel development:

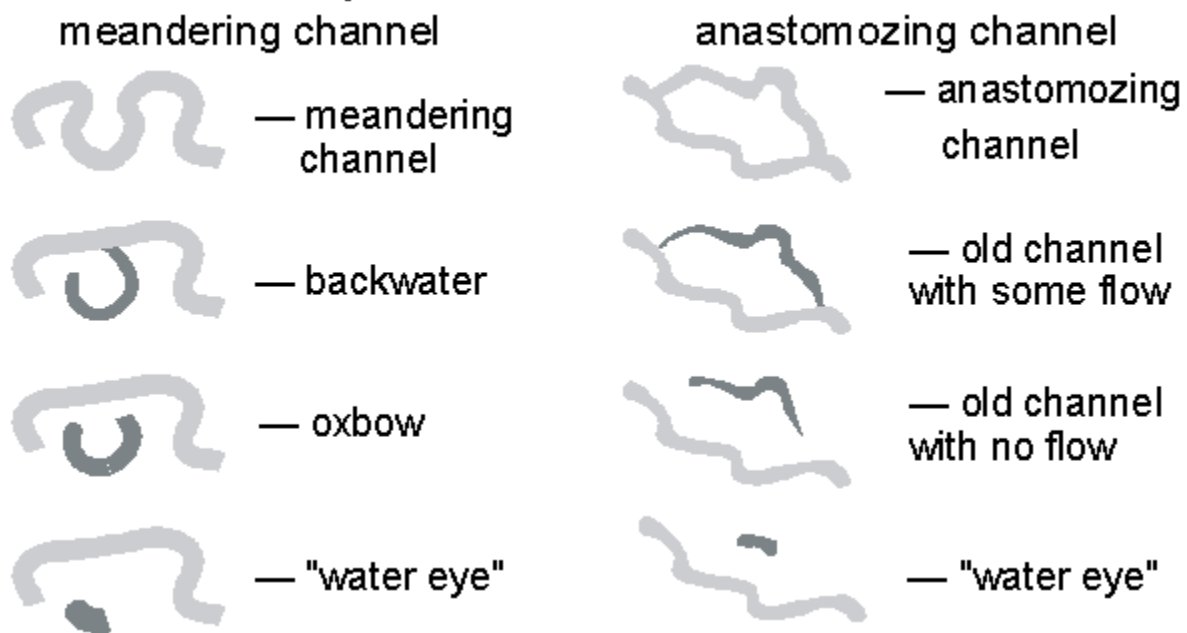
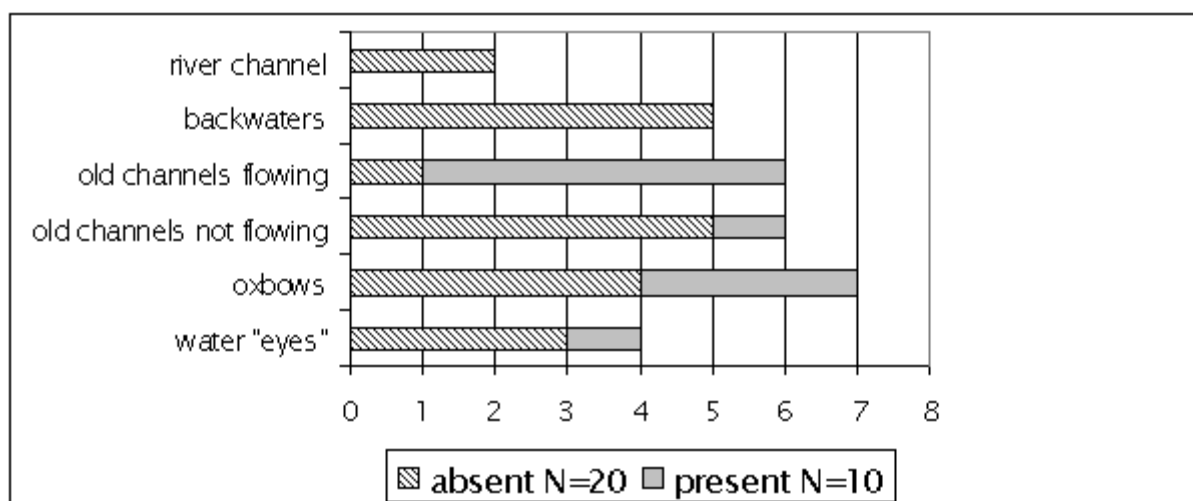


Figure 2: Geomorphology of the studied water bodies

A comparison of water bodies, both occupied and unoccupied by swan mussel shows that the species prefers larger oxbows or old river channels with slow current (fig. 3.)

Figure 3: Number of waterbodies with and without swan mussel population



Drainage was a main factor responsible for loss of potential habitats of the species. In the Nida valley it was started in the end of the 60-ties, however the most of study area was degraded during the 80-ties. The main bed of the river was straightened and deepened. The elevated river embankments isolated the

river meanders and old riverbeds from the main course of the river, which conduced to their eutrophication and gradual vanishing.

Bottom structure

The distribution of the mussels on the bottom of waterbodies indicates that only some places offer suitable conditions for them. The largest concentrations of the mussel beds were found on the slope of the bottom, about 2-10 m from the bank. Close to the bank (0-2m) there is no mud, water is shallow, waves mix the sediments and changes bottom structure. There is also a high risk of the predation. In the deepest parts of the waterbodies the layer of the mud is very thick and oxygen conditions are worse (fig. 4).

The best conditions occur in the intermediate zone, on the slope of the bank. Each kind of the waterbody has a specific pattern of water currents. Movements of water influence the oxygen and food conditions in the waterbody. The most advantageous current patterns for mussels seem to occur on the slope of the bank. The largest concentrations of the mussel specimens occur there. Mussels with small body size were more frequent near the bank and bigger specimens showed preferences for places more distant from the bank.

The preferred microhabitat - part of the waterbody with suitable current pattern and thin layer of the mud - is characteristic for the waterbody in the early stage of the succession, that means, for oxbows and old river channels with some flow.

Figure 4: Dirstribution of the swan mussel on the bottom of the old river channel with a very small flow - the optimal habitat

Figure 4 is available in the printed version of this report only!

Water chemistry

In the Nida river valley two types of waters can be recognised: one with content of carbonates and calcium and the other with high sulphates and calcium content. The first type is characteristic of most waters in this climatic zone. Sulphates-and-calcium waters are rarer and flow from gypsum karst area (WROBEL 1964). They have high content of both Ca^{+2} and SO_4^{-2} ions. Whereas the water characteristic of the main Nida river is suitable for *Anodonta*, most of their tributaries usually belong to sulfate-and-calcium type, avoided by the species.

A physicochemical analysis of water indicates lower concentration of Cd^{+2} in the mussel sites. Swan mussel never occurs in the water bodies, which has no oxygen at the bottom. This species does not occur in waters with high conductivity, which flow out from gypsum karst area and characterise high concentrations of calcium and sulphate ions, and also higher concentration of Mg (tab. 1.).

Tab. 1. Results of the water chemistry studies of the waterbodies with and without swan mussel populations (only statistically significant (*) and near significant results).

Parameter	Abundance of the swan mussel		Statistics
	present	absent	
conductivity	650 μS	880 μS	$F(1,15)=4,2$ $p=0,059$
$\text{PC1}(\text{Ca} + \text{SO}_4)$	-0.5	0.8	$F(1,15)=4,1$ $p=0,06$
O_2 dissolved in H_2O	9,4 mg/dm^3	8,4 mg/dm^3	$F(1,28) = 4,73$ $p = 0,04 *$
Mg	7,8 mg/dm^3	5,6 mg/dm^3	$F(1,15)=3,67$ $p=0,074$
Cd	0,009 ppm	0,022 ppm	$F(1,15)=5,95$ $p=0,028 *$

4. Discussion and conclusions

The main aim of the project was to establish criteria for identification of the environmental conditions favourable for *Anodonta cygnea* populations and to propose a way of their management and conservation.

The detailed water chemistry analysis led to the conclusion that first of all *Anodonta cygnea* avoids the cadmium - the metal highly toxic for living organisms. The increased concentration of the cadmium was recorded in sites near railways and roads, which are probably the source of pollution. The species avoids water bodies, which has no oxygen at the bottom, which may be caused by eutrophication - a natural process characteristic in old stage of water bodies succession.

There is a possible positive relation between the mussel occurrence and higher magnesium contents, although the mechanism of this relation is unclear.

As in the case of the majority of aquatic species, only complex management and protection of the whole river valley may help to restore the swan mussel in its former habitat and prevent its extinction. The types of water bodies inhabited by *Anodonta* are oxbows and old river channels, mainly originating as a result of geological activity of the river. Thus, conservation measures cannot be based on individual water bodies but should consist in protecting of the natural character of whole of the Nida valley. The conservation of the species in the river valley must be focused on creating large diversity of water bodies, because the existing ones are no longer a suitable habitat for the swan mussel due to the natural succession. In natural conditions new sites created by the river replace water bodies disappearing due to the succession. Natural sites have offer a large variety of suitable natural microhabitats (shape of the bottom, currents pattern) where the mussel beds can develop. Thus meandering and anastomosing processes must continuously operate, permanently creating new habitats, which are colonised by *Unionids*, while the previous mussel sites continuously loose their suitable character. Floods purify water bodies from pollution and mud, enable migration and colonisation. The natural river has higher selfpurification ability and keeps the sources of pollution far from the floodplain.

Maintaining of channel changes by the Nida river and regular flooding of the whole of the floodplain (where only meadows, fields and small forests exist) is not in a conflict with the current land use. This should not be complicated and expensive. The protection of the hydrological process and in this way the protection of the water bodies in different stages of succession gives a real chance to maintain the swan mussel, or to restore its population. The present threats resulting from water pollution seem to be less important but they need complex solutions, too.

Acknowledgements

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References

BAUER, G. (1988): Threats to the freshwater pearl mussel *Margaritifera margaritifera* L. in Central Europe. *Biological Conservation* 45, 239-253.

DYDUCH-FALNIOWSKA, A. (1992a): *Margaritifera margaritifera* (LINN, 1758) Skojka perlorodna. In: Polish Red Data Book. Ed. Z. Glowacinski. PWRiL: 302-304.

DYDUCH-FALNIOWSKA, A. (1992b): Malze. Bivalvia. In: Red List of Threatened Animals in Poland. Ed. Z. Glowacinski. PAS - Nature Protection Research Centre: 25-29.

DYDUCH-FALNIOWSKA, A. (1989): Threats to the bivalves of the Unionidae family and their habitat preferences in the waters of Poland. *Proceedings of International Scientific Seminar CMEA/IUCN: The problems of the plant and animal species protection. 24-26 October 1989, Cracow-Zakopane, Poland.* Nature Protection Research Centre PAS, Cracow: 65-70.

PIECHOCKI A., A. DYDUCH-FALNIOWSKA (1993): *Mieczaki (Mollusca), malze (Bivalvia)*. Wydaw. Naukowe PWN, Warszawa. - (Fauna Słodkowodna Polski; z. 7 A).

WROBEL, S. (1964): Peculiarities of the chemical composition of water in ponds situated on gypsum. (Osobliwosci skladu chemicznego wody stawow polozonych na gipsach). *Acta Hydrobiol.* 6, 3: 285-288.

Biosphere Reserves: a model for implementing the "Ecosystem Approach" in Europe

Question of Scale

The Convention on Biological Diversity (CBD) is the stimulus for work at the global level. Signatories to the Convention are committed not only to global initiatives but also to action within their own State. In Europe, there are two other initiatives which provide opportunities for action at different scales. First, the Pan-European Biological and Landscape Diversity Strategy (McCLOSKEY 1996) is an initiative from the Council of European Environment Ministers designed as a response to the CBD. The Council of Europe initiated the drafting of the strategy and involved the European Centre for Nature Conservation, IUCN and the World Conservation Monitoring Centre. The current work programme to implement the strategy is for the period 1996 – 2000. The main themes include work on the creation of ecological networks, coastal and marine ecosystems, rivers and related wetlands, inland wetlands, grassland, forests and mountains. Other themes include landscapes and threatened species. The Strategy is therefore taking an ecosystem approach, though it also has a theme which looks at the integration of biodiversity conservation into various sectors of economic activity. Secondly, within the European Union, there is the EC Biodiversity Strategy (ANON. 1998). This was adopted by the Commission in February 1998, includes a general set of objectives to be achieved, calls for sectoral and cross-sectoral action plans to be developed and lays responsibility with the various Directorates General. The CBD requires that individual States produce national action plans and in several countries this has led to a requirement for the production of plans by lower tiers of Government. Within such plans there is often an emphasis on both habitat and species plans being produced. This provides scope for an ecosystem approach being engendered. In parallel, there could be merit in each country adopting the BR approach to the management of its whole territory.

Basic Biosphere Reserve Concept

The concept was developed under United Nations Educational, Scientific and Cultural Organisation's (UNESCO) Man and the Biosphere (MAB) Programme and was initially formulated in 1974 (UNESCO 1974), leading to the establishment of the first Biosphere Reserves (BRs) in 1976. However, the concept has continued to evolve and was most recently re-enunciated at a meeting in Seville in 1995 (UNESCO 1996). The general approach of UNESCO to BRs is a very broad and tolerant one, which seeks to embed

the Reserves in the milieu of normal land use practice and to achieve a rapprochement between development pressures and sustainable use. This thinking is not only entirely consistent with the ecosystem approach, it embraces all of it and more. The future of biodiversity conservation has been said to depend on a flexible approach to the management of ecosystems rather than on binding legislation (IUCN 1998). This too is part of the ethos of the BR manager and hence, the current perception of BRs is very much in tune with the Malawi Principles which characterise the Ecosystem Approach. The Reserves are study sites and demonstration areas which serve three functions viz the conservation of biodiversity, provision of support for research training and innovation and fostering sustainable development in partnership with local communities.

The fundamental difference between BRs and all forms of protected areas is that they have no outer boundary. Additionally, they form a world network of representative ecosystems within biogeographic provinces. Each Reserve is divided into three zones. The innermost or core zone tends to be the area of highest value for biodiversity conservation and tends to be managed as an area set aside for long term protection with minimal human activity, mainly in the form of research. The middle or buffer zone is one in which various forms of exploitation may take place but in which the goal of sustainable use of natural resources is paramount. The third or transition zone extends on outwards to land under normal commercial and industrial use. This means that Biosphere Reserves frequently contain portions of the same ecosystem in conditions ranging from near natural to heavily degraded. Each example provides an illustration of the potential of others and a yardstick for measuring the amount of degradation. This means that BRs are places where the functioning of ecosystems under a variety of management regimes can and should be studied.

Within the core and buffer zones, the intention is that all forms of exploitation should be managed. Whilst different mechanisms exist in different countries, management is frequently achieved through a combination of legislation in the fields of nature conservation and spatial planning of land management involving the stakeholders concerned. Inherent in the concept is the idea that the Reserves will be used for research and education. This includes that aimed at empowering the general public by enhancing their awareness of the threats to the life support systems of planet earth and hence to the survival of mankind. Importantly, it also includes examining the scope for local action and for other actions by local communities. The approach is based on maintaining the integrity of ecosystems and demonstrating the ways in which exploitation can be sustainable. This part of the concept has been made increasingly explicit in the last decade.

In any one country, the suite of areas selected is expected to cover the range of bio-geographical zones that exist. Despite the pioneering work of Udvardy (UDVARDY 1975), there is little international agreement on bio-geographic sub-divisions below the province level, even in Europe. Ecosystems also have a bio-geographic distribution and when dealing with any one part of the range it is wise to be aware

of the full distribution and the variations that occur therein. This can provide useful pointers on questions relating to the functioning of the system. The European Union has also produced a schematic bio-geographic zonation. This has considerable importance to the selection and designation of areas protected under the Birds Directive and the Habitats Directive. In addition, it is important in relation to the creation of ecological networks that support the major occurrences of particular ecosystems. Whilst the initial set of BRs declared in 1976 was very variable in terms of the size of individual Reserves, the recent trend has been for the declaration of very large areas. Of a total of 359 reserves expected to be designated at the end of 1998, representing 90 countries, there are 33 reserves larger than one million hectares (LASSERRE 1998). Ten of these have been declared in the last five years. Two of the Reserves yet to be approved, Air et Tenere in Niger (24 million Ha.) and Mata Atlantica in Brazil (30 million Ha.), are larger than the United Kingdom. They therefore provide enormous scope for research and experimentation and real challenges for co-ordination and management. At the other end of the scale, some countries have failed to keep pace with the evolution of thinking and their Reserves do not encompass the current philosophy. The UK is a case in point. The Reserves declared in 1976 were mainly the core areas only of the modern concept and are managed as strict nature conservation areas. The discrepancies were noted in a report in the early 1990s (ANON. 1990) but it has taken the Statutory Framework arising from the Seville Strategy to force the UK into a more formal review of the position. Work on reviews of the BR series is also in train in Belarus, Finland, France, the Russian Federation and the Ukraine (ROBERTSON 1997). Another fundamental difference from other protected areas is that BRs constitute a world network, legally established under a Statutory Framework adopted by the UNESCO General Conference in 1995. They are now subject to a periodic review every 10 years. Due to the complexity of the arrangements and the number of different groupings with a voice in the management of a BR, there is a tendency for the person at the top of the management chain to be referred to as the BR Co-ordinator rather than manager. There is an important distinction in roles here and it is the co-ordination role which is closely related to making the Malawi principles work effectively.

Application of the Malawi Principles

A workshop was organised within the framework of the Convention on Biological Diversity at Lilongwe, Malawi in January 1998. This resulted in a set of principles to guide those seeking to apply an ecosystem approach in the conservation of biodiversity (UNEP 1998). These principles therefore need to be taken account of by all governments that have signed the Biodiversity Convention. Whilst the underlying ideas are sound, the expression of them as principles is inconsistent. Ideally, they should be capable of being applied by those responsible for strategic land use planning on behalf of a local authority or national government. The underlying approach is one of encouraging all managers of ecosystems or elements thereof to appreciate that they are dealing with what may only be a part of a functioning ecosystem. For that reason, they need to have regard to the effects of their actions on other parts of the system and on

the interests of others. Given the 25 years of experience already gained in such work on BRs, they are ideally placed to be models for study and examples to which governments should look in seeking to take forward work under the Convention, especially where an ecosystem approach is required.

1. Management objectives are a matter of societal choice.

Societal choice can be expressed in many forms, not the least of which is through international conventions such as that on the Conservation of Biodiversity. What is important here is that societal choice is not equated solely with the needs of local communities nor with the voice of locally elected representatives. In a BR, the management objectives are usually expressed as both general ones that apply throughout and as those that refer to individual zones. For the core zone, which seldom has any habitations, the "societal" input tends to come from the "users" i.e. the reserve authority and the research institutions involved. The BR however, is there as an expression of societal choice and it is therefore implicit that the core zone will be managed for biodiversity conservation. In the buffer zone, there is more scope for the involvement of any local communities but once again, the societal choice is made at the time of the creation of the Reserve and biodiversity conservation is expected to take precedence over other considerations. In the transition zone, the reverse is the case and biodiversity conservation is subservient to other societal concerns.

Thinking of major ecosystems, one wonders how analogous points can be made. Most national governments are signatories to a wide spectrum of international agreements, including those on trade and commerce. Probably the key documents for biodiversity conservation will be the national biodiversity action plans. Few of the ones that I have studied have given a clear indication, in respect of individual ecosystems, of any societal choice. Whilst the plan for the UK envisaged a series of "Habitat Action Plans" (ANON. 1995a), it provided no strategic vision as to whether certain types will be increased or decreased in relation to one another. Subsequent work on plans for individual habitats produced some excellent ideas but again no strategic overview (ANON. 1995b). At the level of the European Union we also have conflicting pressures coming from the environmental policy on the one hand and the agricultural policy on the other. Both policies can claim to be an expression of societal choice. Those wishing to take an ecosystem approach to their work will be hard pressed to find a way of determining how they prioritise the societal choices involved. What is clear in the BR context, is that managers require training in dealing with such activities as the resolution of conflicts over the use of natural resources (KERR 1995). For BRs, the co-ordinators have to be both the oil and the glue. They are required to be oil in the sense of easing the workings of the system and of being poured on troubled waters. They require to be glue in order to hold things together and sometimes a really tenacious grip is required to counter the forces of deformation.

2. Management should be decentralised to the lowest appropriate point.

This is presumably akin to the concept of subsidiarity and the key word is "appropriate". Defining what the appropriate level is in various sets of institutional arrangements is a real challenge. Some BRs straddle national boundaries. They have already wrestled with the problems of relatively junior staff having transfrontier responsibilities and of co-ordinators on either side of the boundary having an unusual degree of delegated authority-in order to avoid the need for long chains of command, involving politicians, over mundane management matters. The principle is an excellent management maxim. If it is viewed in a BR context, the pattern of delegated authority in different countries is very varied indeed. It makes a great deal of sense for there to be some overall authority responsible for a co-ordinated approach to the work. This relates to a national perspective on the series and to the general prioritisation of funding. Next, it makes sense for there to be a manager for the individual Reserve and normally such a person would expect to have specialists in charge of the different functions such as practical management, scientific research and monitoring, public facilities, interpretation and so on. That does nothing for an ecosystem approach. This principle needs to make clear that the management of an ecosystem demands an analogous set of responsibilities. Thus, the country action plan needs to indicate the relative priority for action in respect of the suite of ecosystems present and the key activities that need to be undertaken-first by the different arms of government at the national level, then at the local government level. A good plan would also provide guidance and incentives for any owners or managers of large or important tracts of the ecosystem. In other words, the merits of decentralisation of decision-making come when the delegation of authority is accompanied by clear guidelines on the limits to the authority and the over all policies and priorities which are to apply.

3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

One wonders who are these ecosystem managers? Will they recognise themselves and do as required? It must be made clear who is being addressed and something more than exhortation is almost certainly desirable. Foresters are used to the idea of managing different parts of a forest for different purposes and they normally have a plan, which encompasses all of the same types within one document or part thereof. In a BR, a similar approach is often adopted. Areas requiring similar treatment to achieve the management objectives are dealt with within the one section. Few people will think of themselves as ecosystem managers. This advice is appropriate for all managers of land and for all whose activities impact on any aspect of the biosphere. In some ways, the approach is akin to that of requiring a well-conducted environmental impact assessment for both policies and projects. The European Community already has legislation on this topic and there would be merit in ensuring that the ecosystem approach is more fully incorporated in due course.

- 4. Any ecosystem management programme 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**

This is surely the ultimate counsel of perfection destined to fall on deaf ears attached to powerless people. There can be few true ecosystem management programmes where there are people with control over these issues. One of the basic problems of biodiversity conservation is that biological resources are frequently managed by a plethora of interests, over the same piece of land. Whether it be mountain, river or coast, the chances are that the ecosystem is seen by a gamut of bodies and individuals as being managed by them. In Scotland, Scottish Natural Heritage has created a forum for each of the major estuaries. Whilst these bodies mainly serve a need for consultation and information flow, they do also assist in engendering an ecosystem approach (ATKINS 1997). In a BR, it is not unusual for there to be traditional land use, including agriculture, hunting and public recreation. These activities are not always all within the control of the Reserve manager. They are, however, within the scope of the functions of a Reserve Co-ordinator. In addition, it is not unusual for there to be other interests associated with the provision of public utilities who have statutory rights to carry out work.

Market distortions and the provision of incentives are normally subject to all kinds of influence from sources well outside of the control of a reserve manager and many of them are outwith the control of national governments. BR Co-ordinator can have this role and this is an advantage of Biosphere Reserves over the management arrangements in many other more traditional protected areas. Having said that, there is a clear role for the European Union and for national governments to look at this issue as biodiversity action plans are developed. The key aspects in Europe will surely be the reform of the Common Policies on Agriculture and Fisheries and the recasting of the use of the structural funds. At the global level, this principle would suggest that the revision of GATT must be undertaken with these considerations in mind. These are all factors which mitigate against attempts to carry out sustainable development locally since they are far beyond the powers of most local communities to influence.

- 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.**

These two principles are dealt with together. This is a crucial part of the approach and it warrants a fuller treatment since so many influential people will have little grasp of the concepts involved. Worse than

that, one hears views expressed which suggest that large numbers of species may be unimportant to the effective functioning of an ecosystem. In order to gain a clear understanding of the ways in which ecosystems function, there have been a number of significant scientific programmes of which the UNESCO MAB Programme was an early starter. The Diversitas Programme is the latest international science programme to utilise the opportunities offered for long term scientific research and monitoring on BRs (DIVERSITAS 1996). There is still only a limited understanding of the way in which different components of an ecosystem can operate on different timescales and of the way in which the periodicity of climatic events may play a significant role. Despite much work on energy flows within selected systems, there is a need for greater understanding of how these flows may be altered to bring about desired states. In the same way, analysis of the species in an ecosystem in terms of the role that they play therein has progressed substantially. By comparison, the importance of the niche in the maintenance of the system, as opposed to the survival of the species needs more research. Adjustments of the qualitative and quantitative aspects of these topics may affect the duration of a state of equilibrium.

7. The ecosystem approach must be taken at the appropriate scale.

This might be better expressed as "at all levels of Government and planning". In the UK, not only does the national biodiversity action plan give some impetus to an ecosystem approach, local government has also been encouraged to think along these lines. Good progress is being made by many local authorities in Scotland, due to strong input from the state nature conservation agencies and from the voluntary sector (KERR and BAIN 1997). In Germany, the Flusslandschaft Elbe BR has been enlarged from a small reserve which did not encompass enough of the riverine ecosystem. In order to protect the majority of the river system, it has been found necessary to designate a Reserve which involves five Lander. In the Cevennes BR, the management committee was encouraged to seek an extension of the Reserve to enable them to encompass a whole ecosystem and apply a common management regime to it.

8. Objectives must be set for the long term.

Many ecosystems involve processes that operate over a time scale of centuries. It makes good sense to try and set objectives that will stand the test of such a time period. Given the mortality of human beings and the rapidity with which governments and other institutions undertake reviews if not changes of policies, there is also merit in having objectives or targets to be met within a relatively short such time-scale such as five or ten years. These are also a much more effective spur to action and provide a means of measuring progress. Most protected areas have some form of management plan and these documents frequently set out both long and short-term objectives. Short-term objectives should be SMART (specific, measurable, achievable, relevant, time-related). Having said that, they need to be set in the

context of the longer-term vision. The Seville Strategy provides exactly that guidance in respect of BRs. There is a real tension between the current pre-occupation with measurable targets on the one hand and providing visionary strategic vision on the other. Both are required. It may be easier to deal with the former but they may be to no avail in the absence of the longer vision and that is what governments are reluctant to become involved in. Perhaps the EU Biodiversity Strategy can be used to encourage them in that direction.

9. Management must recognise that change is inevitable.

The whole idea of the Man and the Biosphere Programme when it was launched in 1971 was that of integration- of disciplines, of concepts, of goals and of efforts. People were seen as the motor of change. The Reserves have now seen 25 years of change and 25 years of training in dealing with change. In the Seville Strategy, the phrase used is "change in line with the conservation objectives". The idea is inherent in the BR concept. Transition areas were intended to accommodate adaptations to society's call for sustainable development and use. In these areas, calls for a return to some romantic notion of a natural state are inappropriate. They contain the means of production of the community and the approach is a positive and forward-looking one which seeks to accommodate change whilst seeking a good environment and a good quality of life. Change seems to have been the hallmark of the current decade. The pace of change has increased rapidly not just in respect of ecological considerations but also in respect all kinds of aspects of society. The rate at which governmental structures have been changing in Central European states, for example, has been beyond the comprehension of the ordinary citizen in Western Europe. In the early decades of the nature conservation in Europe there was a belief that humans were the enemy and that the ideal form of management was that which put some kind of fence around nature. This was meant to keep man at bay and allow nature free reign. Belief in the ability of nature to restore small portions of ecosystems to some form of natural balance was short lived. It took longer for mankind to enunciate management policies ranging from "leave alone" through to "intensive intervention for restorative purposes". Persuading managers of biodiversity to do nothing on occasion is one the most difficult challenges we face because doing nothing is not perceived as management. Research into the functioning of ecosystems has given us a much better understanding of the complex mosaics involved and how different parts of the mosaic have cycles of growth and decay that operate over very different timescales. Change is inevitable. Recognising that does not necessarily give a clear view of what best to do in the short or long term. Given that many mire systems would naturally grow, dry out and decay, what should the manager do? In most cases, they opt for approaches which slow the rate of change so that mankind can enjoy the biodiversity of a particular stage for a reasonable length of time. The dynamics of many coastal ecosystems are such that they pose a threat to human activities. Intervention in these processes is usually very expensive. None-the-less, many countries are heavily

involved in coastal defence works. Recent predictions in respect of climate change and sea-level rise are forcing a reappraisal of the merits of such schemes.

10. The ecosystem approach should seek the appropriate balance between the conservation and use of biological diversity.

The conservation and use of biodiversity in European landscapes may be thought to require a different approach from that which is appropriate in primeval ones. When dealing with such artificial creations as fishponds or peat diggings, it may be thought that the BR approach has nothing to offer. Yet, the fishponds at Trebon in the Czech Republic are part of a BR and they are part of a landscape which is highly cherished by the local people. In a similar way, the Norfolk Broads in the UK, fashioned from ancient peat diggings, form a greatly loved and characteristic landscape within a National Park, which has been suggested for BR status.

The appropriate balance between the conservation and use of biological diversity is the Holy Grail of biodiversity conservation. It does not mean abandoning all ecosystems to exploitation but it does entail working out what uses allow regeneration of the ecosystem to the same quality as before. Biosphere Reserves are dedicated to this work and it is important that they produce good workable examples as well as sound scientific observation and analysis. In order to do this, there needs to be a good understanding of the relationship between the ecosystems in the core area of the Reserve and the various exploited forms of it found in other zones of the Reserve and within the biogeographical zones in which the Reserve is placed. Crucial to the success of any such endeavour is the setting in place of arrangements for long-term monitoring. This is a key feature of a well run BR and one which has attracted considerable attention from EuroMab, the grouping of scientific institutes operating under the MAB Programme (SYKES 1990).

11. The ecosystem approach should consider all forms of relevant information including scientific and indigenous and local knowledge, innovations and practices.

Making use of indigenous knowledge and traditional sustainable land use practices is now a key component in the successful management of a BR. In addition, the ways in which cultural considerations influence the attitude of people to the land and their use of it has become recognised as an important concern of managers. Whilst there is a tendency to think that this only refers to "primitive societies in the third world", there is ample evidence that local communities in Europe have much to tell ecosystem

managers that cannot be obtained from purely scientific sources. Thus, systems of low intensity agriculture are frequently associated with a way of life which is not determined simply by the prevailing ecological conditions, but just as much by tradition and by the cultural outlook of the communities involved. For example, the crofting communities in Scotland tend to retain a strong religious belief, foster the gaelic language, and have a strong sense of stewardship of the land. In the Bily Carpaty BR in the Czech Republic, they are seeking to reinstate the mowing regime which operated under the previous agricultural system and which was responsible for a landscape type which will disappear unless there is this type of intervention. The traditional practice of transhumance, though in a modified and motorised form, is still in existence in the Cevennes BR. In the Vosges du Nord BR, they have evolved an alternative sylvicultural system aimed at producing quality timber rather than quantity. Many societies in Europe have been encouraged to move towards less sustainable practices though the incentives provided by the EU agricultural policy. There are signs that encouragement for stewardship of the land and for the maintenance of rural communities will figure more prominently in the new communities funds (BALDOCK et al 1996.).

12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

This thought holds no threats to those already working in the BR arena since the whole idea of a BR is the bringing together of all the stakeholders. In addition, since they are expected to play a demonstration role and since they are open-air laboratories, they are a focus for co-operation and co-ordination. In many instance they have already resulted in the formation of consortia each aimed at dealing with a particular ecosystem. Indeed, the approach taken has been seen to be so successful that the political authorities on the islands of Menorca and Lanzarote are using it to manage the islands and the surrounding seas.

Reflections of a manager

Those successful as managers usually find that they have developed a systematic approach to taking decisions. Each establishes a short checklist to assist them. It usually takes the form of a set of questions. What is my responsibility in this matter? What exactly is it that I must do? How do I set priorities? Where do the resources of manpower and money come from? If the Malawi Principles are to be adopted by practitioners, further explanation of how to apply the principles at various levels of consideration will be required. Personally, I would favour a complete recasting of the concepts in the current set of principles and the production of an explanatory text that makes clear what the approach means at different levels and for different types of managers. Certainly, it would be helpful to set out actions

appropriate by national government and its agencies, local government and various key sectors of society.

There is no reason why the BR concept cannot be applied to the conservation of biodiversity at a country level. Most countries have some idea of the biogeographical variations that occur within their boundaries even if there is no agreed standard approach to classification in Europe. Many already have a suite of BRs, albeit that many of them need adjustment to come in line with the Seville Strategy. In addition, all EU countries and most pan-European countries have a suite of sites designated to fulfil the obligations of such international conventions as Bonn and Berne and additional work is in progress to produce the Natura 2000 network. These sites can be viewed as the equivalent of the core zone of a Biosphere Reserve. The general fabric of the countryside that forms the rural hinterland of the country can be viewed as the buffer zone. Here the target should be to attain sustainable use. More and more governments are subscribing to the concept of sustainable use and the Malawi Principles need to be applied in the development of land use policies for the rural areas. The transition zone at the country level is the remainder and it will include all of the major industrial complexes and the urban areas. Here too though, there are signs that people are interested to create less blighted environments and that normally means environments that are better from the point of view of biodiversity conservation. There have even been calls for the creation of BRs in urban areas. Certainly, there is no reason why the concept cannot be applied. In the same way, managers of urban areas and of industrial sites could be encouraged to apply the Malawi Principles.

BRs are working tools. They are designed for use, for experimentation and for putting principles and concepts into practice. In my view, they are ideally suited to the development of "The Ecosystem Approach" and I would encourage those involved in UNESCO and IUCN to continue working together in the search for a better future for the world's biodiversity - including that of the human species.

References

- ANON. (1990): Review of the UK Biosphere Reserves. Report to the UK MAB Committee. Nature Conservancy Council, Peterborough, England.
- ANON. (1995a): Biodiversity. The UK Action Plan. HMSO, London.
- ANON. (1995b): Biodiversity: The UK Steering Group Report Volume 2. HMSO, London.
- ANON. (1998): A European Biodiversity Strategy. COM(1998)42, European Commission, Brussels.
- ATKINS, S. (1997): Scotland's Living Landscapes: Firths. Scottish Natural Heritage, Battleby.
- BALDOCK et al (1996): Farming at the Margins: Abandonment or redeployment of Agricultural land in Europe. Institute for European Environment Policy, London.
- DIVERSITAS (1996). An international Programme for Biodiversity Science. Operational Plan. UNESCO, Paris.
- IUCN (1998): Protected Areas in the 21st Century: From Islands to Networks. IUCN, Gland.
- KERR A. J. and BAIN C. (1997): Perspectives on Current Action for Biodiversity Conservation in Scotland. In: Biodiversity in Scotland: status, trends and initiatives pp 273-285. Fleming, L.V., Newton, A.C., Vickery, J.A., and Usher, M.B., Editors, HMSO, Edinburgh.
- KERR, A. J. (1995): Education on Environmental problems and the resolution of resource use conflicts in Biosphere Reserves. In: People and Protected Areas: proceedings of the seminar for the managers of biosphere reserves of the EUROMAB network. Cevennes Biosphere Reserve and National Park, France.
- LASSERRE, P. (1998): Workshop on Expanding the Scale. IUCN, Gland.
- MCCLOSKEY, C. (1996): PEBLDS Explained. IUCN, Gland.
- SYKES, J. M. (1990): Monitoring on Biosphere Reserves. NERC/NCC Joint Contract Report.
- UDVARDY, M. D. F. 1975: A Classification of the Biogeographical Provinces of the World. IUCN Occasional Paper 18, Morges, Switzerland.

UNEP (1998): Report of the Workshop on the Ecosystem Approach. Council of the Parties to the Convention on Biological Diversity, Internal Paper.

UNESCO (1974): Task Force on: Criteria and guidelines for the choice and establishment of biosphere reserves, Final Report, MAB report series No 22 UNESCO/ UNEP.

UNESCO (1996): Biosphere Reserves; The Seville Strategy and the statutory framework of the world network. UNESCO, Paris.

VERNHES, JANE ROBERTSON (1997): Biosphere Reserves: old and new. Paper presented at the IUCN conference on "Protected Areas in the 21st century: from islands to networks".

Stakeholder concept as an instrument to value natural areas and support decision making at the local level.

The case study from Mala Fatra NP, the Slovak Republic

Abstract: This paper forms a part of the research project oriented on the valuation of natural areas and support of the democratic decision making process and sustainable development at the local level in transition economies. Main focus is on the results of the survey conducted in the Mala Fatra region in the Slovak Republic. It is the first attempt to use stakeholders concept approach to regional planning and decision making process in Slovakia. The study is based on survey research where stakeholder preferences were taken into account in the initial phase of the planning process. Based on the values covered from the various stakeholders (visitors, residents, local enterprises, municipalities, state administration and others), alternative scenarios of the future development were derived.

The challenge facing this project is to demonstrate the ecosystem in an economic context by showing arguments that protection of the NP Mala Fatra makes sound economic sense and sustainable use is the most cost effective way of future development when dealing with natural areas. Secondly to show, that the major problem is lack of communication between “conservationists” and “developers” rather than limitation of financial resources and in order to achieve prosperous management practices there is substantial need to involve all relevant sectors of society and scientific disciplines.

Key words: stakeholder, decision making, positional analyses, transition economy, command and control approach, adaptive management

1. Introduction

The transition process from command and control to democratic society may result in significant areas of conflict. Problems include weak tradition of private property rights, a high demand for consumptive development and institutional weakness. Environmental protection, in the past, was not a major interest of society. Additionally, present economic development focused on material values and consumption hinders the public’s recognition of environmental protection as an important element of society. Hence, the successful transformation of environmental policy should focus not only on the legal and technical aspects but also on changing public perception,

understanding priorities, values and awareness building. Decision making in pre-1989 Command and Control (CAC) regimes in Central and Eastern Europe was made by political representation and based on ideological or political principles rather than economic characteristics. Environmental decision making was generally limited to a supplement of land use - planning documentation with very low influence in the decision making process. The key element missing in the former command and control approach to decision making is consensus building and public involvement. The major accomplishment in the legal field today is a well developed legislative framework in environmental decision making. On the other hand, implementation and law enforcement is still inadequate. Citizens as individuals are not very active in environmental decision making. Generally, there is a lack of interest in public matters and apathy towards getting involved in community life. Decisions are usually based on administrative principles without sufficient involvement of all interested parties. Any involvement of the public or other interested parties occurs in the late phases of the planning process when the detailed proposal already exists and it is too late to initiate meaningful change.

Slovakia geographically in the centre of Europe. It is on the boundary of the Carpathian mountains and the Pannonian lowland areas which allows for a rich diversity of flora and fauna which is higher compared to most Western European countries (MoE, 1995). 40.6% of the total area is forested with more than 70 areas of natural and virgin forests covering some 20 000 ha. The biodiversity of Slovakia includes 11.270 plant species, more than 26. 700 animal species and 1000 species of protozoa. National parks together with protected landscape areas comprise 23 % of the total country area. Currently there are 7 national parks and 15 landscape protected areas.

Nature protection in the Slovak Republic is under the responsibility of the Ministry of Environment (MoE). The key piece of legislation in the field of nature protection is the Act on Nature and Landscape protection (The Act) that came in force in January 1995. According to this Act, the protection of nature is the fundamental priority within the protected areas. "Preservation of biodiversity, conservation and rational use of natural resources, and optimising the land use" is one of the five priorities of the State Environmental Policy.

Problem identification

• Nature protection - Economic benefit

After the political change in 1989, all property that was seized by the socialistic government in 1948 was returned to the previous owners. Since all national parks in Slovakia were created after 1948, much of the land within the parks is now privately-owned. However, the Nature Protection Act states that the state will compensate private land owners for economic losses associated with

any hindrance on their ability to use their property for economic gain. To date, there has been no money available from the state to provide this compensation. In order to generate economic profit within the shortest time period money generating activities e.g. timber, intensive tourism with the resulting emphasis on natural resource exploitation and over land use are provided.

• **Competence in decision making process**

Under the present decision making structure, NPS serves as advisory body to the state administration. Most decisions affecting national parks are made by state administration and municipalities where most first hand knowledge and the needs of local communities are concentrated but where also private interests of local stakeholders are more visible. Hence professional experience and skills concentrated within the NPS can not be fully applied and their competence is limited to the assistance with illegal constructions within the park or other radical activities instead of active management of the park associated with sustainable land use, biodiversity protection and environmental education.

2. The case of the Mala Fatra

2.1 Description of the territory

The Mala Fatra region is located in north-central Slovakia in Zilina district. The territory of the Mala Fatra region is not a single administrative unit. Historically it has evolved from separate villages, composed of 6 municipalities surrounded on both sides by the Mala Fatra mountain range. Due to the extreme climatic conditions, the mountains and steep slope it was historically the least developed part of the district. Today the area represents a centre for traditional Slovak culture with folklore and unique traditional housing style located generally on the steep slopes and isolated sites. The Terchova municipality is in a special position, because it represents a historical cultural centre and the most accessible entrance to the park. Thus it has the largest potential for tourism and related economic activities.

The Mala Fatra NP incorporates an area of 22 630 ha and includes a major part of the Mala Fatra mountain range. The park is almost entirely mountainous characterised by highly sensitive limestone and dolomite rock formations, karst topography represented by canyons, gorges as well as springs, waterfalls and caves. The highest and most sensitive areas are alpine in nature and covered only by grasses and forbs which is the habitat for most of the endangered species. There is a high diversity of wild animals and plants with three local and 20 regional endemic non vertebrates. The Mala Fatra was declared a protected landscape area in 1967 and was changed to a national park on April 1, 1988. The stated purpose of the park is to preserve biodiversity and wildlife, unique animals and plants species and to maintain ecological stability.

2.2 Human influence

The ecosystem incorporating the Mala Fatra has been strongly influenced by human activities since the 15th century when cultures from southern Europe migrated to the region and introduced sheep farming. To enhance forage production at the highest elevation pastures, these sheep farmers cut many trees in the sub alpine zone, thus lowering the natural forest line by as much as 200m. Today, several high-density recreational facilities are located within the park, often on the most sensitive sites. These facilities have caused significant impacts on the native vegetation, soil, and wildlife. In addition, the high density trail system which was poorly designed and constructed has resulted in considerable vegetation and soil damage that may compromise the quality of recreation in the future. Trail erosion especially prevalent. At several sites eroded sections exceed 10m width and occasionally (on the top of the ridge) they exceed 30m. High numbers of visitors are also likely to adversely affect wildlife as well, primarily eagles, wolves, and bear. Several ski areas have been built in the Vratna valley, within the park, expanding the period of high visitor use to include the winter months.

2.3 Property rights issues

Property issues play a key role in the quality of nature protection in the Slovak Republic. 83% of the total area of Mala Fatra NP is represented by forest, 8.8% agricultural land and 8.5% alpine zone. Private ownership is predominant in the Mala Fatra NP, representing 87.6 % of total forest park land. In addition, 10% of the most valuable park land belongs to one individual private owner. Thus the conflict between nature protection and economic benefit became more significant. However, it cannot be solved simply by compensating the owners. The key question is who will control the local assets, which can generate decent revenues in the long term if managed in a sustainable way or much greater short term benefits based on natural resource exploitation. Because of these conditions and circumstances, ecological stability, biodiversity, and visitors' experiences are in jeopardy. An additional concern is the sustainability of the local economy which is largely based on tourist-based income.

3. Methodology

3.1 General approach

There is no universal methodology that could be potentially applied for such a complex issue. For the purpose of this project it was decided to use a combination of several methods that already have been successfully used in other parts of the world. None of them has been applied in the Slovak Republic and there is very limited experience from other countries in the CEE region. This paper refers to the result of the and positional analysis (PA), that was selected as a background methodological framework for this study.

3.2 Positional Analysis (PA)

Positional analysis was presented for the first time in 1973 by PETER SODERBAUM (EDLUND J., QUINTERO R. 1995). It is a decision making instrument based on the holistic conception of economics. The main idea of PA is that decisions should be taken according to a matching procedure, where a specific set of chosen alternatives represents the starting point for the process. PA procedure is composed of several steps, e.g. description of the decision situation, identification of the problem and interested parties, design of alternatives, identification of potentially affected systems and effects, analysis of irreversible effects and the interests of stakeholders and conditional conclusions². Whole framework of the PA has not been applied in Mala Fatra. The main task of the survey, derived from the concept of PA was to identify preferences over all stakeholders groups and to compare scenarios of future development with respect to impacts and conflicts of interests.

3.3 Involved parties -stakeholders

The stakeholders of the Mala Fatra region range from residents, local enterprises, municipalities to state administration and state organisations, and across domestic and international visitors. The selection of the stakeholders group was an open process based on a preliminary analysis of the conflicts in the region and consultations with park managers. Al together 184 interviews were collected, from which 51.1% were domestic visitors, 43 % visitors from the CEE region and 6% from Western countries. Up to 79% of respondents indicated, that the Mala Fatra was the main destination of their trip and 67.9% of the respondents had already visited the Mala Fatra previously. The average duration of a trip amounted to 4.82 days. The most favourite activities

² For more details on PA refer to the SODERBAUM (1990) or EDLUND et al (1995).

of visitors included hiking (47%) and visiting natural monuments (21%) Respondents represented the population of the five municipalities surrounding the park and two small villages located directly in the national park. All together 33 interviews were collected. Almost 70% of the respondents indicated the main source of their income - full time employment contract, 21% self employed and the rest retired. Most residents indicated a net monthly income between 75 - 150 US\$³ only 19% earned over 270 US\$ and 6.3 % of incomes were below the poverty line. Eleven representatives from local businesses were interviewed for the study. Most of them represented the tourism sector. Others were from a timber production company, a co-operative and a supermarket. The mayors of six municipalities were interviewed. The state administration was represented by three districts and one county office. In addition to that, the Mala Fatra National Park Service and the Rescue Service were contacted.

3.4 The survey

3.4.1 Scenarios of future development

The scenarios were designed with regard to the present situation and conflicts in the region. Each scenario follows three main ideas. First, decision making that predominantly focuses on the role of NPS, that is one of the most controversial part of present decision making structure. Secondly, the negative impacts to the natural environment and visitor's services, last but not least the economic activities in the region. Three scenarios offer three different possibilities from which A_0 . *Non Action* : current uses would continue without any change in decision making, management and nature conservation practices. Second A_1 . *development scenario*: no major changes in decision making process, which could be understood as a compromise, where a certain level of development is allowed but it should follow the conditions of sustainable development. Finally A_2 represents strict conservation oriented scenario. Respondents were informed that the scenarios should be understood as pre-conditions for future development that have to be given now in order to secure certain development in the future. It does not mean that no physical change occurs in the future and that the description of the scenarios refers to a certain state of the same matters in future.

3.4.2 Matrix of effects/activities

An matrix of 15 potential effects and activities serves as social, economic or environmental indicators of the quality of the environment in the region. Effects/activities has been selected

³ An average net montly salary prevailing at the time of the survey amounted 260 US\$.

according to the problem description and the potential consequences for the environment. Four groups of indicators and one single indicator were identified. Environmental indicators: *wildlife and landscape scenery* because of the primary objective of the park and as qualitative environmental measures. *Erosion* was chosen because of its significant impact on karst topography where thin soils are present, *alpine vegetation* because it is very sensitive and easy to destroy by over visitation and overgrazing. General management problems: *Waste* minimisation and *traffic regulation and* finally economic activities e.g. *tourism, timber, agriculture, hunting, local industry* represent the most significant human influence within the area, *employment, economic profit or wages* important indicators of local socio-economic development. The single indicator is *cultural values*, that in the context of The Mala Fatra region represents not only traditional life style, folklore and housing but also several traditional products made of sheep milk and wool. As most traditional Slovak souvenirs they can play a key role in increasing the revenues and economic profit of the region. Respondents were asked to rate on scale from 1 to 15 their personal opinion about the importance of listed effects/activities in order to secure the future positive development of the Mala Fatra.

3.4.3 Interview schedule

The interviews were undertaken during July and August 1997 (for visitors) and September 1997 (for other stakeholders). All interviews were conducted on face to face basis by trained interviewers. Before the survey, a pilot survey was conducted, with a sample size of 25 respondents. The opinion leader approach was used for selection of the representatives of municipalities, enterprises and state administration while the random sample method was used for the selection of visitors and residents.

4. Results

4.1 Stakeholders interests and preferences

The purpose of the analysis of interests and preferences is to address the conflicts systematically. All together 46 respondents participated in this part of the survey. Figures 2- 6 demonstrate breakdown by stakeholders groups of the respondents interests and preferences in selected effects and activities (mean values of selected effects/activities).

Figure 2 is available in the printed version of this report only!

Figure 3 is available in the printed version of this report only!

Figure 4 is available in the printed version of this report only!

Figure 5 is available in the printed version of this report only!

Figure 6 is available in the printed version of this report only!

On average respondents of the Mala Fatra survey valued selected effects /activities in the following order (from the top down):

*cultural values→landscape scenery→tourism→alpine vegetation→employment→
wildlife→erosion→agriculture→traffic regulation→hunting→wages→
economic profit→timber→local industry*

4.2 Scenarios of future development

All together 56 individuals were asked to express their opinion on scenarios for future development. The refusals amounted to 19.8%. By groups, the lowest was observed in the group of municipality (0%), the highest by residents (50%). The most frequent reason was lack of time. The results in total and by stakeholder groups are shown in the table 1.

Table 1: Scenarios of Future Development of the Mala Fatra Region - Stakeholders Preferences

Group	respond. total	refusals	A ₀	A ₁	A ₂	combination s
residents	14	7	0	4	0	3
municipalities	6	0	0	1	0	5
entrepreneurs	12	2	0	5	0	5
state organisations	4	0	0	2	0	2
visitors	20	1	0	16	1	2
total	56	10	0	28	1	17

**It was possible to combine scenario's or to add new idea in order to design the scenario that would fit into the respondent's view.*

The majority of respondents gave priority to scenario A1 , development based on sustainability. Several respondents proposed a combination of scenarios (31%), changes were in most cases

associated with the decision making. From a total number of 15 modifications, 14 respondents indicated that decision making should not ever be under the responsibility of national park service but rather under the municipality or state administration - (13) or shared together with National park service (1). As seen from table 2 the most creative were entrepreneurs and municipalities. A few other changes were emphasised in order to demonstrate interests in future orientation towards tourism with respect to sustainable development. One respondent proposed exclusion of individual transport to be included into scenario A1.

5. Discussion and conclusions

The results given in the matrix of effects/activities showed that there are no major discrepancies across the stakeholders groups. Most of the respondents values selected indicators in a very similar way. The general link is that some of environmental indicators (erosion, alpine vegetation, landscape scenery) as being of very high importance, while NO was given to timber production, hunting or local industry. On the other hand, tourism represented the top of economic interests over all groups, especially in municipalities and enterprises. It was surprising, that there was an extremely low level of interest in the profit and the income of local communities by all groups. Especially for municipalities and residents it could be a great source of benefit. Nevertheless, there were some differences. First of all the indicator cultural values was given highest importance by residents while getting the lowest value from representatives of municipalities. On the other hand the same group valued timber and agriculture higher compare to the other groups. While visitors and state organisation gave full preference to all environmental indicators, enterprises and municipalities supported only landscape scenery , which is most likely result of interests to develop conditions for successful tourism rather than direct support to non use values of the park. The fact that respondents valued lower economic profit and wages of local community clearly indicate that they are not fully aware of the link between financial resources generated from profit, social welfare given by wage rate and possibilities to improve local development, nature protection included and or that the co-operation between profit generators and local stakeholders is not satisfactory.

In a part of the scenarios respondents clearly declared preferences for the development scenario that would secure a sustainable future. No one did chose the non action scenario and only one response was targeted at the nature conservation oriented scenario. At the same time the majority of respondents were not satisfied with the description of the scenarios, they rather preferred a combination of at least two scenarios. Among the three main ideas that were followed by development scenarios e.g. decision making, negative impacts to the environment and future economic development, the first was seen to be most crucial for the majority of respondents.

6. Policy implications

Mala Fatra NP is not a homogenous wildlife area. Historically it is integrated part of the whole region. Two rural areas have been in the territory of the park since 16th. century and one recreational area was built in the park 30 years ago, before the park was established. It is very difficult to sustain the present system of park management provided exclusively by NPS and oriented to strict protection. The survey showed that most of the respondents do not wish NPS to be a major decision maker, many think that they should not participate at all. Face to face interviews disclosed that, there is general opinion to associate most of the restrictive and unpopular regulations in the park with the NPS although under the present decision making pattern they only serve as the advisory body to the state administration. This is probably due to the fact, that even with very limited competence in decision making NPS is very active in local conflicts related to the illegal construction or small violations of the nature protection law. On the other hand they do not provide sufficient environmental education and widely accessible information about the parks importance and benefits nor do they have enough power to stop bigger and more harmful activities. This leads to the situation that generally the park administration has very low respect across the region and some are of the opinion that there is no need for a national park. The budgetary resources allocated for such management are insufficient to do the job. Under such conditions the NPS will have to change its approach to the management from strict conservation towards modern management based on programs for protection that would include environmental effectiveness as well as assessment of economic efficiency and that would be able to attract local stakeholders in order to involve them in to the planning process as both actors and fund raisers.

Since all stakeholder groups declared low discrepancies in preferences for future development it is possible to suggest, that the problem is rather in effective communication and information exchange between “nature conservationists” on one side and “developers” on the other side.

In addition, the most powerful stakeholders are trying to impose their own interests in the power game without constructive and continuous communication with other actors involved in the conflict. Thus the main orientation of policies is often changed in the direction of the “winners”. In such a scenario individuals e.g. residents, visitors, etc. are left “outside” unless one side provides them with enough information in order to make them support their position in the conflict.

The study also showed that the value of the park indicated by various stakeholders is a clear signal to decision makers to consider park existence as an economic value rather than burden, as often seen in present. The respondents clearly declared their preferences in environmental indicators e.g. landscape scenery, biodiversity, alpine zone etc. In addition, tourism based on sustainable development was selected by majority of stakeholders as most preferable economic activity. The fact that visitors, as the only source of income for tourism, are coming to the region because of the park, gives protection of the park economic sense.

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References

ACT OF NATIONAL COUNCIL OF THE SLOVAK REPUBLIC ON NATURE AND LANDSCAPE PROTECTION, (1995).

EDLUND, J., QUINTERO, R. (1995): Do Wabura - Farewell to the River. Application of Positional Analysis to the Urro I Hydro Power Plant in Columbia. Report 94, Swedish University of Agricultural Sciences, Department of Economics, Uppsala.

FREEMAN III, MYRICK, A. (1992): The Measurement of Environmental and resource Values. Theory and Methods. Resource for the Future , Washington D.C. USA.

LE MAITRE, D., GELDERBLOM, C., MAPHASA, L., YSSEL, S., VAN DEN BELT, M., MANUEL, T. (1997): Communication the value of fynbos: results of a survey of stakeholders. Ecological Economics 22, pp 105-121.

MAFUNDA, D., NAVRUD, S.: Positional Analysis Applied to Water problems in Developing Countries. Water Management and Conflict Resolution pp. 426-437.

MINISTRY OF ENVIRONMENT OF THE SLOVAK REPUBLIC (1995): Nature Protection in Slovakia, Bratislava.

MINISTRY OF ENVIRONMENT OF THE SLOVAK REPUBLIC, UNEP (1996): Framework for National Biodiversity Strategy in the Slovak Republic, Bratislava.

ANONYM. (1992): National Parks and Protected Landscape Areas of Slovakia. Ecologia publishing house, Bratislava.

SÖDERBAUM, P. (1990): Economics in Relation to Environment, Agriculture and Rural Development. Report 31, Swedish University of Agricultural Sciences, Department of Economics, Uppsala.

COKER, A., RICHARDS, C. (Eds.) (1992): Valuing the Environment. Economic Approach to the Environmental Evaluation. Proceeding of a Workshop held at Ludgrove Hall, Middlesex Polytechnic on 13 and 14 June 1990. John Willey and Sons.

ZYLICZ, T. (1995): Will New Property Rights Regimes in Central and Eastern Europe Serve Nature Conservation Purposes? Economic Discussion Papers No.12 Faculty of Economic Sciences, University of Warsaw.

Definitions

Workshop on the Ecosystem Approach (Malawi)

The ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes and interactions amongst organisms and their environment. The ecosystem approach recognizes that humans are an integral component of ecosystems.

The ecosystems approach can be considered as a framework for analysis and implementation of the objectives of the CBD.

Salvatore Aricò, Secretariat, Convention on Biological Diversity

“The ecosystem approach is a tool for managing natural and semi-natural systems while sustaining or restoring their resources, biological diversity, functions and values. It is based on a collaboratively-developed vision of desired (baselines?) conditions that integrates the desired level of ecological, economic, social and cultural quality and based on best available knowledge and on the application of the precautionary principle. It is applied within a geographic framework defined primarily by ecological boundaries. The ultimate goal of the ecosystem approach is to improve the overall quality of life.”

Interagency ecosystem management task force (US)

The ecosystem approach is a method for sustaining or restoring natural systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

The goal of the ecosystem approach is to restore and sustain the health, productivity, and biological diversity of ecosystems and the overall quality of life through a natural resource management approach that is fully integrated with social and economic goals.

List of references to the ecosystem approach in CBD documents and background papers

COP-2:

UNEP/CBD/COP/2/2	Jakarta Mandate: paragraph 97. “holistic approach to ecosystems”
UNEP/CBD/COP/2/5	Report of the first meeting of SBSTTA paragraph 40.b
UNEP/CBD/COP/2	Decision II/8, Preliminary consideration of components of biological diversity particularly under threat and action which could be taken under the convention, paragraph 1
	Annex to decision II/9, statement on biological diversity and forests from the CBD to the IPF, paragraph 12
	Annex II to decision II/10, draft programme for further work on marine and coastal biological diversity, paragraph 2.a

SBSTTA-2:

UNEP/CBD/SBSTTA/2/10	Agricultural biological diversity, summary, chapter 1.1 “An ecosystem approach”, paragraph 2
UNEP/CBD/SBSTTA/2/11	Biological diversity in forests, paragraph 59, paragraph 97

UNEP/CBD/SBSTTA/2/14	Report by the executive secretary on marine and coastal biological diversity, paragraph 19 (ii) “ecosystem-based approach”, Annex 1 paragraph 8 (iii) and paragraph 9b ii “ecosystem management approach”,
UNEP/CBD/SBSTTA/2/Inf.6	An ecosystem approach to the management of northern coniferous forests

COP-3:

UNEP/CBD/COP/3/3	Report of the second meeting of the SBSTTA, Annex Recommendation II/1 paragraph 8, Recommendation II/8 paragraph 2
UNEP/CBD/COP/3/13	Appraisal of the SBSTTA review of assessments of biological diversity and advice on methodologies for future assessments, paragraph 25 and paragraph 27
UNEP/CBD/COP/3/14	Consideration of agricultural biological diversity under the CBD, introduction and chapter 1.1 An Ecosystem approach
UNEP/CBD/COP/3/16	Biological diversity and forests, paragraphs 59, 96.2, 98
UNEP/CBD/COP/3	Decision III/12 Programme of work for terrestrial biological diversity: forest biological diversity, paragraph 6.b

SBSTTA-3:

UNEP/CBD/SBSTTA/3/Inf.5	Report of the meeting of the Liaison group on forest biological diversity, paragraph 15.b, 16, working group 1 report, annex III working group 1
UNEP/CBD/SBSTTA/3/Inf.10	Report of the joint FAO-CBD secretariat workshop on farming systems approaches for the sustainable use and conservation of agricultural biodiversity and agro-ecosystems, conclusions of the working groups: “Integrated agro-ecosystem approaches”
UNEP/CBD/SBSTTA/3/Inf.13	Recommendations for a core set of indicators of biological diversity, paragraph 2.2
UNEP/CBD/SBSTTA/3/Inf.22	Forests and biological diversity, paragraphs 10, 16, 86
UNEP/CBD/SBSTTA/3/Inf.26	“Biodiversity and Inland Waters” workshop, Introductory rationale, Article 6, 8, 12.4 “ecosystem-based approach”
UNEP/CBD/SBSTTA/3/2	Biological diversity of Inland waters, paragraph 3, chapter 2 “The ecosystem approach”, paragraphs 18, 19, 27, 39

COP-4:

UNEP/CBD/COP/4/2	Report of the third meeting of the SBSTTA, paragraph 9: “ecosystem-based approach”, paragraph 15: “holistic ecosystem management approach”, Annex 1 to recommendation III/1 concerning agenda item 3: “ecosystem-based approach”,
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Annex to recommendation III/2 programme element 2:
“ecosystem approach”,

recommendation III/3 concerning agenda item 5:
“ecosystem approach”

Annex to recommendation III/3: “ecosystem approach”

UNEP/CBD/COP/4/4	Status and trends of the biological diversity of inland water ecosystems... paragraph 15: “ecosystem-based approach”, paragraph 50: “ecosystem approach”
UNEP/CBD/COP/4/5	Implementation of the programme of work on Marine and Coastal biological diversity, programme element 2
UNEP/CBD/COP/4/6	Programme of work on agricultural biological diversity, paragraphs 33, 73
UNEP/CBD/COP/4/7	Draft programme of work for forest biological diversity, paragraphs 2, 35, Annex
UNEP/CBD/COP/4	Decision IV/1 A. paragraph 4 Decision IV/1 B. Ecosystem approach Decision IV/1 C. Decision IV/4 paragraph 7 (b), programme of work A. paragraph 8c (i), paragraph 9 (d), paragraph 9 (i), Annex to Decision IV/5 paragraph 2 and pages 37/38

Annex to Decision IV/7 paragraphs 3(b), 10, 11, 16,
18,21,27,51

Decision IV/10 A.

Decision IV/15 paragraph 6

UNEP/CBD/COP/4/Inf.9

Report of the workshop on the Ecosystem approach
(Malawi)

Ten Principles for Ecosystem Management and Recommended Actions for Implementation of an ‘Ecosystem Approach’

Adapted from draft text of ‘**Ecosystem Management: Questions for science and society**’ a synthesis of the first Sibthorp seminar held at the Royal Holloway Institute for Environmental Research, University of London 21-22 June 1996. Edited by E. Maltby, M. Holdgate, M. Acreman and A. Weir. Royal Holloway Institute for Environmental Research and IUCN. Prepared by: L. Safford, Scientific Co-ordinator, & E. Maltby, Chair IUCN Commission on Ecosystem Management, RHIER Secretariat. As input to the **workshop on the Ecosystem Approach** held in Lilongwe, **Malawi**, 26-28 January 1998. The interpretation drawn by the authors of this document may not necessarily be that intended by the contributing authors of the above publication, or the delegates to the first Sibthorp Seminar.

Introduction

The First Sibthorp Seminar of June 1996 was designed to look critically at the findings of recent ecological research and consider how far it made a radical re-think of conventional conservation practices necessary. The principal conclusions reached by delegates at the Seminar were distilled as a series of Ten Principles for Ecosystem Management, set out below.

Ten principles for ecosystem management	
<i>Guiding Principles</i>	1. Management objectives are a matter of social choice. 2. Ecosystems must be managed in a human context. 3. Ecosystems must be managed within natural limits. 4. Management must recognise that change is inevitable. 5. Ecosystem management must be undertaken at the appropriate scale, and conservation must use the full range of protected areas.
<i>Operational Principles</i>	6. Ecosystem management needs to think globally but act locally. 7. Ecosystem management must seek to maintain or enhance ecosystem structure and functioning. 8. Decision-makers should use appropriate tools derived from science. 9. Managers must act with caution. 10. A multi-disciplinary approach is needed.

Principles for Ecosystem Management, Implication for Management, and Recommended Actions for Implementation of an “Ecosystem Approach

Notes: Actions may not be possible now, but should be a target for the future.

Principle and Rationale	Implications for management	Recommended Actions for implementation
1. Management objectives are a matter of social choice and ecosystems must be managed in a human context. Human activity is usually the key factor driving change within ecosystems and social choice will determine the objectives of management plans. Different sectors of society will each want to manage the ecosystem to meet their present and future political, economic, cultural and social needs. Local, national, regional and/or global societies may be dependent on an ecosystem.	An effective ecosystem approach should: a) balance the potentially conflicting demands of different interest groups, b) balance the needs of present societies with the need to maintain the potential of the ecosystem to provide for future generations. c) take account of the likely political, legal, economic, social, cultural and ecological implications of the various management options to achieve those goals. As human activity is determined by economic and political pressures, management goals must be compliant with the economic and political position of the region.	1. The management goals for any ecosystem should be decided through dialogue among all interested parties (including private owners of resources), and especially the area's inhabitants. Goals may be dominated by local concerns and needs but wider (including global) implications must be recognised. 2. Mechanisms for community decision-making, and conflict resolution need to be applied. 3. Methods for assessing the costs and benefits of alternative management strategies need to be developed. 4. Methods of assessing and comparing cultural and social costs and benefits with economic costs and benefits need to be developed. 5. Independent Risk assessment and cost benefit analysis of the likely political, legal, economic, social, cultural and ecological implications of the various management options should be carried out. 6. Expert advice and results of analysis should be presented to all interested parties (or their representatives) in an understandable and accessible form. 7. Management plans must take into account who is to manage a particular area and its component ecosystems, and ensure management decisions fit the wider political process.

Principle and Rationale	Implications for management	Recommended Actions for implementation
2. Conservation of biological diversity and sustainable use of natural resources is essential to, rather than in competition with, the long term provision of human requirements.	The conservation of biological diversity is essential for the maintenance of the natural resources on which humans depend.	1. Decision makers and managers need to understand the importance of particular species/communities in natural resource management. 2. Decision makers and managers need to understand the concept of carrying capacity.
3. Ecosystems must be managed within natural limits. Management objectives that operate within the limits of natural productivity and functioning of the ecosystem will be the most attainable.	In considering the likelihood or ease of achieving the management objectives, consideration must be given to the environmental conditions which limit ecosystem structure and functioning. Dependence on temporary, unreliable natural conditions, or artificially maintained conditions should be recognised.	1. Research findings should be used to assess current and possible future environmental limits controlling attainable management objectives. 2. In the development of an ecosystem approach independent expert advice should be obtained on the likelihood and practicality of having to maintain conditions artificially to achieve the management objectives. 3. Whether achieving the objectives would constrain the future management options for the ecosystem.

Principle and Rationale	Implications for management	Recommended Actions for implementation
4. Management must recognise that change is inevitable. The intrinsic nature and external environments of ecosystems, and the social, cultural, political and economic nature of the human populations dependent on them are constantly changing.	Management should aim to conserve options for sustainable use rather than necessarily preserve ecosystems in their current state. Management should be adapted to and accommodate expected ecological change (notably in climate and hydrology). Management should be adapted to and accommodate expected change in the political, economic, social and cultural nature of the human populations dependent on the ecosystem. Active management may enable society to adapt to the altered conditions, for example, introduction or reintroduction of appropriate species or the reorganisation of resource use.	1. Expert independent advice should be obtained on; a) the likely change in ecological and environmental conditions and socio-economic needs. b) what impact these changes could have on the biodiversity, functioning and environmental services provided by the ecosystem; the human populations dependent on it; the chances of or effort involved in achieving the management objectives and the constraints on future management of the system. c) What actions could mitigate undesirable changes.

Principle and Rationale	Implications for management	Recommended Actions for implementation
5. Ecosystem management must be undertaken at the appropriate scale and full use made of the range of protected areas. Management actions within one component area of an ecosystem (e. g. a forest) can impact on other areas (e.g. a coral reef) because hydrological (or atmospheric) processes connect them. Therefore the scale of ecosystem management should be appropriate to ensure compatibility of management objectives.	An ecosystem approach should be developed on a sufficiently large geographic scale to take into account large scale processes that can affect or be affected by the outcome of management actions. Issues of air and water quality, must encompass both source areas and affected areas.	1. The scale at which ecosystem processes operate relevant to a proposed management plan should be identified. Those areas linked by these processes and likely to be affected by or affect the management objectives must be taken into account. 2. Resource managers representing areas of an ecosystem linked by such processes should a) discuss the objectives of management actions within each component area. b) assess how the processes and management actions of any one area will affect those processes and actions taken in others, and c) define management objectives that are not compatible, unsustainable or unequitable, and discuss alternative strategies. 3. Research is needed to increase detailed understanding of the sizes of the unit that are necessary for effective ecosystem management. 4. Protected areas must be integrated into ecosystem management plans which aim to harness the human demand for natural resources to conserve biodiversity. To this end protected area managers may need retraining in appropriate methods of management. 5. Within their wider strategies and policies, countries should develop systems of protected areas, using the full range of IUCN categories, rather than networks exclusively of strictly protected parks and reserves.

Principle and Rationale	Implications for management	Recommended Actions for implementation
6. Ecosystem management needs to think globally but act locally. The ultimate scale of ecosystem management is global, since all components of the earth's system are interrelated. Policies for ecosystem management may be developed by intergovernmental panels at a global or regional scale and address overriding issues such as global warming and freshwater allocation. However, ecosystem management has to be implemented at a national and local scale.	Implementation requires willing local participation. Management plans must support, and be supported by local people, national and global policy, in that order of priority. National, and regional policy makers need to be aware of the impact of their activities on one another and on the global community. Global policy frameworks need to be linked to national and local actions.	Management plans must: 1. support local social conditions, for example security of land tenure or the alleviation of poverty. 2. ensure local communities have the capacity to care for their own resources sustainably. 3. adopt and generalise the "polluter pays" principle to cover all resource use. 4. ensure the linkage between local, national, regional and global processes is understood at each level of organisational structure. 5. ensure good communication between organisations working on different geographical scales.

Principle and Rationale	Implications for management	Recommended Actions for implementation
7. Ecosystem management must seek to maintain or enhance ecosystem structure and functioning. The physical, chemical and biological components of ecosystems perform processes which together determine the structure and functioning of an ecosystem. Structure and functioning determines which goods and environmental services the ecosystem can provide, and the support it can give to both human and wildlife populations (both locally and remotely). Changes in the components of the ecosystem lead to changes in the support it can provide in the present and future.	Management must ensure that human activities do not reduce the ecosystem's ability to provide these services, that is damage structure and function. Those implementing the ecosystem approach should appreciate the role components of the ecosystem play in determining the goods and services the ecosystem supplies and understand that human welfare and the structure and functioning of ecosystems are interdependent.	1. Further research and education is required on the linkage between biodiversity, ecosystem processes, functions, goods and services. 2. Management plans should incorporate monitoring of the key components of an ecosystem, in order to detect changes in the ecosystem which could impact on structure and function and hence management goals. Monitoring requires the identification of indicators and criteria to assess: a) the structural and functional status of an ecosystem. b) the success or failure of management practices and achievement of management objectives. 3. Decision makers and managers need guidelines on recognising threats to functioning before they become irreversible. 4. Guidelines are required to enable decision makers and managers to maintain/restore functioning of ecosystems.
8. Decision-makers should use appropriate tools derived from science. Physical, chemical and biological processes determine whether or not management goals are achieved. Ecosystem management plans must therefore be based on a scientific understanding of these processes.	Scientific understanding must be distilled and translated for practical application by decision makers and ecosystem managers. The use of the concept of Critical loads (the maximum input of a pollutant that an ecosystem can tolerate without undergoing a significant degenerative change) is a good example of making ecological theory applicable by ecosystem managers.	1. Mechanisms for distilling and translating scientific knowledge for practical application by decision makers and managers need to be developed.

Principle and Rationale	Implications for management	Recommended Actions for implementation
9. Managers must act with caution. We can not and never will be able to predict the exact consequences of all management actions. A precautionary approach should be adopted by decision makers and managers to minimise the risk of loss or degradation of ecosystem characteristics.	Management objectives must be developed using the precautionary principle. Ecosystem managers must be willing and able to amend management policies and practices as often and as quickly as necessary, this must include the willingness to abandon concepts and to admit mistakes.	1. Managers and decision makers should accept that science may only be able to advise on the probable rather than certain consequences of a management action, and assume that changes and the accompanying consequences will be at least as extreme as estimated, rather than less so.
10. A multi-disciplinary approach is needed. Management plans must be developed for geographic areas managed traditionally by different sectors and agencies. Inter-sector, interagency collaboration must therefore be established on all aspects of planning and implementation of projects.	Management must include mechanisms for intersectoral collaboration and for the creation and operation of multidisciplinary advisory teams. Both sectoral agencies and such advisory teams should interact strongly with the stakeholders of the areas involved in the management plan.	1. Guidelines and protocols are required for creating mechanisms for interaction between different management sectors, expert advisors from a range of disciplines and the societies intrested in the management plan.

**”Workshop on the Ecosystem Approach to the Management and
Protection of the North Sea”,
held in Oslo, Norway, 15-17 June 1998.**

Introduction

At the Intermediate Ministerial Meeting 1997 (IMM 97) in the North Sea Conference framework the concept ”Ecosystem Approach” was discussed as a part of the integration of fisheries and environmental policies. This was reflected in the ”Assessment Report on Fisheries and Fisheries related Species and Habitats Issues” and in the ”Statement of Conclusions” from the IMM 97 in paragraphs 2.6 (see below), 15.2 and 19.

”2.6 Further integration of fisheries and environmental protection, conservation and management measures, drawing upon the development and application of an ecosystem approach which, as far as the best available scientific understanding and information permit, is based on in particular:

- the identification of processes in, and influences on, the ecosystems which are critical for maintaining their characteristic structure and functioning, productivity and biological diversity;
- taking into account the interaction among the different components in the food-webs of the ecosystems (multispecies approach) and other important ecosystem interactions; and
- providing for a chemical, physical and biological environment in these ecosystems consistent with a high level of protection of those critical ecosystem processes.”

At its meeting in Oslo 16-17 October 1997, the Committee of North Sea Senior Officials (CONSSO) welcomed a Norwegian initiative to arrange a workshop on the Development of an Ecosystem Approach to the Management and Protection of the North Sea.

The concept of the "Ecosystem Approach" has also been central to the following up of the Convention on Biological Diversity (CBD). In January this year, the governments of Malawi and the Netherlands thus hosted a workshop on the more general aspects of the Ecosystem Approach. This "Malawi workshop" concluded with 12 principles that may provide a general basis for further work on the development and application of the Ecosystem Approach concept.

The main goal of the workshop was to develop further the concept of the Ecosystem Approach with special attention given to:

- processes in the North Sea ecosystems critical for maintaining their characteristic structure and functioning, productivity and biological diversity, including the interaction between different components in the foodwebs and other important ecosystem interactions;
- major human influences on these processes, including the effects of contaminants and fisheries;
- identification of gaps in the scientific knowledge of these processes and human influences on such processes. Improvements in coordination of collection and utilization of data; and
- considerations of how the use of this knowledge could influence the present conservation and management measures applied to living organisms on different trophic levels and to their environment.

In addition, one important aim was to discuss the application of the principles from the "Malawi workshop" in the management of the North Sea ecosystems, with a view both to forward the work in the North Sea and within the CBD.

The results from this workshop have contributed to broaden our view concerning management of marine resources, species and habitats, and give a direction for the further development of an Ecosystem Approach to the Management and Protection of the North Sea.

Summary and Conclusions

The workshop was arranged in the framework of the North Sea Conference. Invited speakers presented relevant topics in plenary sessions. Parallel group discussions were arranged in session II and III. In the final summary session IV the discussion was structured according to a suggested framework for an Ecosystem Approach as illustrated by the flowchart in figure 1. The following conclusions were drawn from the plenary discussions:

- 1. It may be difficult or impossible to manage the North Sea towards a desired ecosystem state. We may, however, manage the human activities in an integrated manner to achieve sustainable use and protection of the North Sea.**

The North Sea is an open ecosystem with complex interactions and considerable natural variability. This, along with our limited understanding of these interactions and variability, set limits to our ability to manage the North Sea as an ecosystem. It is, however, clear that some human activities result in changes to the North Sea ecosystem. These human activities may be managed in order to keep the impacts and changes within acceptable limits, in accordance with the principle of sustainable use and protection of the North Sea ecosystem.

- 2. There is a need for agreed upon definitions of terms such as "ecosystem" and "ecosystem approach".**

The definition of "Ecosystem Approach" was discussed, but the workshop did not draw a conclusion. A clear and agreed upon terminology is required to avoid misunderstandings based on semantic rather than substantial differences of opinion. Important elements of a definition are the interlinked nature of organisms as components of ecosystems and the interactive nature of man's various uses and impacts on ecosystems. An Ecosystem Approach is, and should be, a developing/adaptive concept. Management must involve the whole of the North Sea catchment area taking into consideration the regional differences in geography, biology and human impacts.

- 3. Clear objectives for an Ecosystem Approach to the management and protection of the North Sea must be formulated. There is a need for objectives both at the general level, as overall or integrated objectives, and at the specific level, as more detailed and operational objectives.**

It is a political responsibility to establish objectives for both ecosystem function, as well as human use, based on advice from scientists, managers and stakeholders. General objectives have been formulated in the Statement of Conclusions from the IMM 97 in Bergen. The development of Ecological Quality Objectives in the Oslo-Paris Convention (OSPAR) may provide more clearly defined general objectives as a framework for more specific operational objectives related to fish stocks and the marine environment. It would be useful if these and any new scientific fishery related objectives were developed in time to be included as part of the new EU Common Fishery Policy.

- 4. The management of the North Sea should be based on the best use of the present scientific knowledge. In particular, there is a potential for more extensive use of existing ecological knowledge.**

Management decisions have to be taken continuously even if the scientific basis is limited. The current monitoring of fish stocks and environmental conditions provide information for management decisions. This information may be integrated more extensively as a basis for management advice. Ongoing work in the International Council for the Exploration of the Sea (ICES) may provide advice on how to achieve this.

- 5. The present knowledge of the North Sea as an ecosystem does not provide a sufficiently good basis for full implementation of an Ecosystem Approach to the North Sea management. There is, therefore, a need for focused research on the North Sea ecosystem, including climatic, biological and human driving forces of ecosystem variability.**

Despite a long history of research and monitoring, the knowledge of the North Sea as an ecosystem is still insufficient, and a systematic and holistic Ecosystem Approach to the study of the North Sea is insufficiently developed. Ecosystem research can provide a systematic framework for identifying important gaps in knowledge and for filling those gaps. In this process it is important that managers and politicians specify and communicate their needs for information and advice.

- 6. The present monitoring of the North Sea is often insufficient to reveal human impacts on the ecosystem. There is a need for improved, integrated monitoring through co-ordination and harmonisation of existing national and international monitoring activities, as well as through implementation of new methods and technology.**

While research provides basic knowledge and insight into the functioning of the North Sea ecosystem, monitoring provides updated information about the state of components of the ecosystem. Important features of the ecosystem dynamics are long-term and large-scale variability related to fluctuations or changes in climatic driving forces. Monitoring can provide data on such variability which is used in research to reveal the underlying mechanisms. It is important that monitoring activities are linked to objectives. Monitoring programmes for collection of ecological and socio-economic information must, therefore, be adjusted as new objectives are being developed as part of an ecosystem approach. There is at present a considerable amount of monitoring being carried out for various purposes, most of it as national programmes. However, there is a considerable potential for improved collection and utilisation of data through co-ordination and harmonisation of ongoing national and international monitoring activities. There is also a need to implement new and better methods and technologies in monitoring programmes. ICES, OSPAR and the Global Ocean Observing System (GOOS) are international bodies which are already contributing and may contribute in future to the harmonisation and further development of monitoring of the North Sea.

7. There is a need for integrated assessments prepared by experts on North Sea fish stocks, environment and socio-economics.

Assessments of available information from monitoring and research provide the basis for scientific advice and management decisions. Integration of fisheries, environmental and socio-economic issues require integrated scientific advice and assessments. The integrated assessments should be prepared by experts on North Sea fish stocks and the North Sea environment in close collaboration. To avoid duplication of work and to secure cost-effectiveness, this could be carried out as co-ordinated or joint activities between the relevant international bodies (i.e. ICES, OSPAR, European Environmental Agency (EEA)). One possible approach to assessment is the development of indicators of change based on socio-economic and ecological research. These indicators should be linked to objectives and they should be practical in management use (measurable yardsticks).

8. Stakeholders, along with scientists, managers and politicians, should be involved at different stages of the decision process to promote openness, transparency and responsibility.

Involvement of stakeholders in the management process is important to achieve sustainable utilisation of marine ecosystems. Stakeholders should be involved in the various steps including the setting of objectives, assessment of scientific information and utilisation of scientific advice for management decisions. The scientific basis should be clearly outlined and the advice should be clearly stated. Scientific and political considerations, although interlinked, should be kept separate. This will improve the transparency in the decision-making process and will clarify the different roles and responsibilities of stakeholders, scientists, managers and politicians. However, to achieve common objectives for an Ecosystem Approach, adequate communication between stakeholders, scientists, managers and politicians within an already existing institutional framework is of major importance.



CBD



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Item 13 of the provisional agenda

(Review of the operations of the Convention:

Longer-term programme of work)

Report of the Workshop on the Ecosystem Approach

Lilongwe, Malawi, 26 - 28 January 1998

Submission by the Governments of the Netherlands and Malawi

I. Introductory Remarks

1. Due to the initiative and generous support of the Governments of Malawi and the Netherlands, a CBD-Workshop on the Ecosystem Approach was held in Lilongwe, Malawi, from 26 to 28 January 1998. The Workshop was formally opened by Honorable F.V. Mayinga Mkandawire, M.P., Minister of Forestry, Fisheries and Environmental Affairs. The Minister underscored the importance of the process to discuss the ecosystem approach for the implementation of the Convention. Prof. Dr. Herbert Prins welcomed the participants on behalf of the Government of the Netherlands and expressed his satisfaction that the participants were eminent scientists who were so willing to share their thoughts on the difficult issue of the ecosystem approach. The Workshop was co-chaired by Prof. Dr. Herbert Prins and Prof. Dr. James Seyani from Malawi.

2. The debate was initiated by introductory remarks of Dr. Francesco Mauro in which he provided a short history of what is now referred to as the "ecosystem approach" in the process of the Convention on Biological Diversity (CBD).

3. The Convention on Biological Diversity defines in Article 2 an ecosystem as *"a complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit."* The ecosystem is one aspect of biological diversity which means *"the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems"* (Article 2).

4. The Convention states that *"the fundamental requirement for the conservation of ecosystems and natural habitats is the in-situ conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings"* (Preamble). *In-situ* conservation (Article 8) is complemented by the promotion of *ex-situ* conservation (Article 9). These provisions provided together with the three objectives of the Convention - the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising out of the use of genetic resources (Article 1) - and other relevant preambular statements provided the basis for the Conference of the Parties (COP) and its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to elaborate on what is now referred to as *"the ecosystem approach"*.

5. The importance of an ecosystem approach in addressing biological diversity was directly or indirectly confirmed on several occasions, starting with the first two meeting of the SBSTTA in 1995 and 1996. At the second meeting of the SBSTTA the ecosystem approach was explicitly mentioned and, thereafter, the third meeting of the COP underscored the importance of regional and ecosystem approaches for the development of guidelines and indicators. As it is well known, the SBSTTA has decided that a main theme should be considered, together with cross-cutting issues, at each of its meetings. Thus, the following thematic areas have been discussed so far: marine and coastal, agricultural, forest, and inland water biological diversity. All these themes, which are not at all equivalent to ecosystems but rather clusters to facilitate discussions, have been considered according to a sort of ecosystem approach and, in several occasions, the approach and the consequent indications for action were endorsed by the COP. In all instances, the

approach has been indicated although the terminology used varied: "ecosystem approach", "ecosystem process-oriented approach", "ecosystem management approach", "ecosystem-based approach" etc.

6. In order to develop a common understanding of the ecosystem approach, the Secretariat organized an informal discussion, held as a side-event at the third meeting of the SBSTTA in September 1997 in Montreal. In that occasion, where a draft discussion paper was provided as "provocative" background material, there was consensus among all participants that a discussion within the process of the CBD should be urgently initiated as there is a broad range of views about the meaning, scope and elements of the approach. At that meeting, several problems were highlighted that need further discussion: terminology, types of ecosystems ("natural" vs. "man-modified"), underlying theoretical assumptions, relation between ecosystem approach and ecosystem management, problems of methodology, need for case studies, implications for the implementation of the CBD with special reference to its *modus operandi* and the legal implications. In conclusion, the participants to that meeting suggested that a process should be initiated to foster the discussion about the meaning and the elements/principles of the ecosystem approach in the CBD, and that such a discussion should be reflected in an information document to be presented possibly at the fourth meeting of the COP, to be held from 4 to 15 May 1998 in Bratislava, Slovakia, as a basis for further discussion and elaboration. The present workshop is the result of that suggestion and of the initiative by the CBD-Secretariat to ensure an advancement of the debate on the ecosystem approach.

7. During the three-day meeting which included an evening session, the participants discussed what they thought an ecosystem approach should be and why an ecosystem approach should be taken to implementing the Convention. After discussing those two questions, the focus laid on the third question: What are the principles of an ecosystem approach? The participants considered that question as the most important one.

II. Findings of the Workshop

1. What is an ecosystem approach?

8. Taking the provisions of the Convention and the deliberations within the process of the Convention into account, the participants of the Workshop developed the following description of the approach:

The ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes and interactions amongst organisms and their environment. The ecosystem approach recognizes that humans are an integral component of ecosystems.

9. The ecosystem approach can be considered as a framework for analysis and implementation of the objectives of the CBD.

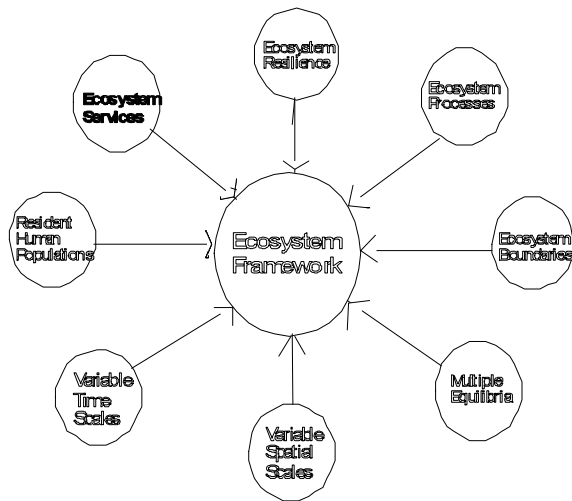


Fig. 1: Ecosystem Framework

Conceptual Framework for Ecosystem Management

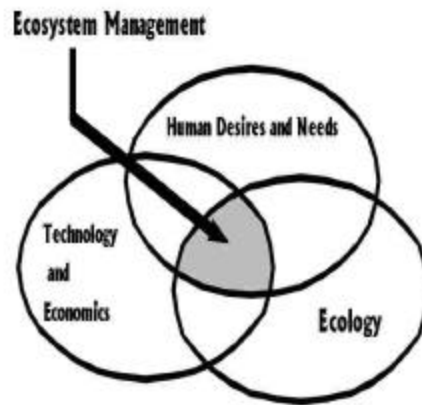


Fig. 2 : Venn Diagram

10. In elaborating on and applying the ecosystem approach, the following elements should be borne in mind:

(a) original meaning of "ecosystem" in order to avoid a misconception as a unit of a particular scale such as habitat, biotope or biome;

THE HIERARCHICAL AND NESTED NATURE OF ECOSYSTEMS

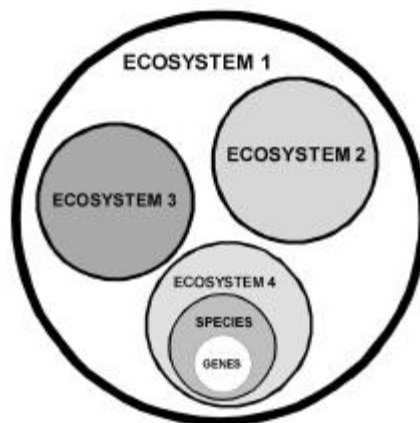


Fig. 3 Ecosystems

(b) the problem/question should determine the scale to which the ecosystem approach is applied

(c) "ecological" reasoning includes the following elements:

- non-linearity
- functioning
- interconnectedness
- the human dimension
- adaptability/resilience (as opposed to stability)

11. Ecosystems are complex, non-linear and the outcomes of processes often show time lags. Further properties of ecosystems are discontinuities, thresholds, resilience and interconnectedness of which humans are part. Since ecosystems are dynamic, they contain elements of surprise and uncertainty. Management needs to be adaptive to allow for testing of management policies and emphasizes learning-by-doing.

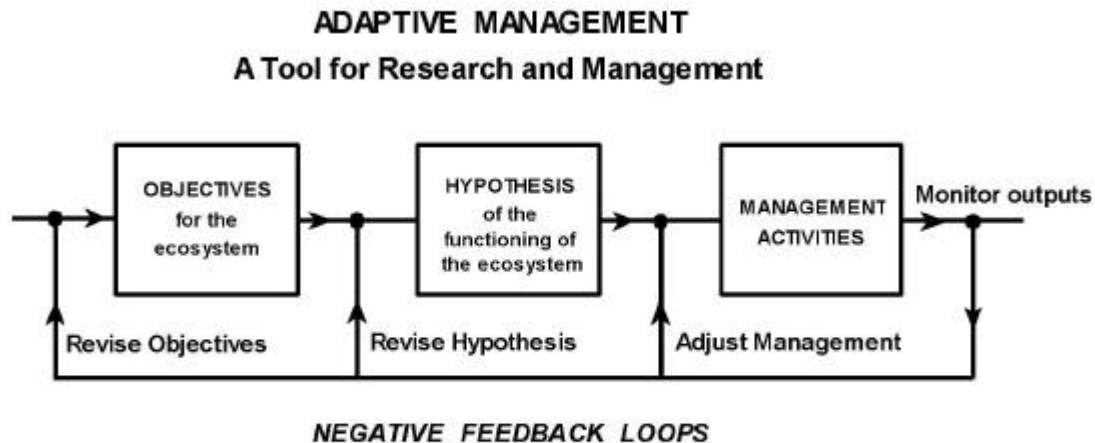


Fig. 4 Adaptive Management

12. It was debated whether the term “ecosystem approach” was not preferable to “ecosystem-based approach” given the above considerations. The ecosystem concept and its underlying principles are primarily a basis for development of a management methodology for particular areas of land or water rather than a focus on any particular ecosystem as it might be implied by the term “ecosystem approach”. The term “ecosystem-based approach” would reflect better the particular type of reasoning and analysis to tackle the objectives to implement the Convention. However, as the term “ecosystem approach” has been used throughout the discussions within the Convention, it was felt that it was advisable to continue to use this term.

13. As summarized in the introductory remarks, the COP and SBSTTA have discussed and decided upon various thematic areas. The ecosystem approach should be applied throughout all these and future thematic areas.

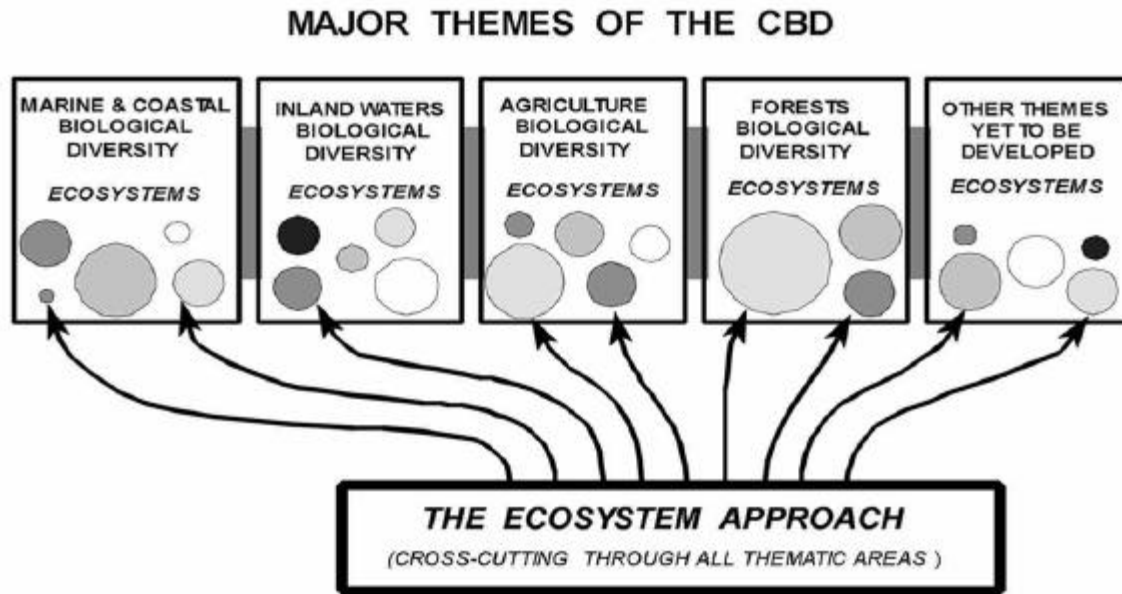


Fig. 5 Thematic areas and the ecosystem approach

2. Why should we take an ecosystem approach?

14. Classical nature conservation approaches have limitations as the sole tool for management of biological diversity and frequently but not always display one or more of the following characteristics:

1. Insufficient recognition that ecosystem functioning is vitally important for people, biological diversity and overall environmental quality;
2. Management is too site-specific and does not take into consideration the interlinkage with other sites;
3. Lack of an integrated consideration of nature and culture;
4. Too much emphasis on either the species characteristics (uniqueness, rarity) or on establishing protected areas;
5. Too little emphasis on the fact that the major part of the world's biological diversity lies outside protected areas;
6. Not all stakeholders in the management of any given ecosystem might be involved to a sufficient degree or in an integrated manner;
7. Inappropriate assignment of costs and benefits, due to market distortion and failure, perverse incentives and lack of consideration of the values of public goods and services from ecosystems;
8. A failure to integrate or coordinate with other sectoral interests. Agriculture, environment, forestry, fisheries, health, planning etc., including nature conservation, are often managed separately by different governmental bodies or others in a non-integrated way which is often to the detriment of biological diversity and people.

15. In order to overcome those shortcomings and deficiencies, an ecosystem approach should be taken, *inter alia*, for the following reasons:

1. The ecosystem concept helps to define the appropriate management level to meet the three objectives of the Convention.
2. Functioning ecosystems are indispensable for the survival of human beings and future generations as well as the global environment, as the Convention recognizes the intrinsic value of biological diversity.
3. Biological diversity is inextricably linked to ecosystem processes, functioning and resilience.
4. Ecosystem understanding allows effective or sustainable use.
5. People frequently move among ecosystems, and often use different ecosystems to satisfy their needs.
6. Humans are frequently seen as external to ecosystems even when they are residents within them.
7. The ecosystem approach allows the use of both indigenous and local knowledge, innovations and practices including traditional management systems and scientific thinking.
8. Place appropriate emphasis on the range of goods, services and information which ecosystems provide to humanity, including
 - food
 - construction materials
 - medicines, biochemicals and genetic information for pharmaceuticals
 - wild genes for domestic plants and animals
 - tourism and recreation
 - maintaining hydrological cycles
 - cleansing water and air
 - maintaining the gaseous composition of the atmosphere and regulating climate
 - pollinating crops and other important plants
 - generating and maintaining soils
 - storing and cycling essential nutrients
 - absorbing and detoxifying pollutants of human origin
 - satisfying spiritual and cultural needs
 - providing sources of beauty and inspiration
 - providing opportunities for research

3. What are the principles of an ecosystem approach ?

16. As they are all complementary and interlinked, the principles below need to be read in conjunction with each other. Together they characterize the ecosystem approach.

17. All involved in implementing the ecosystem approach should remain accountable to their constituencies for the consequences of management actions. The ecosystem approach should include a system of accountability that addresses performance of managers and decision-makers, and achievement of management objectives. Management actions should strive for efficiency, effectiveness and equity. They should be taken with precaution.

1. **Management objectives are a matter of societal choice.**

Rationale :

Different sectors of society view ecosystems in terms of their own economic, cultural and social needs. Ultimately, all ecosystems are managed for the benefit of humans - whether that benefit is consumptive or non-consumptive.

2. Management should be decentralized to the lowest appropriate level.

Rationale:

Decentralized systems can lead to greater efficiency, effectiveness and equity. The closer the management is to the ecosystem, the greater is the responsibility, accountability, participation, and use of local knowledge.

3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

Rationale:

Management interventions in ecosystems often have unknown or unpredictable effects on other ecosystems and therefore need careful consideration and analysis. This may require institutions for decision-making which lead to appropriate compromises and trade-offs.

4. Recognizing potential gains from management there is a need to understand the ecosystem in an economic context. Any ecosystem management program should

- (a) reduce those market distortions that adversely affect biological diversity;**
- (b) align incentives to promote sustainable use;**
- (c) internalize costs and benefits in the given ecosystem to the extent feasible.**

Rationale:

(1) The greatest threat to biological diversity lies in its replacement by alternate systems of land use. This often arises through market distortions which undervalue natural systems and populations and provide perverse incentives and subsidies to favor the conversion of land to less diverse systems.

(2) Often those who benefit from conservation do not pay the costs associated with conservation and, similarly, those who generate environmental costs (e.g. pollution) escape responsibility. Alignment of incentives allows those who control the resource to benefit and ensures that those who generate environmental costs will pay.

5. A key feature of the ecosystem approach includes conservation of ecosystem structure and functioning.

Rationale:

Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment as well as physical and chemical interactions within the environment. The conservation of these interactions and processes is of greater significance for the long-term maintenance of

biological diversity than simple protection of species.

6. Ecosystems must be managed within the limits to their functioning.

Rationale:

In considering the likelihood or ease of attaining the management objectives, attention must be given to the environmental conditions which limit natural productivity, ecosystem structure and functioning. The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable or artificially maintained conditions and, accordingly, management should be appropriately cautious.

7. The ecosystem approach should be undertaken at the appropriate scale.

Rationale:

The approach should be bounded by spatial and temporal scales that are appropriate to the objectives. Boundaries for management will be defined operationally by users, managers, and scientists. The ecosystem approach is based upon the hierarchical nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems.

8. Recognizing the varying temporal scales and lag effects which characterize ecosystem processes, objectives for ecosystem management should be set for the long term.

Rationale :

Ecosystem processes are characterized by varying temporal scales and lag effects. This inherently conflicts with the tendency of humans to favor short term gains and immediate benefits over future ones.

9. Management must recognize that change is inevitable.

Rationale:

Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential "surprises" in the human, biological and environmental realms. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision which may foreclose options.

10. The ecosystem approach should seek the appropriate balance between conservation and use of biological diversity.

Rationale:

There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations where conservation and use is seen in context and

the full range of measures are applied in a continuum from strictly protected to human-made ecosystems.

- 11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.**

Rationale:

Information from all sources is critical to arriving at effective ecosystem management strategies.

- 12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.**

Rationale:

Most problems of biological diversity management are complex with many interactions, side-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

4. Conclusions and Recommendations:

18. The participants of the Workshop conclude that these 12 principles provide a good basis for discussion and suggest them to the CBD community (Parties, international organizations, non-governmental organizations, representatives of local and indigenous communities and non-parties) and the scientific community at large for further discussion and elaboration. The principles will have to be taken from a conceptual realm and made operational. Furthermore there are many dilemmas involved in establishment of management objectives between stakeholders within an area, between local communities and central authorities, between a managed area and areas outside etc. Procedures and methodologies for arriving at balanced trade-offs are necessary.

19. The participants of the Workshops offer their findings on the concept of the ecosystem approach and its principles to the fourth meeting of the Conference of the Parties to be held in Bratislava from 4 to 15 May 1998 as a basis for initial consideration of the ecosystem approach. This report should be circulated by the Clearing-house mechanism so that further discussion is fostered.

20. The Conference of the Parties might wish to give a mandate for further work to the SBSTTA and include the ecosystem approach into the medium and long-term programme of work. This work should also be carried out through intersessional activities.

Annex A

List of References

Allegretti, Maria Helena *et al.* 1996: Implementation of the Biological diversity Convention. The Ecosystem approach as a strategy to achieve sustainability in the use of biological diversity, unpublished.

Batjargal, Z 1995: New Challenges, New Solutions: Back to the Future, In: Environmental Conference in the Pacific Century. Proceedings of the Fourth Pacific Environmental Conference 1994, East-West Center, Honolulu, Hawaii, USA, Pp. 52-60.

Berkes, Fikret, Colding, Johan, Folke, Carl 1997: Rediscovery of Traditional Ecological Knowledge as Adaptive Management, Beijer Discussion Paper Series No. 109, The Royal Swedish Academy of Sciences, Stockholm.

Bridgewater, Peter 1997: A new paradigm for protected areas in a new century. Or *Do we really need protected areas?*, Kingston, Australia, unpublished.

Brunnee, Jutta, Toope, Stephen, 1997: Environmental Security and Freshwater Resources, in: American Journal for International Law, Vol., 91, pp. 29 - 59.

-- 1994: Environmental Security and Freshwater Resources: A Case for International Ecosystem Law, Yearbook of International Environmental Law, Vol. 5, 1994, pg. 41 - 78.

Clark, Norman 1996: Decision Tools for Public Policy: Can We do without Economics? In: Journal of economic issues, Vol. XXX, No. 4, December 1996, pp. 949 - 966.

Costanza, Robert *et al.* 1997: The value of the world's ecosystem services and natural capital, in: Nature Vol. 387, No. 6230, 15 May 1997.

Di Castri, Francesco 1996: Biological diversity, in: World Science Report 1996, pp. 242 - 252, Paris, UNESCO.

-- , Younes, Talal 1996: Introduction: Biological diversity, the Emergence of a New Scientific Field - Its Perspectives and Constraints, in: Di Castri, Francesco, Talal Younes (eds.) 1996: Biological diversity, science and development. Towards a new partnership, CAB/IUBS, Paris.

--, Hadley, Malcolm 1988: Enhancing the Credibility of Ecology: Interacting Along and Across Hierarchical Scales, in: GeoJournal Vol. 17, pp. 5 - 35.

Ecological Society of America 1995: The Scientific Basis for Ecosystem Management. An Assessment by the Ecological Society of America, Ad Hoc Committee on Ecosystem Management.

Ecosystem Management in the Context of the Convention on Biological Diversity, Discussion Paper on Articles 6 and 8 CBD, U.S. Dept. of State, 1995.

Ecosystem Management: Lessons from Around the World. A Guide for Development and Conservation Practitioners, February 1998, Synopsis of a report prepared for the World Bank by IUCN.

Farming System Approaches for Sustainable Use and Conservation of Agricultural Biological Diversity and Agro-ecosystems. Report of the Joint SCBD - FAO Workshop, UNEP/CBD/SBSTTA/3/Inf. 10 (excerpts).

Folke, Carl, Pritchard, Lowell Jr., Berkes, Fikret *et al.* 1997: The problem of fit between ecosystems and institutions. Background document for the project on Institutional Dimensions of Global Change of the International Human Dimensions Programme.

Holling, C.S. 1973. Resilience and Stability of ecological systems, in: Annual Review of Ecology and Systematics. Vol. 4. pp. 1-23.

-- 1976: Adaptive environmental management and assessment, John Wiley, New York.

-- 1986: Resilience of ecosystems; local surprise and global change pp.292- 317, in: (eds). Clark, C. W., and Munn., R.E. Sustainable Development of the Biosphere. Cambridge University Press.

Holling, C.S.; Meffe, Gary K., 1996: Command and Control and the Pathology of Natural Resource Management, in: Conservation Biology 10 (2), pp. 328 - 337.

The Keystone National Policy Dialogue on Ecosystem Management. Final Report October 1996, The Keystone Center, Colorado.

Lapin, Marc; Barnes, Burton V. 1995: Using the Landscape Ecosystem Approach to Assess Species and Ecosystem Diversity, in: Conservation Biology, Vol. 9, pp. 1148 - 1158.

Lélé, Sharachandra; Norgaard, Richard B., 1996: Sustainability and the Scientist's Burden, Conservation Biology, Vol. 10 (2), pp. 354 - 365.

Malby, Ed 1997: Ecosystem management: the concept and the strategy, in: World Conservation, September 1997, pp. 3 and 4.

-- 1997: A tale of two Melaleucas, *ibid*, pp. 8 - 10.

Maltby, E., Holdgate, M.A., Acreman, M., Weir A. (Eds) 1996: The scientific basis of ecosystem management towards the third millennium'. Proceedings and synthesis of the First Sibthorp Seminar held at the Royal Holloway Institute for Environmental Research, University of London, 21 - 22 June 1996. RHIER/IUCN.

Noss. R.F. 1992: Issues of scale in conservation biology, in: Fiedler, P.L. & S.K. Jain (eds.), Conservation Biology: the Theory and practice of nature conservation, preservation and management, pp. 240 - 250. Chapman and Hall.

Pickett, S.T.A., V.T. Parker & P.L. Fiedler 1992: The new paradigm in ecology: Implications for conservation biology above the species level, in: Fiedler, P.L. & S.K. Jain (eds.), Conservation Biology: the Theory and practice of nature conservation, preservation and management, pp.65 - 88. Chapman and Hall.

Primm, Stuart L. 1997: The value of everything, in: Nature, Vol. 387, No. 6230, 15 May.

Prins, Herbert 1997: The ecosystem concept: Definition for the ecosystem approach, unpublished.

Safford, Leslie and Maltby, Edward 1998: Ten Principles of ecosystem Management and Recommended Actions for Implementations of an ' Ecosystem Approach'. Draft for discussion, 8 pp.

Scavia, Donald, Ruggiero, Michael, Hawes, Ellen 1996: Building a scientific basis for ensuring the vitality and productivity of U.S. ecosystems, in: Bulletin of the Ecological Society of America, Vol. 77, pp.125 - 127.

Schellnhuber, Hans-Joachim *et al.* 1997: Syndromes of Global Change , in: Gaia Vol. 6, pp. 19 - 33.
(see also http://www.awi-bremerhaven.de/WBGU/wbgu_publications.html)

Sexton, W.T., Johnson, N.C., Szaro, R.C. : The ecological stewardship project: a public-private partnership to develop a common reference for ecosystem management in the USA, Proceedings from the XI World Forestry Congress, Antalya, Turkey, 13 to 22 October 1997, Volume 2, B. Forests, Biological Diversity and the Maintenance of the Nature (<http://193.43.36.21/waicent/faoinfo/forestry/wforcong/PUBLI/V2/T7E/7.HTM#TOP>).

The Southern Africa Sustainable Use Specialist Group (SASUSG) 1997: Sustainable use issues and principles, SASUSG/IUCN, Harare.
-- 1996: The Key Considerations for Sustainable Use of Wild Fauna and Flora, 4th Draft, June 1996, SASUSG/IUCN, Harare.

Vogel, Joseph 1996: The Successful Use of Economic Instruments to Foster Sustainable Use of Biological diversity: Six Case Studies from Latin America and the Caribbean. White Paper, final report. Commissioned by the Biological diversity Support Program on behalf of the Inter-American Commission on Biological diversity and Sustainable Development In preparation for the Summit of the Americas on Sustainable Development, Santa Cruz de la Sierra, Bolivia, December 6 - 8.

Vitousek, Peter M.: Mooney, Harold A.; Lubchenco, Jane; Melillo, Jerry M., 1997: Human Domination of Earth's Ecosystems, in: Science Vol. 277, 25 July , pg. 494 - 499.

Walker, Brian 1994: Conserving Biological Diversity through Ecosystem Resilience, in: Conservation Biology, Vol. 9, pp. 747 - 752.

Walters, C. 1986. Adaptive Management of Renewable Resources, McGraw Hill, New York.

Collections of Case Studies:

Ecosystem Management: Lessons from around the world. A Guide for Development and Conservation Practitioners, February 1998.

The Keystone National Policy Dialogue on Ecosystem Management. Final Report October 1996, The Keystone Center, Colorado.

Annex B:

List of Participants:

Batjargal, Dr Zambyn

Director General, National Agency for Meteorology, Hydrology and Environment Monitoring, Mongolia

Bridgewater, Dr Peter
Chief Science Adviser, Environment Australia

Di Castri, Prof Francesco
Director of Research, National Centre of France

Hammer, Dr Monica B.
Researcher, Department of Systems Ecology, Natural Resources Management, Stockholm University, Sweden

Henne, Dr Gudrun
Special Assistant to the Executive Secretary, CBD Secretariat

Kabwaza, Mr Maphael Peter
Director, Department of Environmental Affairs, Malawi

Maltby, Prof Edward
Director, Royal Holloway Institute for Environment Research,
Chair, IUCN Commission on Ecosystem Management, United Kingdom

Martin, Mr Rowan Barry
Chairman, IUCN Southern Africa Sustainable Use Specialist Group, Zimbabwe

Mauro, Dr Francesco
Director, Environment Department, National Agency for Energy, Technology and the Environment, Italy

Prins, Prof Herbert H.T.
Professor Tropical Nature Conservation and Vertebrate Ecology,
Department of Nature Conservation, Wageningen Agricultural University, the Netherlands

Ruggiero, Dr Michael
Leader, Biological Monitoring and Applications, US Geological Survey, United States of America

Schei, Mr Peter J.
International Negotiations director, Directorate for Nature Management, Noeway

Seyani, Prof Jameson, Henry
General Manager, National Herbarium and Botanic Gardens of Malawi, Malawi

Vogel, Prof Joseph
Professor of Environmental Economics, Facultad Latinoamericana de Ciencias Sociales (FLACSO), Quito, Ecuador

Vokhiwa, Dr Zipangani M.
Coordinator National Biological diversity Strategy and Action Plan, Department of Environmental Affairs, Malawi

Annex C

Rationale of the Workshop

The discussion on how to manage biological diversity and the natural environment is increasingly being conceived as best being dealt with through an "ecosystem approach". As the development of such an approach is still in its infancy, there is a need for discussion on what it means for the Convention on Biological Diversity. Within the process of the CBD there is a need for discussion about the meaning of an "ecosystem approach" for the implementation of the objectives of the Convention.

The workshop in Lilongwe, Malawi, from the 26 to 28 January 1998 is, after the informal workshop at the third meeting of the SBSTTA, the second activity in the process of the CBD on the ecosystem approach. The convenors of the workshop seeks advice from the participants of the workshop on the meaning and implications of the ecosystem approach in the Convention. Advice is sought about key questions related to the ecosystem approach (what lessons can be drawn from existing case studies; what is an ecosystem; why to take an ecosystem approach and what does it imply; on which scale is integrated decision making possible; what are possible guidelines for an ecosystem approach). The workshop will provide a report for the fourth Conference of the Parties which will meet in Bratislava, Slovakia, from 4 to 15 May 1998. It will be presented to the Executive Secretary of the Convention and made available on the Internet. The report will be distributed as an information document at COP4 and feed into the discussions on the *modus operandi* and the medium and longer term programme of work in the CBD. The workshop shall initiate a broader discussion involving all stakeholders of the CBD community with the aim to further the regime building process in the Convention and to help implementing its three objectives.

**Workshop “Ecosystem approach” -
what does it mean for European ecosystems?**

Programme

Wednesday, 25.11.1998

Arrival on the Isle of Vilm

18.30 dinner

20.30 evening programme

Thursday, 26.11.1998

08.00 breakfast

09.00 **HANNES KNAPP**

Welcome and opening of the workshop

Introduction of participants

HORST KORN/JUTTA STADLER

Introduction to the workshop

MONICA HAMMER

Introduction to the “Malawi Principles” - the Baltic Sea case study

10.30 coffee / tea break

EDWARD MALTBY

IUCN Commission on ecosystems management (CEM):

Perspectives on the “Ecosystem approach”

ANNE SCHULTE-WÜLWER-LEIDIG

The work of the IKSR: an ecosystem approach for the River Rhine

12.00 lunch

13.30 guided tour in the nature reserve of the Isle of Vilm

15.30 coffee / tea break

MILAN RUZICKA

Ecological criteria for construction of water reservoirs

KATARZYNA ZAJAC

Perspective of the swan mussel *Anodonta cygnea* restitution - from species to ecosystem approach in landscape ecology

LINDA HEDLUND

The North Sea “case study” (report from the workshop in Oslo in June 1998)

18.30 Reception at the invitation of the Federal Agency for Nature Conservation, Germany

Friday, 27.11.1998

08.00 breakfast

09.00 **LINDA HEDLUND**

“Eco system management - landscape planning in Swedish forestry”

ALEXANDER KERR

Biosphere reserves - a model for implementing the “ecosystem approach” in Europe

TATIANA KLUVANKOVA

Stakeholder concept as an instrument to achieve adaptive management and sustainable development at the local level.-The case study from Mala Fatra NP, the Slovak Republik.

10.45 coffee / tea break

Working groups (Session 1)

Discussion

12.00 lunch

13.30 ***Working groups (Session 2)***

Discussion

15.30 coffee / tea break

Plenum

Final discussion

18.00 dinner

20.00 evening programme

Saturday, 28.11.1998

07.30 breakfast

departure

**“Ecosystem Approach” - Scientific Workshop,
to be held at the International Academy for Nature Conservation,
Isle of Vilm/Germany, Nov. 25 - 28, 1998**

Participants

1. Marius Groza	Ministry of Waters, Forests and Environmental Protections Bvd. Libertatii No 12, sector 5 Bucharest, Romania tel.: +40-1-4100215 fax: +40-1-4100282
2. Dr. Monica Hammer	Department of Systems Ecology Stockholm University S- 106 91 Stockholm, Sweden tel: +46-8-164216 fax: +46-8-158417 e-mail: monica@system.ecology.su.se
3. Linda Hedlund	Ministry of the Environment S-103 33 Stockholm, Sweden tel: +46-8-4052122 fax: +46-8-103807 e-mail: linda.hedlund@environment.ministry.se
4. Alexander Kerr	BioLogic Branden Grove 119 West Princes Street Helensburgh G84 8LX Scotland, United Kingdom tel.: +44-131-312-7765 fax: +44-131-312-8705 e-mail: skerr@scottishwt.cix.co.uk

5. Tatiana Kluvankova	Institute for Forecasting Slovak Academy of Sciences Sancova 56 81105 Bratislava, Slovakia tel.: +421-7-39 5256 fax: +421-7-39 5029 e-mail: tatiana@progeko.savba.sk
6. Dr. Horst Korn	Bundesamt für Naturschutz Internationale Naturschutzakademie Insel Vilm 18581 Lauterbach, Germany tel.: +49-38301-86130 fax: +49-38301-86150 e-mail: bfn.ina.vilm@t-online.de
7. Jean-Pierre Le Danff	Secretariat of the Convention on Biological Diversity 393, rue St-Jacques, # 300 Montreal, Qc, Canada H2Y 1N9 tel.: +1-514-288 222 0 direct-tel.: 288 287 7034 fax: +1 -514.288 6588 e-mail: jean-pierre.ledanff@biodiv.org
8. Prof. Dr. Edward Maltby	Royal Institute for Environmental Research Holloway, Callow Hill, Virginia Water, Surrey GU25 4LN, United Kingdom tel.: +44-1784-47-7404 fax: +44-1784-47-7427 email: e.maltby@rhbnc.ac.uk
9. Carlos Martin-Novella	Commission Européenne DGXI.A4 TRMF 1/71 200, rue de la Loi Brussels - 1049, Belgium tel.: +322-296-3976 fax: +322-296-9557 e-mail: carlos.martin-novella@dg11.cec.be

10. Ursa Mezan	Ministry of Environment and Physical Planning Nature Protection Authority Vojhova 1 b Ljubljana 1000, Slovenia tel.: +386-61-178-4502 fax: +38661-178-4051 e-mail: ursa.mezan@gov.si
11. Ruuben Post	West-Estonian Archipelago Biosphere Reserve Vabrikuväljak 1 92411 Kärddla, Estonia tel.: +372-46-96276 fax: +372-46-96269 e-mail: ruuben@bka.hiiumaa.ee
12. Milan Ruzicka	Institute of Landscape Ecology SAS Branch Nitra Akademicka 2 949 01 Nitra, Slovak Republic tel.: +421-87-356 02 fax: +421-87-356 08 e-mail: ruzicka@pribina.savba.sk
13. Anne Schulte- Wülwer-Leidig	Internationale Kommission zum Schutze des Rheins PF 309 56003 Koblenz, Germany tel.: +49-261-12495 fax: +49-261-36572 e-mail: iksr@rz-online.de
14. Dr. Rudolf Specht	Bundesamt für Naturschutz Internationale Naturschutzakademie Insel Vilm 18581 Lauterbach, Germany tel.: +49-38301-86134 fax: +49-38301-86150 e-mail: bfn.ina.vilm@t-online.de

15. Jutta Stadler	Bundesamt für Naturschutz Internationale Naturschutzakademie Insel Vilm 18581 Lauterbach, Germany tel.: +49-38301-86134 fax: +49-38301-86150 e-mail: bfm.ina.vilm@t-online.de
16. Katarzyna Zając	Institute of Nature Conservation PAS ul. Arianska 1 31-505 Krakow, Poland tel.: +48-12-4215144 fax: +48-12-4210348 e-mail: nozajac@eyt-kr.edu.pl nazajac@cyf-kr.edu.pl