Report of the International Workshop on "Ways to Promote the Ideas behind the CBD's Ecosystem Approach in Central and Eastern Europe"

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Ways to Promote the Ideas behind the CBD's Ecosystem Approach in Central and Eastern Europe

Report of the workshop convened by the German Federal Agency for Nature Conservation at the International Academy for Nature Conservation, Isle of Vilm
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1 Introduction

The international workshop „Ways to Promote the Ideas behind the CBD's Ecosystem Approach in Central and Eastern Europe" brought together 26 experts from 10 European countries from May 05-09, 2004. It was organized by the German Federal Agency for Nature Conservation at its conference centre, the "International Academy for Nature Conservation" on the Isle of Vilm.

In organising the workshop, the Federal Agency was led by Decision VII/11 of the 7th Conference of the Parties (COP-7) to the Convention on Biological Diversity (CBD), in February 2004 in Kuala Lumpur, which "agrees that the priority at this time should be on facilitating the implementation of the ecosystem approach as the primary framework for addressing the three objectives of the Convention in a balanced way" and "requests the Executive Secretary, in collaboration with Parties and relevant international and regional organizations, to facilitate the undertaking of the following activities, …:

(a) Undertake an analysis of the range of existing tools and approaches, that are consistent with the Convention's ecosystem approach, but operate on different levels and belong to a variety of sectors/communities, …, in order to learn from their experiences and build upon their approaches, and identify any gaps in the coverage of such tools;
(b) (..)
(c) Continue collection of case-studies at national, sub-regional, regional and international level on the implementation of the ecosystem approach, …."

The aim of the workshop was to discuss on the basis of national case-studies and of experiences gained from other approaches such as Sustainable Forest Management, Sustainable Fisheries and the transboundary protection of high-mountain areas the following issues:

- If the existing guidance for the implementation of the ecosystem approach is valuable in practice;
- Which existing initiatives/approaches/opportunities can be built upon and what possible solutions there are to overcome identified obstacles for the implementation of the ecosystem approach in Central and Eastern Europe;
- If there are synergies between the ecosystem approach of the CBD and other approaches, which might be used to reach the goals of the Convention.

The workshop was set up as an informal scientific meeting and the participants attended in their personal capacity as biodiversity experts. The meeting was chaired by Dr. Horst Korn.

This report contains abstracts of the presentations made by participants on their activities, experiences and views with regard to the implementation of the CBD's Ecosystem Approach in Central and Eastern European Countries. The result of a finalizing working session is summarized and recommendations are given to help individuals and organizations in their work and to contribute to further discussion on the issue.

2 Results and Recommendations of the Workshop

Summary of Considerations on the Implementation of the Ecosystem Approach in Central and Eastern European Countries

1. General Remarks

The Ecosystem Approach contributes to sustainable development.

Relationship between the Ecosystem Approach and other approaches

The Ecosystem Approach is not a competing but rather a complementary approach to other approaches. The Ecosystem Approach is a general approach, other existing approaches (Sustainable Forest Management, Integrated Coastal Zone Management, Integrated River Basin Management, the Biosphere Reserve concept, the Regional Seas Programs, regional conventions such as the Alpine Convention and the Carpathian Convention, etc.) may be seen as a potential specification of the Ecosystem Approach for certain sectors, biomes, regions etc.

Many elements of the Ecosystem Approach exist in other management approaches and are implemented in projects and other activities without reference to the Ecosystem Approach. However, the number of projects explicitly based on the Ecosystem Approach of the Convention on Biological Diversity (CBD) is increasing.

2. Obstacles for the Implementation of the Ecosystem Approach of the CBD

Intersectoral aspects

- Sectoral approach in institutions, education, minds etc. results in lacking intersectoral cooperation
- Traditional sectoral planning may fear to lose competencies and importance what results in resistance from sectoral planning disciplines
- Missing flexibility of bureaucracy (institutional inertia)
- Lacking tools of acquiring and applying transdisciplinary knowledge

Relationship between the Ecosystem Approach and other approaches

- In some cases the Ecosystem Approach is seen as a competitive approach.
- Selective use of Ecosystem Approach Principles by other approaches

Legal aspects and law enforcement

- Low governmental capacities to implement the CBD and the Ecosystem Approach and to integrate it into existing legislation
- Problem regarding decentralization: Lack of capacity in local authorities
- Outdated and inconsistent laws

- Implementing the Ecosystem approach may be difficult in certain cases under the conditions of centralistic systems of management of natural resources by the state.

Public awareness and communication of the Ecosystem Approach

- Ecosystem Approach is a complex, demanding concept (holistic, cross-cutting)
- Lack of knowledge and promotion of the Ecosystem Approach philosophy

Information exchange

- Lack of information exchange between research, science and practice
- Relevant data on conservation and sustainable use of biological diversity are not freely available in many countries.

Participation

- The common perception of participatory processes as being time-intensive and costly
- Lack of trust and awareness on the side of local population
- Lack of capacity for effective participation of local population
- With regard to private land, implementation of participatory concepts may be a difficult task (for example due to legal constraints)

Ecosystem management practices

- Low acceptance of adaptive management and participatory approaches
- Uncertainties with regard to and too little emphasis on ecosystem functioning
- Too little emphasis on protection of landscape diversity
- Lacking integration of physical and chemical processes with biological ones in management
- Increasing loss of traditional knowledge relevant for the conservation and sustainable use of biological diversity in Europe

Economic aspects

- Predominance of large scale economic interests
- Conflict between long-term ecological and short-term social and economical aims

3. Recommendations

Principles and guidance of the CBD's Ecosystem Approach

- Further guidance based on experiences and case studies is desirable, for example on participatory management.
- Reflect the necessity of education and public awareness raising in the guidance of the Ecosystem Approach.

Interlinkages / relationship with other approaches

- Network existing approaches by using the Ecosystem Approach as the overarching framework.

- Harmonize terms (e.g. landscape restoration, decentralization) and methods between the Ecosystem Approach and other related approaches
- Possible areas for future collaborative efforts in implementing the Ecosystem Approach and Sustainable Forest Management (SFM) in Europe
  - connectivity between forest areas,
  - transboundary cooperation
  - guidelines for adaptive forest management
  - data collection
- Some of the areas for further integration of SFM and the Ecosystem Approach as mentioned in Dec. VII/11 of the CBD's Conference of the Parties are covered by the documents of the Ministerial Conference for the Protection of Forests in Europe (MCPFE) process; these opportunities should be used.

Intersectoral aspects

A cross-sectoral approach to ecosystem management requires a paradigm change in management.

- Promote multi-sectoral and cross-sectoral management approaches through practical integration of the Ecosystem Approach into agriculture, fisheries, forestry, physical planning and other sectors that affect biodiversity.
- Prepare case-studies for the Ecosystem Approach in and across different sectors and on their base develop appropriate guidelines and models of integrated management of natural resources.
- Develop and harmonize monitoring systems.
- Implement nature conservation and Natura 2000 interests into agri-environmental programs.
- Perform cross-sectoral evaluation of subsidies as to counterproductive effects and coordinate all incentives across sectors.
- Use the Ecosystem Approach in the decision-making process of funding institutions e.g. EU and World Bank.

Legal aspects and policies

- Integrate relevant international „soft law" regulations into binding national laws.
- Apply the Ecosystem Approach to the implementation of relevant European legislation and policy (e.g. Water Framework Directive, NATURA 2000, "2010-Target" etc.).
- Evaluate national natural resource policies and legislation (both existing and envisaged amendments), identify implementation gaps and define needs for action.

Information exchange and public awareness

- Enhance public understanding of biodiversity.
- Distribute information on the Ecosystem Approach to stakeholder groups (e.g. spatial planners etc.).
- Promote data collection and exchange.
- Collect and make use of traditional ecological knowledge and practices.

Tools

- Interpret / translate the Ecosystem Approach Principles into local conditions / circumstances (assessment matrix according to MATTHES in this volume)
- Develop and disseminate guidelines on the implementation of the Ecosystem Approach for specific actors (e.g. spatial planners, politicians, authorities).
- Develop instruments for decision support (criteria & indicators, impact assessment of the decision, guidelines, checklists, best practice manuals, tool box, etc.).
- Apply risk analyses, environmental impact assessment, strategic impact assessment, and cost-benefit-analyses to biodiversity issues
- Develop improved methods for economic (monetary) valuation of biodiversity and its benefits in order to be able to internalise the negative externalities (e.g. polluter-pays-principle).
- Remunerate positive external effects of biodiversity management that exceed legal provisions and good practice.
- Use the Ecosystem Approach as a tool for landscape management.
- Practical integration with surrounding landscape
- Do research on the basic life supporting processes.
- Do research on the structure and functioning of ecosystems.
- Do research on thresholds and carrying capacities of ecosystems.
- Develop and harmonize criteria and indicators for biodiversity conservation.
- Implement Biodiversity Strategies and Action Plans.
- Make use of National Forest Programs.
- Prepare a National Nature Protection Strategy.
- Prepare a National Strategy for Sustainable Development.
- Integrate the Ecosystem approach into these Strategies already during preparation.
- Develop Ecological Networks as an important model of biodiversity protection and enhance integration of existing protected areas into the broader landscape.
- Establish new transboundary protected areas and enhance transboundary cooperation (e.g. transboundary management planning).

Capacity building

- Promote capacity building for the Ecosystem Approach by strengthening the capacity of local communities, NGOs and responsible authorities such as ministries and agencies for example via the Clearing House Mechanism.
- Promote capacity building for good governance.

Participation

Participation has been proven to be essential but difficult to implement.

- Promote or establish procedures for active participation.
- Achieve balance between scientifically established limits (for example carrying capacity) and local interests.

- Develop a common understanding or vision, establish consensus on underlying common values in the beginning of a participatory process.
- Establish an Ombudsman for nature and future generations (a representative for the interest of those who cannot speak for themselves).
- Avoid the risk of political abuse.

4. Lessons Learnt from Projects Presented by the Participants

- The principles of the CBD Ecosystem Approach are helpful in addressing complex systems.
- A scientifically based management plan proved to be the best foundation.
- Involving the stakeholders proved to be the most difficult issue.
- The Biosphere Reserve concept seems to provide an appropriate model for implementing the Ecosystem Approach combining the three objectives of the CBD.

5. Some Existing Initiatives and Opportunities for the Application of the Ecosystem Approach (indicative, non-exhaustive list)

- Sustainable Forest Management
- River Basin Management
- Integrated Coastal Zone Management
- Sustainable Fisheries Management
- Biosphere Reserves
- Århus Convention (Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters)
- Addis Ababa Principles of Sustainable Use (CBD)
- Convention and Ministerial Declaration on Black Sea Protection and Pollution Prevention
- Black Sea Biodiversity and Landscape Conservation Protocol
- State Program of Biodiversity Conservation of the Ukraine
- EU Biodiversity Strategy and its associated action plans
- 6th Environmental Action Programme (EAP) of the EU
- EU Leader Initiative
- LIFE Natura projects of the EU
- Ecosystem based management
- Participatory processes
- Landscape-scale approach

3 The CBD's Ecosystem Approach and Related Approaches

Towards Implementation of the CBD's Ecosystem Approach - Examples from Sweden

MONICA HAMMER

The CBD's Ecosystem Approach in Context

Ecosystem management approaches building on a holistic view of the integrated human-nature system are increasingly suggested as a basic management framework (CHRISTENSEN et al., 1996; ANON., 1998; DALE et al., 2000). Such approaches are developed from the increasing awareness both in science, policy, and practical management about difficulties to manage natural resources in a sustainable way within and across sectors (e.g. LUDWIG et al 1993, HOLLING and MEFFE, 1996). Human activities, such as agriculture, forestry, or fisheries forming natural resource use patterns will have direct or indirect effects also on biodiversity and ecological functioning. Habitat conversion and land use change are currently considered the main causal agents influencing biodiversity loss and alterations to ecosystem structure and functioning (MATSON et al., 1997; DALE et al., 2000). Unwanted ecological degradation has led people to try to manage the impacts they have on the ecosystems. However, predicting ecological outcomes is often difficult, contingent on drivers that are not easily predicted and include uncertainties, non-linearities, and surprise. In particular, it seems difficult to address long term, gradual changes matching slow ecological variables with more short term policies (e.g. GUNDERSON et al., 1995; GUNDERSON & HOLLING; 2002; FOLKE et al., 2002).

The conceptual framework of the Ecosystem Approach implies a shift from a product oriented management focus towards identifying what the ecosystems really do. The main long term objective is thus to sustain functioning ecosystems and recognizing the interdependencies between human actions and ecosystem dynamics.

Within the UN Convention on Biodiversity (CBD), the Ecosystem Approach was adopted by the Conference of the Parties (COP) in 1995 as the primary framework for conserving biodiversity (ANON., 1998). The CBD Ecosystem Approach is here described as a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way, recognizing that humans are an integral part of many ecosystems. The Ecosystem Approach will help to balance the three objectives of the Convention. The twelve Malawi principles and the guidelines adopted by the COP provide an overall framework identifying the following key aspects; focus on the functional relationships and processes within ecosystems, enhance benefit-sharing, use adaptive management practices, carry out management actions at the scale appropriate for the issue being addressed, with decentralization to the lowest level, as appropriate, and finally ensure intersectorial cooperation.

Sustaining the flow of ecosystem goods and services

From a human perspective, the main importance of the natural environment to man is its ability to provide the wide array of ecosystem goods and services that constitute the very basis of human existence. These are generated by essential ecological processes, which in turn are sustained by the diversity of species and communities (JANSSON et al., 1994; DAILY, 1997; LEVIN, 1999). Key processes include nutrient cycling, biological productivity, cleansing of water and air, pest control, pollination, and maintenance of nature's vast genetic library, but also a diversity of cultural services.

Ecosystems and biodiversity are closely related concepts. The concept of ecosystem is defined in CBD as a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Biodiversity includes diversity within and between species and diversity is a structural feature of ecosystems. The variability among ecosystems in turn is an element of biodiversity.

An ecosystem approach includes maintaining functioning ecological systems to secure the flow of natural goods and services important for the welfare of human societies. It implies that a target resource, such as fish or a tree species, is treated as an inseparable component of a complex network of processes and functions at different spatial and temporal scales. Thus, an ecosystem approach would stress that there cannot be a supply of renewable resources, without functioning ecosystems to produce them, placing more emphasis on the full range of goods, services, and information, which ecosystems provide to humanity.

Over time, both the natural and the human system fluctuate and change. Examples of such changes in the Stockholm archipelago in Sweden are variations in climate and weather, land lift-up, but also shifts in user patterns, such as the increase of tourism, and new national and international agreements and rules affecting the archipelago directly and indirectly. From a management perspective, the archipelago system can hence be defined as a "moving target". To sustainably govern complex socio-ecological systems, the ability to respond and adapt to changes is critical (HOLLING, 1986; BERKES et al., 2003; KINZIG et al., 2003). Changes in natural resources use occur, due to a combination of ecological and socio-economic causes and this social-ecological system develops in an integrated dynamic and complex way where society and nature constantly face the need for adaptation (HOLLING, 1986; BERKES et al, 2002; GUNDERSON and HOLLING, 2002). Changes in user patterns and ecosystems can be derived from ecological driving-forces as well as from socio-economic drivers. Even if the direct causes of ecosystem change (e.g. eutrophication being directly caused by increase of nutrient levels) belong in the domain of ecology, the underlying causes of change, the legal, social, and cultural factors that direct human behaviour, rest in the domain of economics and social sciences underlining the need for transdisciplinary approaches to management and conservation.

Towards Implementation of the Ecosystem Approach – Finding Good Examples

In its Decisions V/6 and VI/12, the COP requested the Executive Secretary to collect, analyse, compare, and disseminate identified case studies and lessons learned on the Ecosystem Approach. Hence, moving from ideas to implementation is helped by finding good examples and pin point difficulties. Other existing approaches such as Integrated Coastal Zone Management that include elements of the Ecosystem Approach can provide helpful experiences and bridges towards implementation.

Following international agreements, such as the CBD, new policies for e.g. forestry and fisheries also in Sweden, have been adopted with more equal emphasis on production and conservation goals. Sweden has a long coastline and many coastal areas in e.g. the Baltic Sea are facing environmental problems, such as loss of biodiversity, eutrophication, accumulation of toxic substances, as well as depletion of fish stocks and other natural resources (e.g. ELMGREN , 1989; JANSSON and DAHLGREN, 1999). The problems can mainly be considered to be the result of a lack of understanding of the importance to society of these areas and the ecological goods and services they provide, as well as a failure to apply a holistic approach to their management (HAMMER et al., 1993; JANSSON & VELNER, 1995). This is becoming increasingly clear in the light of the transition of coastal societies from traditional subsistence practices to recreation activities and urban influences. One result is increasing conflicts over resource use between different interests, for example nature conservation, fisheries, agriculture, settlements, tourism, and transport. Thus, for many reasons there is an urgent need for improved management of marine and coastal resources as was also suggested in the report of the Commission on the Marine Environment appointed by the Swedish government (SOU, 2003). The work of this commission was based on the CBD Ecosystem Approach and pointed out that the Ecosystem Approach places more far-reaching demands on protection measures than is the case with the current "sectorized" method and would pioneer marine environmental protection. Their analysis further indicated essential components that are needed, and currently lacking, in regional marine conventions; further collaboration among authorities, the research community, industries, and stakeholders, common effect-based targets for both national and international work, and flexibility to implement cost-effective measures within relevant sectors and establish legally binding agreements at the national level.

One international initiative to further the implementation of an ecosystem approach is the Millennium Ecosystem Assessment (MA) (ANON, 2003, MOONEY et al., 2004). It is an international consortium of scientists from over 70 nations undertaking assessments of case studies on global and sub-global levels. The aim is to establish a scientific basis for actions needed to enhance the contribution of ecosystems to human well-being without undermining their long-term productivity and a common conceptual framework has been developed for the assessments (ANON, 2003; MOONEY et al, 2004). Operationally, the MA focuses on three central questions; 1) what is the current status of ecosystems and the services they provide for human beings, and how have they been modified over the recent past? 2) Given plausible future trends in drivers such as population and economic growth, technological development and governance structure, how will the supply of ecosystem goods and services be altered, and what will be the possible impacts of these be on human well being, and 3) what successful responses have we had in the past to conserving and optimising the delivery of ecosystem goods and services (MOONEY et .al., 2004).

In Sweden, for example a local assessment of a wetland landscape in southern Sweden (Kristianstads Vattenrike) within the MA provides an interesting example of the development of an adaptive co-management system, where the social system moved into a new configuration of ecosystem management within about a decade. The wetland landscape area is defined by hydrological and political borders and covers some 110,000 ha. It is known for its rich flora and fauna and includes Sweden´s largest wet grassland landscape used for grazing and haymaking. Many of the values associated with it require active

management to be sustained. Over the years, the values of the wetland landscape have been compromised and in spite of efforts for its protection, including the Ramsar convention that provided a framework for protection, the degradation continued. To counteract this development, changes in policy were initiated in the late 1980s including the establishment of a flexible and dynamic network organisation, the Ecomuseum Kristianstad Vattenrike (EKV) in 1989 to help the municipality of Kristianstad to manage the wetland landscape, which is now a biosphere reserve candidate. The work of EKV has developed into an adaptive co-management approach that includes stakeholders at several levels in society from local to international within existing institutional frameworks. Conflict resolution mechanisms and the existence of key stewards are regarded as important factors for turning the negative trend in Kristiandstad Vattenrike. Building ecological knowledge by e.g. land use mapping, and incorporating local knowledge and skills of for example local farmers has allowed the development of context specific knowledge and management practices.

An important aspect of an ecosystem approach is the knowledge base underlying our decision-making. Changes in natural resource use are often followed by a shift in how nature and natural resources are perceived and valued (TENGÖ and HAMMER, 2002; BERKES and FOLKE, 1998). Sustaining and accumulating ecological knowledge and understanding of how to respond to environmental change in order to sustainably manage and use resources, biodiversity and ecosystems is pivotal. In a well functioning system, such knowledge is most probably a combination of scientific and local knowledge, which can be generated from science or from experience. In particular, there is an increasing literature pointing to the potential of also utilizing local ecological knowledge accumulated by local users and institutions (DYER and MCGOODWIN, 1994; BERKES and FOLKE, 1998; TENGÖ and HAMMER, 2003). Local ecological knowledge is site specific and may be a mixture of scientific and practical knowledge (JOHANNES,1978; GADGIL et al., 2000; OLSSON, 2003; BERKES et al., 2003). Recreational fishers and conservationists, for example, often have quite specialized and species oriented knowledge, while persons engaged in traditional activities such as subsistence fishing, farming, and hunting are likely to possess a broader experience of changes in resource use. These different forms of local knowledge need to be integrated with scientific knowledge as a basis for the development of management strategies.

A Swedish example of balancing conservation and use by a participatory approach where the use of local ecological knowledge was key is the shrimp fisheries in the Koster - Väderöfjord at the Swedish west coast (SKÖLD, 2003). This area is probably the most species rich marine area in Sweden and contains unique areas with several groups of, for Sweden, rare species, e.g. deep soft and hard bottoms with cold water corals (*Lophelia pertusa*). There are also reproduction and feeding areas for economically important species for fisheries. Human activities reflected in the status of the area include large scale eutrophication, fisheries, and exploitation of seashores. In particular there was a difficult conflict between shrimp trawling and conservation. Shrimp trawling has taken place in the fjord for almost a century and occupies some 50 fishers on ca. 30 boats. The yearly total allowable catch of some 200 tons is shared between the fishers via an informal local governance system. The fishery is also considered to be indirectly important for the other industries in the region, such as processing and tourism. The catch itself is not considered to be a threat to the shrimp population, however the effects of the trawlers on other organisms by scraping the bottoms was regarded as a major threat, leading to a problematic conflict

between fisheries and conservation. A working group with representatives from the different stakeholders involved (fishers, municipalities, county council) was established in 1999. With the help of an inventory provided by a nearby marine research laboratory, using a remote controlled submarine vessel and multibeam scanning, as well as the local knowledge provided by stakeholders, a fine tuned management plan could be worked out, identifying 10 small protected areas, and specific rules for trawling, along with the development of new gear that allowed a continued fishing while minimizing the detrimental effects on the ecosystem.

Concluding Remarks

Implementing the CBD Ecosystem Approach by adapting the overarching framework, principles and guidelines to particular local and regional conditions and settings defined by the problem at hand – the problem shed – as is the current priority will hopefully provide a strong possibility to increase the understanding of the relations between biodiversity and functioning ecosystems as well as functioning social-ecological systems. As is indicated from the examples above, governance solutions in line with the Ecosystem Approach exist and one important task is to further compile and analyze the experiences from practical management as one step towards implementing the framework and balancing the three objectives of the Convention of Biodiversity.

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Outcome of the Session of the MCPFE/PEBLDS Ad-Hoc Working Group on the Development of a Pan-European Understanding of the Linkage between the Ecosystem Approach and Sustainable Forest Management

presented by MARTA GAWORSKA

1 Introduction

Following the Ministerial Conference on the Protection of Forests in Europe (MCPFE) Work Programme and the Pan-European Biological and Landscape Diversity Strategy (PEBLDS) Forest Biodiversity Action Plan, the session of the Ad-hoc Working Group on "Development of Pan-European Understanding of the Linkage Between the Ecosystem Approach and Sustainable Forest Management" took place from April, 19-21 at Krakow, Poland. The meeting was organised by the MCPFE Liaison Unit Warsaw in cooperation with the PEBLDS Secretariat. The Government of Poland contributed to the organisation of the meeting by funding a field trip to the Tuszyma Forest District of the Regional Directorate of the State Forest in Krosno.

51 participants from 23 countries and the European Commission and eight international organisations took part in the deliberations.

Mr. Piotr Borkowski, head of the MCPFE Liaison Unit Warsaw opened the session and welcomed the participants on behalf of the Liaison Unit Warsaw. Dr. Edward Lenart, Deputy Director of the Forestry Department of the Polish Ministry of the Environment welcomed the participants on behalf of the Minister of the Environment of Poland. Ms Ivonne Higuero addressed words of welcome on behalf of UNEP/PEBLDS.

Mr. Ingwald Gschwandtl (Austria) was elected as chairman of the ad hoc Working Group by the participants, and he chaired the plenary sessions. The two discussion groups were chaired by Ms. Conceicao Ferreira (Portugal) and Ms. Ivonne Higuero (UNEP/PEBLDS).

Practical examples of the application of the Ecosystem Approach through Sustainable Forest Management (SFM) in forest ecosystems were demonstrated and discussed during the field trip.

2 Mandate of the Working Group

Both the European Ministers responsible for forests at the Vienna Conference (April 2003) as well as the European Ministers responsible for environment at the 5th Environment for Europe Ministerial Conference (Kiev, May 2003), endorsed a Framework for Cooperation between the MCPFE and the Environment for Europe/Pan European Biological and Landscape Diversity Strategy (EfE/PEBLDS).

The Framework for Cooperation proposed, as one of the joint activities, the clarification between the Ecosystem Approach and SFM, building on the work achieved so far by the MCPFE on SFM. The Framework thus follows up on the decisions taken by the Convention on Biological Diversity (CBD) (6th Conference of the Parties to the CBD, Expanded Work Programme on forest biological diversity, 2002) and the United Nations Forum on Forest (UNFF) (2003, third session, Resolution 3/4, paragraph 8) with respect to the clarification of the two concepts at the regional pan-European level.

To follow up on the decisions it was decided at the MCPFE Expert Level Meeting, October 2003 in Vienna, to establish an Ad-hoc Working Group to elaborate on the relationship between SFM and the Ecosystem Approach within the European context and, in particular, to elaborate on the clarification between the two concepts based on the MCPFE experience and achievements with regards to SFM. The PEBLDS Council at the Madrid Conference (January, 2004) agreed to support the Ad-hoc Working Group under the Forest Biodiversity Action Plan proposal.

This action aims at contributing to the implementation of the MCPFE Work Programme, the PEBLDS Forest Biodiversity Action Plan and the Expanded Programme of Work on Forest Biological Diversity of the CBD, as referred in the CBD COP Decision VI/22, paragraphs 15 and 18.

3 Background

The MCPFE is a high-level political initiative for cooperation on the most important concerns and challenges regarding forests and forestry in Europe. This process is based on a series of conferences at the ministerial level and specific follow-up procedures. At the conferences, aspects of the highest political interest and concerns are dealt with by the ministers responsible for forests, which are then expressed in the form of Resolutions as well as General Declarations. Following the Ministerial Conferences, the decisions agreed by the ministers are further specified and put into action at expert meetings, namely by means of the development of a Work Program that integrates actions to be taken at the pan-European level. In addition, it is the Member States' responsibility to implement the commitments at national level.

Launched in 1990, this political platform for dialogue on European forest issues involves around 40 European countries and the European Commission. Furthermore, non-European countries and international organizations participate as observers allowing non-governmental and intergovernmental organizations to contribute with their knowledge and ideas.

Since 1990, four Ministerial Conferences on the Protection of Forests in Europe took place. These are regarded as milestones in the development of international forest policy: Strasburg (1990), Helsinki (1993), Lisbon (1998), and Vienna (2003). The fifth Ministerial Conference on the Protection of Forests in Europe will take place in Warsaw. The MCPFE also recognizes the significance of these commitments at the regional and global levels. It contributes to the implementation of the forest related decisions of the UNCED and its follow-up process within the Intergovernmental Panel on Forests (IPF) and the

Intergovernmental Forum on Forests (IFF). The MCPFE obtained observer status to the UNFF and participates in its work.

Furthermore the MCPFE contributes to the provisions of the United Nations Conventions, particularly the CBD and its Expanded Work Programme on Forest Biological Diversity.

With regards to biological diversity, and in addition to the two specific resolutions (H2: General Guidelines for the Conservation of the Biodiversity of European Forests and V4: Conserving and Enhancing Forest Biological Diversity in Europe) the MCPFE implemented the "Work Programme on the Conservation and Enhancement of Biological and Landscape Diversity in Forest Ecosystems 1997-2000" (Biodiversity Work Programme) in cooperation with the European ministers responsible for the environment and the Ministerial Process Environment for Europe/PEBLDS.

The Pan-European Biological and Landscape Diversity Strategy, endorsed in 1995 at the Third Environment for Europe Ministerial Conference in Sofia, Bulgaria, is a European response to support the implementation of the CBD. The Strategy introduces a coordinating and unifying framework for strengthening and building on existing initiatives. It does not aim to introduce new legislation or programmes, but to fill gaps where initiatives are not implemented to their full potential or fail to achieve desired objectives. Furthermore, the Strategy seeks to more effectively integrate ecological considerations into all relevant socio-economic sectors, and will increase public participation in, and awareness and acceptance of, conservation interests.

At the Fifth Environment for Europe Ministerial Conference in Kyiv, Ukraine, the Ministers of Environment and Heads of Delegations of the States participating in the Pan-European Biological and Landscape Diversity process endorsed the Resolution on Biodiversity, and agreed to halt the loss of biological diversity at all levels by 2010. The Ministers committed to achieving nine sub-targets through national efforts and regional cooperation in the key areas of forests and biodiversity, agriculture and biodiversity, the Pan-European Ecological Network, invasive alien species, financing of biodiversity, biodiversity monitoring and indicators, and public participation and awareness. The PEBLDS has adopted seven action plans for implementation of activities to achieve the sub-targets in the pan European region with special focus on Eastern Europe, the Balkans, the Caucasus and Central Asia, including an action plan on forests and biodiversity to be carried out jointly with the MCPFE.

4 Outcomes

4.1 General Conclusions

The participants of the Ad-Hoc Working Group welcomed the recognition by CBD (Decision VII/11) that SFM can be considered as a means of applying the Ecosystem Approach to forests. They also noted that the FAO Forest Management Working Paper entitled "Sustainable Forest Management and the

Ecosystem Approach: Two concepts, one goal"[1] states that the two concepts aim at promoting conservation and management practices which are environmentally, socially and economically sustainable, and which generate and maintain benefits for both present and future generations.

Participants stated that at the pan-European level the concept of SFM is defined in Resolution H1: General Guidelines for Sustainable Management of Forests in Europe of the Helsinki Conference (1993) and developed through all other commitments, resolutions and declarations of the Ministerial Conferences held in Strasburg (1990), Helsinki (1993), Lisbon (1998), and Vienna (2003). Taking them all into account, the analysis made in the meeting showed SFM to be the concrete means of applying the Ecosystem Approach to forest ecosystems in the European region (see section 4.2 below).

Concerning the request of the Conference of the Parties to CBD (COP 7th Meeting, Kuala Lumpur, 2004: Decision VII/11) to further integrate the concepts of the Ecosystem Approach and SFM, with special emphasis on three critical issues, the participants expressed the following view:

Better cross-sectoral integration and inter-sectoral collaboration: At the 4th Ministerial Conference on the Protection of Forests in Europe (Vienna - 2003), the Ministers signed Resolution V1 on strengthening synergies for sustainable forest management in Europe through cross-sectoral cooperation and national forest programmes. The principles of national forest programmes, following the IPF/IFF Proposals for Action, adopt a holistic and inter-sectoral approach, the integration with national sustainable development strategies as well as consistency with international commitments recognising synergies between international forest-related initiatives and conventions.

Interactions between forests and other biome/habitat types within a landscape: The participants of the meeting considered that this is mainly an issue to be considered at the implementation level, although already recognised at the ministerial conferences. The definition of SFM in the European context addressed the concern about the effects on other ecosystems in Resolution H1: SFM is the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems."[2]

Biodiversity conservation issues, in particular through continued development of criteria, indicators and forest management certification programmes and including protected areas: Biodiversity was a concern at the Helsinki Conference (1993) where the Ministers adopted general guidelines for the conservation of biodiversity of European forests (Resolution H 2). At the 3rd Ministerial Conference (Lisbon, 1998) the Ministers adopted a set of criteria and indicators for sustainable forest management, which includes Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems. The Pan-European indicators were further developed and endorsed at the 4th Ministerial

[1] FAO (2003), Sustainable forest management and the ecosystem approach: two concepts, one goal. Wilkie M.L., Holmgren P., Castaneda F., FAO Working Paper FM 25

[2] MCPFE (1993), Resolution H1 Preamble, Para D.

Conference (Vienna, 2003) as "Improved Pan-European Indicators for Sustainable Forest Management". The list of indicators under Criterion 4 includes among others, indicator 4.9 (protected forests): area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to the MCPFE Assessment Guidelines. In this regard, protected areas are seen as an integral part of SFM.

Conservation of forest biological diversity was again addressed in Vienna by the adoption of Resolution V4: Conserving and Enhancing Forest Biological Diversity in Europe, which includes Annex 1: Framework for Cooperation between the MCPFE and the EfE/PEBLDS, and Annex 2: MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded land in Europe.

4.2 Conceptual linkages between SFM as defined by MCPFE, and the Ecosystem Approach

EA Principle	MCPFE References	Comments
Principle 1: The objectives of management of land, water and living resources are a matter of societal choice.	▪ Participation (Resolution V1: Strengthen synergies for sustainable forest management in Europe through cross-sectoral co-operation and National Forest Programmes; Annex to V1: MCPFE Approach to National Forest Programmes in Europe.) ▪ Partnership for implementation (Resolution L1: People, Forests and Forestry – Enhancement of Socio-Economic Aspects of Sustainable Forest Management; Annex to V1) ▪ Good governance (Vienna Living Forest Summit Declaration: European Forests – Common Benefits, Shared Responsibilities, para. 20) ▪ Partnership and cooperation (Resolution V4: Conserving and Enhancing Forest Biological Diversity in Europe; Annex 1 to V4: Framework for Co-operation Between MCPFE and Environment for Europe/PEBLDS)	Two of the key aspects of National Forest Programmes (NFPs) in Europe are: participation and partnership for implementation.
Principle 2: Management should be decentralized to the lowest appropriate level.	▪ Decentralization (Resolution H1: General Guidelines for Sustainable Management of Forests in Europe, para D; V1; Annex to V1) ▪ Good governance and forest law enforcement (Vienna Declaration, para 20) ▪ Institutional and policy reform (V1)	Decentralization as well as development of human and institutional capacity constitutes important aspects that are closely linked to participation, which is stressed in Annex to V1. Decentralization is linked with participation, and it is also related to decision-making power and implementation. The participants emphasised national contexts, for example different political systems and ownership structures, which vary considerably among European countries should be taken into account. Participants also stressed that in some countries local authorities play an important role in forest management.

EA Principle	MCPFE References	Comments
Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.	▪ Impacts on other ecosystems (duty of care) (Resolution H1, para D: "The concern about the effects on other ecosystems was taken into account in the definition of SFM in the European context"; Resolution V1) ▪ Holistic and inter-sectoral approach (Resolution V1) ▪ Integration with national sustainable development strategies (Resolution V1) ▪ Recommendations for site selection for afforestation (Resolution V4; Annex to Framework of Co-operation: Priority Themes for Co-operation Between MCPFE and EfE/PEBLDS for the period 2003-2005. ▪ Precautionary principle (Resolution H2: General Guidelines for the Conservation of the Biodiversity of European Forests)	It is also reflected in Resolution V1 under the theme of cross-sectoral issues in Principles of NFPs: holistic and intersectoral approach, integration with national sustainable development strategies.
Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should: (a) reduce those market distortions that adversely affect biological diversity; (b) align incentives to promote biodiversity conservation and sustainable use; (c) internalise costs and benefits in the given ecosystem to the extent feasible.	▪ economic function is one of the pillars of SFM (Resolution H1; Resolution L1; Resolution V2: Enhancing Economic Viability of Sustainable Forest Management in Europe, Annex to Resolution L2: Pan European Criteria and Indicators for Sustainable Forest Management) ▪ identifying and removing unintended impediments (Resolution V 2, para. 9) ▪ removing distortions and failures of policies resulting in loss of forest biodiversity (Resolution V4, para. 6) ▪ promote the incorporation of the results of assessment and valuation of wood and non-wood goods and services into national economic and natural resources accounting systems (Resolution L1, para. 10)	The balance between the economic, ecological and social functions is the objective of SFM. The economic context in SFM was the main theme of the L1 and V2 Resolutions, covering the three aspects of the Principle 4 of the EA: ▪ The economic viability of forests is a key pillar of SFM and of crucial importance for maintaining forests and their multiple benefits for society, contributing to sustainable development and human livelihood, especially in rural areas (Resolution V2) ▪ Removing distortions and failures of policies resulting in loss of forest biodiversity (Resolution V4, para. 6) ▪ Social and economic valuation of forest ecosystems goods and services is a commitment of Resolution L1, para. 10.
Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the EA. Principle 6: Ecosystem must be managed within the limits of their functioning.	▪ Conserving functional forest ecosystems (Resolution H1 para. 3) ▪ The precautionary principle (Resolution H2) ▪ Health and vitality and biodiversity (Resolution H2 and Resolution V4 espe-cially para. 15) ▪ Protective forests (Annex 2 to Resolution V4: MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe). ▪ Coherent approach to obtain sufficient knowledge about the ecosystem function and services (Resolution H2)	General Guidelines for SFM in Europe of Resolution H1 promote conservation and maintenance of functioning of forest ecosystems (para. 1, 3, 6, 7, 8). Resolution H2 and Resolution V4 give special attention to these issues, and the development of Criteria & Indicators was the outcome of the commitment to obtain sufficient knowledge on ecosystem functioning. Forest management should be based on the stable and long-term land use policies and regulations, which are aimed at conserving functional forest ecosystems (Resolution H1, para. 3). The European countries are committed to develop a coherent approach to obtain sufficient knowledge about the ecosystem function and services derived from the European forests (Resolution H2, para. 9.1).

EA Principle	MCPFE References	Comments
Principle 7: The EA should be undertaken at the appropriate spatial and temporal scales.	▪ Appropriate scale (Resolution H1 para. 4) ▪ Permanent sample plots for monitoring forest ecosystems conditions (Resolution S1: European Network of Permanent Sample Plots for Monitoring of Forest Ecosystems); ▪ Network for Research into Forest Ecosystems (Resolution S6: European Network for Research into Forest Ecosystems)	Forest management should be based on periodically updated plans or programmes at local, regional or national levels, as well as for ownership units, when appropriate, and on forest surveys, assessments of ecological impact and on scientific knowledge and practical experience (Resolution H1, para. 4).
Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.	▪ Future generations (Resolution H1); ▪ Long-term commitments in NFPs (Resolution V1); ▪ Long-term commitment for protected and protective forest areas (Annex 2 of Resolution V4)	Forest management should be based on periodically updated plans or programmes at local, regional or national levels, as well as for ownership units, when appropriate and on forest surveys, assessments of ecological impact and on scientific knowledge and practical experience (Resolution H1, para. 4).
Principle 9: Management must recognize the change is inevitable.	▪ Periodically updated forest management plans (Resolution H1, para. 4) ▪ Iterative process of NFPs (Resolution V1); ▪ Adaptive management (e.g. to climate change) (Resolution S4: Adapting the Management of Mountain Forests to new Environmental Conditions; Resolution H4 para. 9; Resolution V5: Climate Change and Sustainable Forest Management in Europe, para. 7,8, 9,10); ▪ Forest management and landscape planning (Resolution V4, para. 15)	Forest management should be periodically updated based on forest surveys, assessment of ecological impact and on scientific knowledge and practical experience (Resolution H1, para. 4). Iterative process of NFPs where the forest management should be monitored and adapted if required (Resolution V1). The existing and new forests should be capable of tolerating climatic and other stresses; genetic selection should encourage adaptive traits of tree species (Resolution H1, para. 8). Forest management should be based on periodically updated plans or programmes at local, regional or national levels, as well as for ownership units, when appropriate and on forest surveys, assessments of ecological impact and on scientific knowledge and practical experience (Resolution H1, para. 4).
Principle 10: The EA should seek the appropriate balance between, and integration of, conservation and use of biological diversity.	▪ Balance between the use and conservation (Resolution H2) ▪ Forest biodiversity (Resolution V4) ▪ Economic viability (Resolution L1, Resolution V2)	The basic objective of SFM is to reach a balance between the use and conservation, as described in Resolution H1 and Resolution H2. It is emphasised in General Declaration of Lisbon, Resolution L1 and Resolution V4 (forest biodiversity conservation) and Resolution V2 (economic viability). Furthermore, in the Vienna Living Forest Summit Declaration, 'policy makers are responsible for achieving, in the forest sector and pro-actively with other sectors, a balance between the economic, ecological, social and cultural roles of forests in the context of sustainable development' (para. 2).

EA Principle	MCPFE References	Comments
Principle 11: The EA should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices. Principle 12: The EA should involve all relevant sectors of society and scientific disciplines.	▪ Cultural and social dimensions of SFM, traditional knowledge (Resolution V3: Preserving and Enhancing the Social and Cultural Dimensions of Sustainable Forest Managements in Europe) ▪ Innovations (Resolution H1, para12; Vienna Declaration, para. 17; Resolution V2, para. 11) ▪ Science, research (Resolution S1; Resolution S2: Conservation of Forest Genetic Resources; Resolution S3: Decentralized European Data Bank on Forest Fires, Resolution S4; Resolution S5: Expansion of the EUROSILVA Network of Research on Tree Physiology; Resolution S6; Vienna Declaration, para. 17; Resolution V3, Resolution V4, Resolution V5) ▪ Raising awareness (principles of NFPs, Annex to Resolution V1) ▪ Strengthening the link between the forest sector and society by increasing dialogue and mutual understanding (Lisbon Declaration) ▪ Promote partnerships, public awareness, public relations and transparency in forestry (Resolution L1, para1) ▪ Promote training, education, capacity building (Resolution L1; Resolution V1) ▪ Research, training (Resolution H1, para. 12)	On these issues see also the references and comments to Principle 1 and 2 (participation and societal choice). The Strasbourg Conference (1990) provided an impetus on cooperation at pan-European level on scientific challenges of SFM.

4. 3 Existing MCPFE tools and processes for implementing SFM and the Ecosystem Approach

The MCPFE approach to the relation and the linkages between SFM and the Ecosystem Approach is the concrete effort for bringing the Ecosystem Approach to the implementation level.

The participants agreed that at the implementation level continued efforts need to be made to achieve the common goals of SFM and the Ecosystem Approach.

There are several SFM tools developed at the Pan-European level, but there are also other tools in other sectors that can contribute to and complement the implementation of SFM.

At the practical level implementation varies among countries. In many cases a combination of various tools is used to achieve various objectives.

Tools as developed and adopted by the MCPFE:

- **MCPFE Work Programme**
  The MCPFE Work Program is structured according to the three pillars of SFM and aims at contributing to the sustainable development of society at large. The Work Programme guides the MCPFE process between the Ministerial Conferences by specifying actions, which aid in implementing the MCPFE

resolutions and declarations. The current MCPFE Work Programme comprises thirty Pan-European actions. The implementation of the Work Programme involves relevant organisations, institutions and processes. The programme is a dynamic concept, which allows for incorporating emerging initiatives and activities addressing relevant issues. At each Ministerial Conference a report indicates the status of implementation.

- **Framework for cooperation between MCPFE and EfE/PEBLDS**
  The joint 'Work programme on the Conservation and Enhancement of Biological and Landscape Diversity in Forest Ecosystems 1997-2000' was endorsed in recognition that the conservation and enhancement of the forest biological diversity is a common goal of the MCPFE and EfE/PEBLDS. This work programme has proved to be a useful tool for the collaboration on forest biodiversity issues between the Pan-European forest and environment processes. Based on these experiences, the decision making bodies of the MCPFE and EfE/PEBLDS underlined the benefits of a continued cooperation. At the 4th Ministerial Conference the Framework for Cooperation between the MCPFE and EfE/PEBLDS was endorsed. The priority themes for co-operation for the period 2003-2005 are: ecosystem approach, protected forest areas, forest law enforcement with regards to biodiversity conservation, and recommendations for site selection for afforestation.

- **National Forest Programmes**
  The MCPFE has worked on National Forest Programmes in Europe since its 3rd Ministerial Conference (Lisbon, 1998), building on the outcomes of the IPF, IFF and UNFF. Consequently, the MCPFE tackled this issue in order to develop a common understanding on NFPs in the Pan-European context which was then adopted at the 4th Ministerial Conference (Vienna, 2003) by the Resolution V1: Strengthen synergies for sustainable forest management in Europe through cross-sectoral co-operation and National Forest Programmes. The Annex of Resolution V1 describes the MCPFE Common Approach to the NFPs.
  National Forest Programmes constitute a participatory, holistic, inter-sectoral and iterative process of policy planning, of implementation monitoring and of evaluation at the national and/or sub-national levels. Principles of NFPs in Europe:
  - Participation
  - Holistic and inter-sectoral approach
  - Iterative process with long-term commitment
  - Capacity building
  - Consistency with national legislation and policies
  - Integration with national sustainable development strategies
  - Consistency with international commitments recognizing synergies between international forest-related initiatives and conventions
  - Institutional and policy reform

  The NFP is the framework for all forest policy development at the national level. Its principles are linked with the principles of the Ecosystem Approach. It has to take into account the international commitments.

NFPs aim at strengthening the consistency with the synergies between relevant initiatives and conventions in each country (including CBD, UNCCD, UNFCCC).

- **Criteria and indicators**
  Criteria and indicators are policy instruments for evaluating and reporting progress towards implementing SFM. Criteria define and characterise the essential elements as well as a set of conditions or processes, by which SFM may be assessed. Periodically measured indicators show a direction of change within each criterion. The MCPFE countries report periodically on this basis. The Temperate and Boreal Forest Resources Assessment (TBFRA) programme is committed to structure the information according to Criteria and Indicators.

- **Pan-European Operational Level Guidelines**
  Pan-European Operational Level Guidelines identify complementary actions at the operational level, which will further contribute to SFM. They are designed according to the six Criteria of SFM and intend to translate the international commitments to the level of forest management planning and practices.

- **Assessment Guidelines for Protected and Protective Forest and other Wooded Land in Europe**
  The Assessment Guidelines for Protected and Protective Forest and other Wooded Land in Europe, as adopted at the 4th Ministerial Conference (Vienna, 2003) aim at giving a comprehensive picture of protected and protective forest and other wooded land in Europe by providing data based on comparable terms and definitions.
  The Assessment Guidelines for Protected and Protective Forest and other Wooded Land in Europe are relevant to Criterion 4 on Biodiversity and Criterion 5 on Protective functions.

- **Assessment and reporting**
  The political commitments made by the European ministers responsible for forests and the European Community over the last 13 years have influenced forest management in many countries.
  The assessment of the progress of implementation of these commitments is based on national reports submitted at every Ministerial conference.
  Furthermore, a report on the state of sustainable forest management in Europe is written based on national data related to the criteria and indicators.

4. 4 Other tools relevant to SFM and the Ecosystem Approach

In addition to the tools developed at the Pan-European level by the MCPFE, the participants mentioned the existence of other initiatives at the sub-national, national level or regional level. Examples of some of these tools used for implementing SFM include:

- Forest Management Plans
- Monitoring systems
- Forest certification
- Model and demonstration Forests

- Assessment and reporting
- Forest Communicators Network
- Forest Focus
- Forest Law Enforcement Governance and Trade (FLEGT) initiatives
- Regional conventions such as the Carpathian Convention and the Alpine Convention
- European Forest Genetic Resources Programme (EUFORGEN)
- Ecological networks, such as Natura 2000 or EMERALD
- Forest landscape restoration initiatives

The participants recognized the importance of coordination and synergies with other relevant tools for the implementation of both SFM and the Ecosystem Approach:

- Rural development planning
- Watershed management
- Land use planning
- National Biodiversity, Climate Change and Sustainable Development Strategies and Action Plans
- Strategic Environmental Impact Assessment.

5 Possible Areas for Future Efforts (among others)

Some participants recommended compiling existing case studies on the application of the Ecosystem Approach through SFM in Europe as a contribution to the discussion in the CBD follow-up process on the Ecosystem Approach.

Some participants also mentioned the following areas of concern where further elaboration may be considered:

- Connectivity between forest areas;
- Trans-boundary cooperation;
- Clarification/harmonization of terms (e.g. landscape restoration, decentralization) and methods;
- Guidelines for adaptive forest management;
- Data collection.

Steps towards the Implementation of the Ecosystem Approach by the Example of Forest Ecosystems of Austria

WOLFGANG LEXER
with contributions by Felix Heckl[1], Bernhard Wolfslehner[2], Harald Vacik[2], Josef Hackl[1]

1 Introduction

The richness, integrity and functional capacity of close-to-nature forest biological diversity fitting to site conditions is seen as a key factor for the maintenance of forest ecosystem stability, vitality and productivity, which are required to sustain the multifunctional services of forests. However, forest biological diversity is subject to a wide range of impacts and pressures that are exerted not only by forest management, but as well by various other sectors of economy and land use. Conservation and sustainable use of forest biodiversity has to take into account the totality and interrelatedness of these influences. Therefore this paper focuses on cross-sectoral integration, which is also in response to Decision VII/11 of the seventh Conference of the Parties (COP 7) that calls for better intersectoral collaboration and improved consideration of interactions between forests and other habitat types in sustainable forest management. Since any management approach encompassing all relevant sectoral impacts and use interests requires participation of local stakeholders, special emphasis of this paper is on participatory aspects of decision-making processes and ecosystem management by presenting lessons learnt from case studies and other relevant projects. Thereby, reference is made in particular to Malawi principles No. 1, 2, 3, 10, 11 and 12 of the Ecosystem Approach, which all address, in one respect or another, the closely linked issues of participation, knowledge-sharing, intersectoral coordination, balancing of interests and collaborative setting of objectives.

Subsequently, responding to the overall workshop objectives, general obstacles for implementation of the Ecosystem Approach and possible synergies with other approaches are dealt with, and selected recommendations are presented.

2 Basic Austrian Studies

In cooperation with the Institute of Silviculture (University of Natural Resources and Applied Life Sciences, Vienna), and with financial support by the Federal Ministry of Agriculture, Forestry, Environment and Water Management, the Austrian Umweltbundesamt GmbH (Federal Environment Agency Ltd) has published a basic study on the application of the Ecosystem Approach: „*Foundations for the implementation of the Ecosystem Approach defined under the Convention on Biological Diversity – Aspects of the protection and sustainable use of biological diversity illustrated by the example of Austrian forests*" (UMWELTBUNDESAMT 2003a, 2003b). The entire study in German language as well as an extensive English summary are available for download at the homepage of the Austrian Clearing House Mecha-

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nism[3]. The study's objective was to communicate the Ecosystem Approach to potential users and to compile, analyse and assess basic information on the management of biological diversity from ecological, economic and socio-cultural points of view. With special regard to forest ecosystems and Austrian framework conditions, cause-effect relationships of the multiple impacts (actual and potential) on biodiversity are examined in depth and assessed as to their qualitative significance by taking into account expert consultations. By presenting local case studies, the integration of biodiversity issues in practical forest management on municipality level as well as aspects of participatory planning and decision-making processes are investigated. Provisions resulting from binding law and „soft law" regulations on international, European and (sub)national level in terms of forest biodiversity are analysed in detail. Though not providing a catalogue of concrete actions for implementing the Ecosystem Approach, extensive recommendations and need for action for an integrated management of (forest) biodiversity are discussed by addressing all relevant actors, ranging from decision-makers to the general public. The study is intended as a basic step towards practical applications of the Ecosystem Approach that future implementation projects may build on.

3 Anthropogenic Impacts on Forest Biological Diversity

Based on a comprehensive literature review and an expert survey, the following **key impact groups** were distinguished when analyzing major anthropogenic impacts on forest biodiversity:

- forestry,
- agriculture,
- hunting,
- tourism,
- trade, industry, settlement and transport, as well as
- measures of nature protection.

These impact groups largely correspond to sectors of land use and act as driving forces that exert direct and indirect influences on biodiversity, irrespective of being negative or positive. The overall impact of each land use sector can be broken down to **individual measures** which affect biodiversity, often in ambivalent ways (Table 1):

All the abovementioned measures and connected effects on forest biodiversity can be clustered into six **main impact categories**, each of them aggregating a number of individual influences with similar effects:

- impacts of silvicultural measures,
- fragmentation of habitats,
- changes in natural material cycles,
- changes in land-use types,
- changes in species composition, and
- diversity-promoting measures.

[3] http://www.biodiv.at/chm/berichte/BE153/BE153.pdf; http://www.biodiv.at/chm/berichte/BE153/Web_summary.pdf

Table 1: Measures of sectoral impact groups affecting forest biological diversity (UMWELTBUNDESAMT, 2003a, 2003b)

Forest management:
- management type selected
- silvicultural system selected
- selective interventions (e. g. young-growth tending, thinning)
- establishment and stewardship of forest nature reserves and protected areas under nature conservation legislation
- non-removal of deadwood
- participation in species protection and gene conservation programmes
- habitat fragmentation by forest road construction
- afforestation/reforestation (land use changes)
- changes in tree species composition due to forestry-related susceptibility of forests to game damage
- precautionary mitigating measures with a view to climate change
- damage to soil and vegetation during timber harvesting

Agriculture:
- changes in habitats
- atmospheric and groundwater nitrogen inputs
- forest grazing
- changes in groundwater regime due to irrigation and drainage
- afforestation/reforestation of fallow and marginal land (growth in forest area)
- production of greenhouse gases
- improvement and creation of habitats (e. g. fallow land, field margins, woodland patches)
- contributing land to protected areas, participation in conservation programmes

Trade, industry & transport:
- input of pollutants in ecosystems
- reduction of greenhouse emissions
- habitat fragmentation by infrastructure
- loss of forest area due to clearing and land development
- interference with water regime (e. g. due to construction of hydro-electric power plants in floodplain forests)

Hunting & hoofed game management:
- Planning and implementation of shooting
- changes in tree species composition due to selective browsing
- introduction of non-native game species
- feeding, game-keeping
- preservation measures
- extinction of predators

Tourism, recreational activities:
- forest fragmentation by touristic supra- and infrastructure
- tourism-induced traffic
- disturbance of wildlife and habitats
- forest area losses due to occupation of land by infrastructure
- pollutants inputs, waste & sewage disposal, soil scarification
- local interference with water regime (e. g. snow-making)

Nature protection:
- species protection
- habitat conservation
- establisment and management of protected areas
- dead wood management
- management of forest edges

In order to be able to weight the relative significance of the key impact groups (groups of actors) and the main impact categories in relation to each other, an **expert survey** was carried out. Thereby, a qualitative assessment of the anthropogenic impacts on Austrian forest biodiversity could be obtained.

Among the **impact categories** assessed, the experts considered that *measures of silvicultural practice* have the biggest impact potential. They were ranked first because the entire stand life of managed forests is shaped by regeneration measures up to final yield with the management type selected being the pre-dominant element. Likewise, the area impact of forest management is relevant: the majority of Austrian forests are managed for timber production purposes, but silvicultural measures are also taken in forests

with protective functions. *Diversity-promoting measures* were ranked in the second place. Here, in particular measures by forest management, followed by such of nature protection, were assessed most influential. The remaining impact categories were considered to be of similar, moderate importance.

Figure 1 shows the share of the individual impact groups in the impact categories, ranked from top down by decreasing significance of the group „forestry".

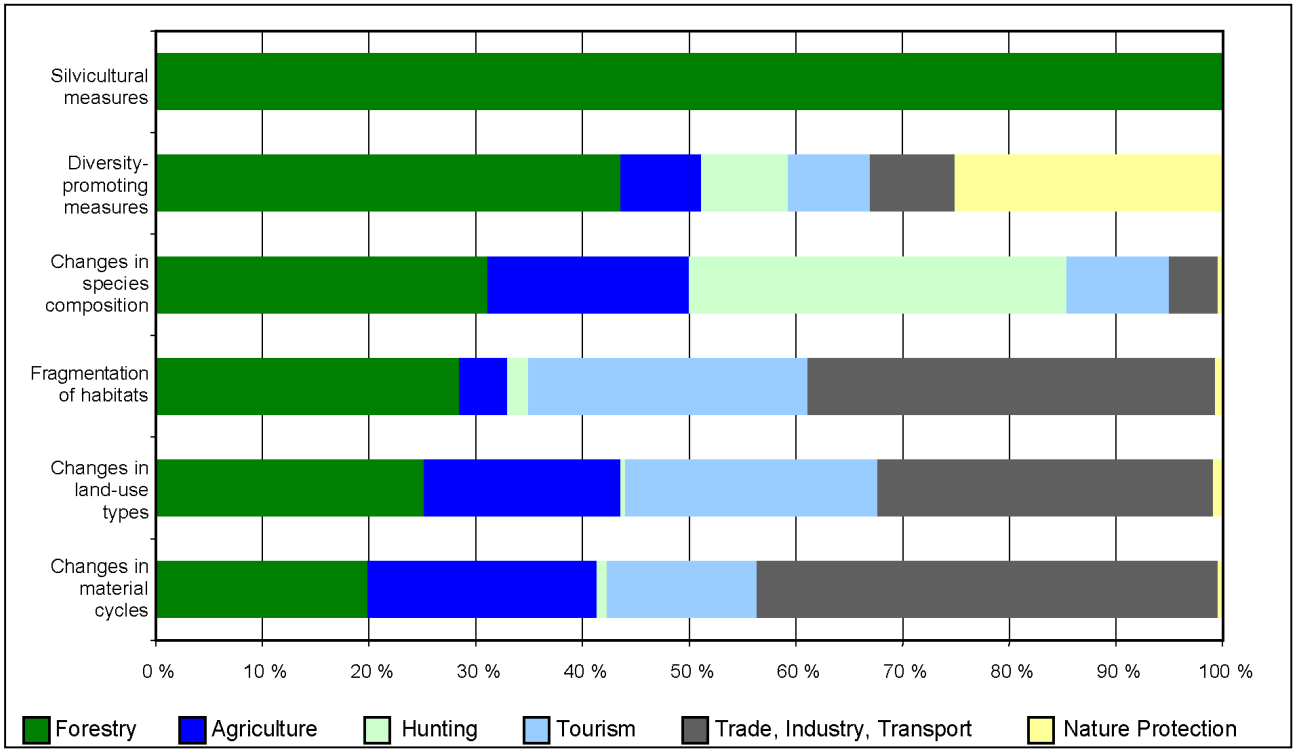

Figure 1: Share of the individual impact groups in the impact categories (UMWELTBUNDESAMT, 2003a, 2003b)

With regard to sectoral **impact groups**, the experts considered that in total forestry actors had the biggest potential of influencing biological diversity in forest ecosystems. Far behind, the impact group of *trade, industry and transport* was ranked in the second place, closely followed by *hunting, agriculture, tourism* and *nature protection* which are considered to be moderately significant to a similar extent in relation to each other. However, a closer look on the overall results reveals that non-forestry land user groups were ranked first for four out of six impact categories. Likewise, the impact of forestry is outweighed by the total impacts exerted by other land user groups for five impact categories. This clearly indicates that the scope of action of each land use sector is limited and that separate sectoral approaches must be inadequate in pursuing efficiently the conservation and sustainable use of biodiversity. This leads to the conclusion that intersectoral and cross-sectoral approaches are indeed required when attempting to cope with the challenges of managing biodiversity, which totally conforms with a number of principles provided by the Ecosystem Approach.

4 Participation in the Management of Biological Diversity

Effective participation of the local population (stakeholders, representatives of interest groups, parties directly concerned, persons interested) has to be considered both a major prerequisite of and a key strategy for achieving cross-sectoral integration. Principles No. 1, 2, 11 and 12 of the Ecosystem Approach explicitly call for participation:

- **Principle 1:** The objectives of management of land, water and living resources are a matter of societal choices.
- **Principle 2:** Management should be decentralized to the lowest appropriate level.
- **Principle 11:** The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
- **Principle 12:** The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

At least two further principles relate to the need for cross-sectoral coordination by involving participatory processes:

- **Principle 3:** Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
- **Principle 10:** The ecosystem approach should seek the appropriate balance between, and the integration of, conservation and use of biological diversity.

4.1 Local case studies: participatory management of forest biological diversity on municipality level

The abovementioned study (UMWELTBUNDESAMT 2003a) features two case studies on municipality level. One was included in a technical SBSTTA information paper prior to COP 7 in order to illustrate compliance with Malawi principle No. 3 (SBSTTA9/INF/4) and is also featured in CBD´s collection of case studies (www.biodiv.org/doc/case-studies/esys/cs-esys-at-01-summ-en.pdf). By applying ex-post evaluation, the case study investigates the participatory development of a forest use plan in the municipality forest of **Dornbirn**. Though the Ecosystem Approach had actually not been used in the project consciously, the example nevertheless shows that many of its principles are applied in practice without making explicit reference.

The second case study was carried out in the municipal forest of **Mödling** and consisted of two project components. In the first one, existing management practices were investigated as to the degree they considered biodiversity aspects and comply with requirements of the Ecosystem Approach. In particular the follow-up project component was set up by deliberately applying the Ecosystem Approach. Its main objective was to develop a model for the future conservation and sustainable use of the municipality's forest biodiversity. In order to be able to reconcile conflicting interests and sectoral demands for forest uses at an early stage and to create an enabling environment for joint objective-setting and decision-making, a bottom-up participation process was initiated. The **workflow** was composed of the following major stages:

- Kick off-meeting: first information to the local public.

- Identification and mobilisation of relevant stakeholders (local and regional NGOs, representatives of land user groups, authorities, political decision-makers) representing a broad spectrum of forest users (forest managers, hunters, nature conservationists, environmental protectionists, recreational users, tourist industry, people concerned with rural development).
- Collaborative drafting of a questionnaire.
- Survey of local people's forest-related needs, interests, behaviour and state of knowledge by disseminating the questionnaire to every household.
- Preparatory and accompanying information activities (regional print media, internet).
- Evaluation of feedback: preferences for future forest uses, identification of conflicts
- Organisation of public meeting (civil council): open discussion of use conflicts and of local people's suggestions.
- Formulation of basic assumptions for a future model of forest management.

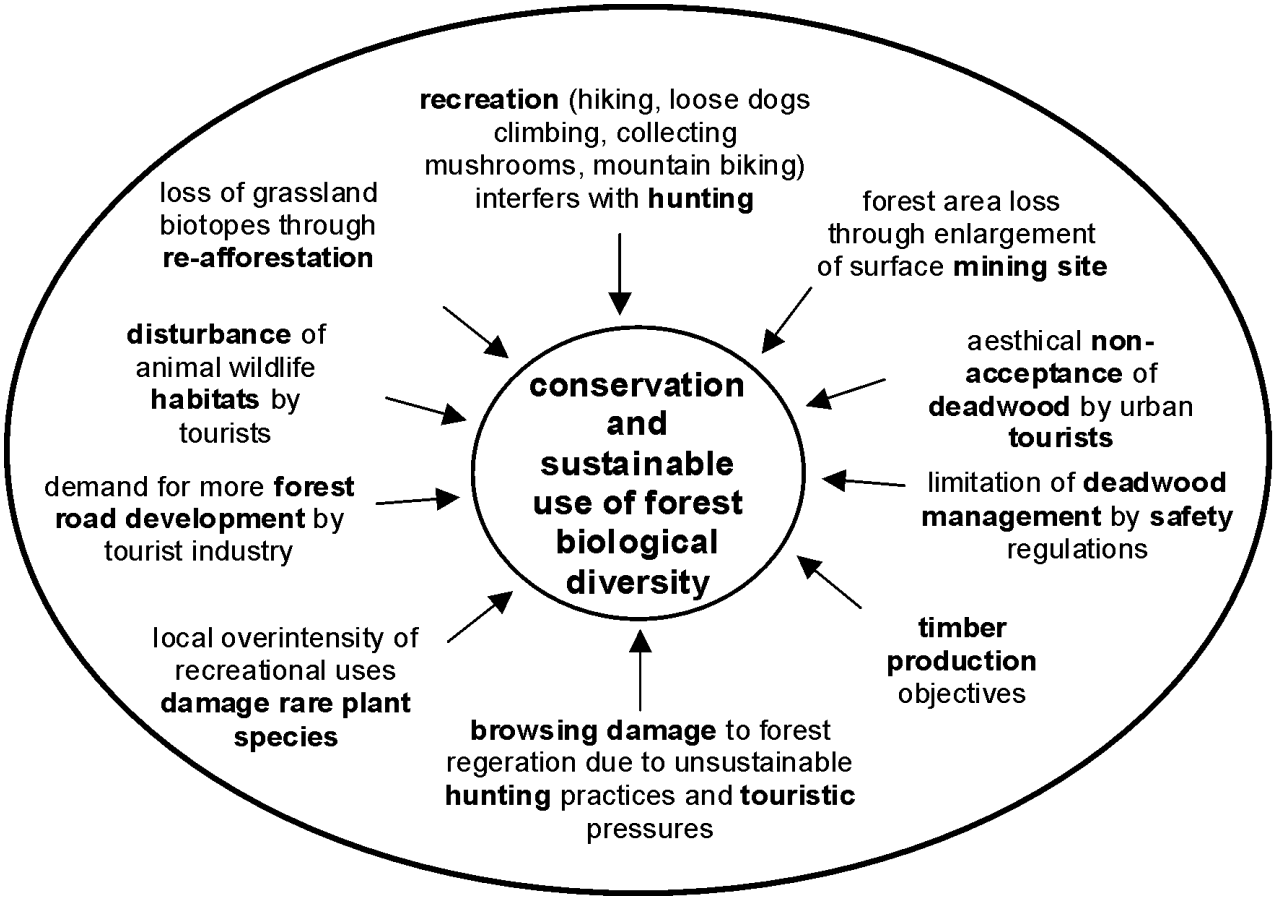

Figure 2: Major use conflicts affecting forest biological diversity, as identified in the case study Mödling

4.2 Lessons learnt

Lessons learnt from the local case studies outlined above, as well as from other subject-related projects of the Umweltbundesamt, may serve as useful contributions in attempting to make the participation-related principles of the Ecosystem Approach more operational.

4.2.1 Specific lessons learnt from case studies

- **Conflicting goals and interests** have to be **laid open** before they can be recognized and, subsequently, balanced out. Participation provides an environment favourable to this purpose. This facilitates mutual learning about each other's views and corrections of biased opinions. Also, differences in the perception of a situation can be distinguished from actually different interests. With regard to the case study Mödling, a number of conflicts could be identified, which not all participants were aware of before (figure 2). While at first the emphasis was on differences in point of views, later on with regard to specific issues parties started to recognize potentials for building alliances with other parties, some of them with similar, but some also with otherwise quite different interests.

- **Full commitment of landowners** to any participatory process is needed, in particular with respect to their responsibility for implementing measures. As forest legislation in Austria grants largely free disposition of management to the forest owners, participation in privately owned forests largely depends on „good will" of the land holder.

- Due to legal constraints by property rights, **on the local level chances for successful participation are best in municipal (public) forests**. Apart from public forests, in Austria participation in forest management exists mainly on the national and regional level (e. g. elaboration of national forest programme, large-scale certification systems, platforms for protection forests, wild-life ecological spatial planning).

- **Early involvement of „stakeholders"** - in terms of representatives of organisations and interest groups – in setting up the project (drafting of questionnaire) was crucial. Sufficient representativity and legitimacy of these persons provided, they are able to articulate the opinions of whole groups. Also, usually these persons are good multiplicators and may succeed in activating and convincing their group members.

- Preliminary establishment of **consent on common basic objectives** and underlying values is an important uniting factor, which may facilitate conflict resolution in critical phases.

- The **process** and its **rules** must be made **clear and transparent** to everybody. Common rules and a „fair play codex" should be accepted by all participants in the beginning. This includes a binding statement on the further use of the process outcome as well as an agreement on how to handle unresolvable conflicts and dissenting opinions (e.g. inclusion in final paper for documentary reasons).

- A sufficient amount of labour should be invested in **defining the scope of the process in content**, particularly towards other critical issues.

- Preparatory **information activities** that are to be carried out professionally and continued throughout the project are essential. In order to motivate stakeholders to participate actively in the process they first have to become aware of their personal concernment. In the case study Mödling, especially

internet-based information and feedback tools proved highly supportive in this respect (about half of the questionnaires were returned electronically).

- Apart from being an information gathering instrument, the **questionnaire** also was helpful in **activating** and **mobilising** people to participate. Above all, the views and interests of persons not sufficiently represented by organisations could be integrated in the process.

- The surveys revealed considerable **knowledge gaps** concerning the term **„biological diversity"**, which was frequently either reduced to mere „species diversity" or completely unknown at all. This lack of information indicates a need for intensifying communication and awareness raising activities. Experts often tend to treat the concept of „biological diversity" as a „black box". As it is a very complex and demanding concept indeed, efforts to explain it to the public must be increased.

- Employing an **external professional process moderator** proved to be extremely helpful. If the neutral status of such a person is accepted, he may be able to perform catalytical functions. According to our experiences, a moderator should have technical knowledge of the subject at issue. Although there are different opinions on this matter, a respective shift in philosophy seems to be taking shape at the time.

- There frequently is a strong **tendency** of participants to **rely on the expert's opinions**. Nevertheless, the experts should avoid dominating the discussions and getting too much involved in moderating the process. Otherwise, this may be misinterpreted as taking sides for one or another party.

4.2.2 General conclusions including experiences from other projects

Other biodiversity-related projects that allowed the Umweltbundesamt to gather further experiences on participatory processes include the development of „Criteria and Indicators of Sustainable Hunting" (UMWELTBUNDESAMT 2001, 2003c), which was achieved in a multi-stakeholder process that took many years. Currently, a manual providing in-depth guidance on participation in ecosystem management on local scale is being prepared by the Umweltbundesamt.

- In general, **conflicts** on the management of biodiversity resources tend to be **inevitable**, **controversial** and **very complex**. They emerge within some context which typically is defined by a complex array of factors, such as numerous parties, multiple issues, deeply held values, cultural differences, different "world views", scientific and technical uncertainty, and legal and jurisdictional constraints. In addition to this, the shift in management from single-resource (soil, water, etc.) and single-species emphasis to an ecosystem-based focus integrating ecological, economic and socio-cultural aspects, as demanded by the Ecosystem Approach, further increases complexity. Methods for effectively managing such conflicts must be responsive to the inherent complexity of those conflicts (WALKER & DANIELS 1997). Participatory approaches provide an appropriate framework for integrated consideration of these aspects.

- **Humans** are the **key-factor** in understanding and controlling the relationship between society and biodiversity resources. Biodiversity management may be seen to a great extent as managing people, and only to a lesser extent as a question of biological sciences (cf. LEOPOLD 1943, cited after SCHULZ 1988).

- Participation fosters **collaborative** and **mutual learning processes**. This is in favour of sustainable conflict resolution.

- **Empirical, traditional and "everyday life"-knowledge** can provide valuable technical expertise that becomes accessible by involving the local population. Participation may **stimulate creative potential** and frequently leads to surprisingly simple and innovative ideas for problem solutions.

- Local people are the best experts when it comes to **knowledge on local conditions**. On the contrary, experts from outside often lack specific local knowledge. Top-town expert decisions often tend to neglect local people´s needs, which cannot be recognized by exclusively applying rational technical expertise.

- **Motivation** and **identification** with decisions normally only comes through **personal involvement** of the stakeholders. **Acceptance** of decisions fosters **commitment** to its implementation. Otherwise, there may be distrust and either active or passive resistance of local people concerned against implementation of measures, which might cause projects to fail and lead to expensive misinvestments. Even the best scientific management plan is useless, if it fails because of a lack of compliance on the part of the local communities.

- Flexibility and **readiness for trade-offs** are required. When bargaining trade-offs, trying to maintain some sort of **„symmetry of sacrifices"** may be helpful , i.e. each party to the conflict should be affected by concessions to a similar extent, provided that this is supportive of achieving the overall targets.

- Participation can strengthen **democratic awareness** and **municipal identity**. As an instrument of direct democracy, it is not intended to substitute decision-making mechanisms of representative democracy, but it can be a very useful complement. Therewith, the legitimacy of elected political decision-makers can be reinforced, and distrust against traditional decision-makers and institutions can be reduced.

4.2.3 Some paradoxical problems of participation

When entering into participation processes, a number of typical methodological dilemmata frequently occur. The following aspects also feature some guidance on how to manage these problems.

- When conflicts arise, parties often assume that the competitive aspects far outweigh any opportunity of mutual gain. Thus, the situation is viewed as a fixed pie that is to be divided between the parties, instead of perceiving any potential that the size of the pie is in fact expandable. This cognitive narrowing is termed **"fixed pie bias"** by WALKER & DANIELS (1997). Therefore, it is important to make participants realize that many issues may not be a "zero-sum game", but could in fact be a **"win-win situation"**.

- It is often argued that **time intensity** is a major disadvantage of participation and may lead to "stakeholder fatigue". On the other hand, we have made the experience that often lasting solutions must be granted the necessary time to evolve. Acceptance of new ideas often requires phases of "dormancy".

- Another common perception is that participation is **expensive**. But compared to the total costs of, e.g., large infrastructure projects, according to experts the costs of participation processes usually amount to only some tenths of a percent (ÖGUT 2004). Moreover, planning processes can be accelerated by participation because long delays due to formal objections, law suits and protest acitivities can be avoided. This reduces overall costs and also contributes to legal certainty for planners, authorities and project initiators.

- One frequently occurring methodical problem is the conflict between **highest possible representativity**, which usually implies large groups of participants, and **highest possible efficiency of work**, which usually implies rather small groups. On the one hand, allowing as many relevant stakeholders as possible a strong voice in the process usually complicates and slows down the process. On the other hand, small expert groups often work more efficient and outcome-oriented. When developing „Criteria and Indicators of Sustainable Hunting" (UMWELTBUNDESAMT 2001, 2003c), a satisfactory trade-off could be achieved by gradually enlarging the circle of participants, starting out from a small expert group and ending up in broad stakeholder involvement.

- It may be an illusion that consensual conflict resolution can always be achieved. However, more essential is how conflicts are handled, and if they are perceived as an opportunity to improve existing situations (LOIKKANEN et al. 1999). This implies a **shift from „conflict resolution" to „conflict management"**, as an open-ended, on-going process without fixed final objectives.

- Open communication can contribute to **de-emotionalizing** of debates. Though, in the very beginning the opposite effect may predominate. In order to identify and clarify conflicts, they first have to be raised.

- In spite of its many advantages, participation has its **limits** and **risks**. Obstacles include, *inter alia*:
  - ⇨ political abuse by instrumentalizing participation in order to legitimate certain decisions;
  - ⇨ lack of resources (time, money), lack of knowledge as well as capacity for articulation and communication on part of local population;
  - ⇨ failure due to group egoisms.

However, if certain **quality criteria** are adhered to, risks and obstacles can be successfully reduced. In order to develop such quality standards, a strategic working group has been established in Austria recently („Strategiegruppe Partizipation": www.partizipation.at/english/basics.html).

4.2.4 Comments on principles and existing guidance of the Ecosystem Approach

The Principles of the Ecosystem Approach relating to participation and cross-sectoral integration, in particular principles No. 1, 2, 3, 11 and 12, are considered extremely important to the conservation and sustainable use of biological diversity. Multiple stakeholder involvement is seen as essential for the implementation of both CBD´s objectives and the Ecosystem Approach.

Seen in retrospective (i.e. before COP´s latest decision VII/11), guidance on these principles was felt to be not sufficient. Thus, only little support was provided when setting up and carrying out the case studies. Still, the entire concept of participatory ecosystem management as it is expressed in the Ecosystem Approach provided stimulating inspiration. In this sense, it was largely used rather intuitively as a leitmotif and conceptual background. However, guidance existing back then provided some good orientation for designing the questionnaire in the case study Mödling.

COP´s latest decision VII/11, which provides more detailed annotations and implementation guidelines, has to be considered an important step forward in making the Ecosystem Approach more operational.

Some of the participation-related principles of the Ecosystem Approach may seem self-evident in theory, but have to cope with numerous technical and methodological problems when being applied in practice. That is why further operational guidance on this particular subject is considered desirable in order to make the concept of participatory ecosystem management more operational. Such support may be provided by additional implementation guidelines, by carrying out and evaluating more specific case studies, by including this issue in CBD´s future „source book", and by elaborating specific manuals or checklists featuring quality criteria for participatory processes, as is done currently in Austria.

5 General Obstacles for the Implementation of the Ecosystem Approach

The general obstacles presented below give a snap shot-like account of the state of reception of the Ecosystem Approach in Austria at the time being. Therewith, they attempt to reflect some widespread (mis)perceptions that hamper implementation.

- Being a cross-cutting, holistic approach, the Ecosystem Approach is a **complex and demanding**, sometimes even over-demanding, **concept**. As well demanding is COP´s provision that „(*...) all principles need to be considered, with appropriate weight given to each (...)*" (CBD/COP/7/21, decision VII/11, 2004). This is contrary to the general human need for reducing complexity, as well as to the preference of political decision-makers for quick solutions and simple answers that are easy to communicate to the public.

- Originally, sectoral thinking came into being as a strategy to cope with the complexity of multi-dimensional issues. A true cross-sectoral approach requires nothing less than a **paradigm shift in management**. This implies that traditional sectoral planning may fear to lose competencies and significance, which leads to institutional resistance.

- In some cases, the Ecosystem Approach is **viewed as a competitive concept** towards established approaches, which might e.g. apply to sustainable forest management.

- The Ecosystem Approach may be **misinterpreted** as a **pure conservation concept**, which hampers acceptance by some land users. This may indicate an increased need for communicating that the idea of sustainable use is at the center of the Ecosystem Approach.

- **Funding** for implementation projects is **difficult** to obtain.

- The idea of **participation** raises fears on part of land owners concerning **interferences with property rights**.

- There is a general **lack of information** on the mere existence of the Ecosystem Approach as well as on its intentions and objectives.

- Diffusion and acceptance of the Ecosystem Approach might be a **long-term, evolutionary process** and require a considerable amount of patience as well as sustained communication activities.

6 Selected Recommendations

- **Network existing approaches** by using the Ecosystem Approach as an „overarching framework", including investigations on the compatibility of approaches. Make use of synergies with other approaches. These may include, *inter alia*, the selected examples listed in Table 2.

- **Apply** the Ecosystem Approach to national **implementation of relevant European legislation and policy**, in particular the **Biodiversity Strategy** and its target to halt the loss of biodiversity until 2010. Examine, if the Ecosystem Approach may be applied to the establishment and management of the **Natura 2000** network.

- **Evaluate** national and subnational **natural resource policies**, **legislation** and **planning instruments** as to the degree they correspond to the Ecosystem Approach. Identify gaps and define needs for action.

- Perform **cross-sectoral evaluation** of European, national and subnational **subsidies** with effects on biodiversity as to counterproductive effects. Coordinate subsidies across all sectors.

- **Remunerate** financially those **positive external effects of biodiversity management** that exceed legal provisions and good practice, in order to achieve a fair sharing of the burdens and costs of management.

- **Integrate** international **„soft law" regulations** that make reference to biodiversity issues into binding national law.

- **Specify** the Ecosystem Approach for applications to specific ecosystem types, land use categories, problem situations, and groups of actors.

- **Develop** new **instruments for decision support** or adapt existing tools, such as criteria and indicators, best practice manuals, codes of practice, checklists, tool boxes, etc.

- **Apply assessment tools** like risk analyses, technical impact analyses and cost-benefit analyses to biodiversity issues.

- **Develop** improved methods for the **economic valuation of biodiversity** and its multiple benefits for society. Presently, all existing approaches are constrained by various methodological shortcomings. Expressing the value of biodiversity in monetary terms can be used as a tool for awareness-raising.

- **Adapt** and „translate" CBD´s announced **„source book"** according to national and regional requirements.

- Intensify **information activities** and awareness raising.

Table 2: Potential synergies with other existing approaches (selection)

International level:	**EU level:**	**National level (Austria):**
• UNFF, IFF, IPF • UNFCC (Kyoto Protocol) • Århus Convention • MCPFE process • Alpine Convention • Addis Ababa principles of sustainable use • IUCN: sustainable use concepts, policy statements (e. g. Amman, 2000). • Biosphere Reserves (MAB) • Integrated Coastal Management • Sustainable Fisheries	• Water Framework Directive („integrated river basin management") • 6th Environmental Action Programme • Biodiversity Strategy & Action Plans • FFH Directive, Birds Directive (Natura 2000) • Forest Strategy • EIA/SEA Directives • Thematic Soil Strategy (*in progress*) • Environmental Liability Directive (*drafted*)	• National Forest Programme • Austrian Biodiversity Strategy • Austrian Strategy for Sustainable Development • EIA, SEA, Spatial Impact Assessment • protected area network • wildlife-ecological corridors • nature conservation by contract • subsidies • sustainable hunting

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Research and Development Project "The CBD's Ecosystem Approach in Selected Forest Biosphere Reserves"

ULRICH MATTHES and DIRK FRANKENHAUSER

1 Objective

The primary objective of the research and development project "The Ecosystem Approach in selected forest biosphere reserves" is to rework the Ecosystem Approach of the Convention on Biological Diversity (CBD) in terms of integrative nature protection in forests. The project is conducted on behalf of the German Federal Agency of Nature Conservation with funding from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

The project focuses on the following research questions:

- Which theories and concepts are behind the Ecosystem Approach – Which experiences and which expert knowledge exist on a national and international level?
- In what respect are there overlaps, synergies or differences to the approach of sustainable forest management (SFM)?
- To what extent was the Ecosystem Approach set into practice in the selected test areas, and which experiences were made?
- Which steps are necessary to establish an international network of test areas? Which demands result out of this in regards to a reorganisation of international and national organisation forms and networks?

Based upon the results of a first expert workshop held in April 2004 in Lambrecht (Rhineland-Palatinate), the subsequent meeting of the ´Project Accompanying Working Group' (PAG) reformulated the objectives of the project. Compared to the above mentioned objective and research questions, the sub-field 'theoretical analysis' is now focused on the spatial implementation of the Ecosystem Approach at the national level. The central question is: How can the Ecosystem Approach be put into practice at the national level?

2 Overview of the Project Structure

Fig. 1 gives an overview over the entire project structure. The working group Freiburg deals with the theoretical foundations of the Ecosystem Approach. The main focus lies in examining the implementation of the Ecosystem Approach on a national level. The working groups Kaiserslautern and Trippstadt are analysing the application/applicability of the Ecosystem Approach for nature conservation in forests at three selected test areas. Forest frameworks and selected themes of analysis are the foundation for these case studies. The results of both project parts will be combined (grey column at the centre of figure 1) to continually enhance the implementation of the Ecosystem Approach.

By re-connecting the results of the case studies to the process of the theoretical analysis of the Ecosystem Approach, the comprehension of the application and compatibility of the Ecosystem Approach in the test areas will be continuously improved. Vice versa, the results of the case studies will significantly contribute to the further understanding of the Ecosystem Approach on the national level due to the reformulation and clarification of its objectives.

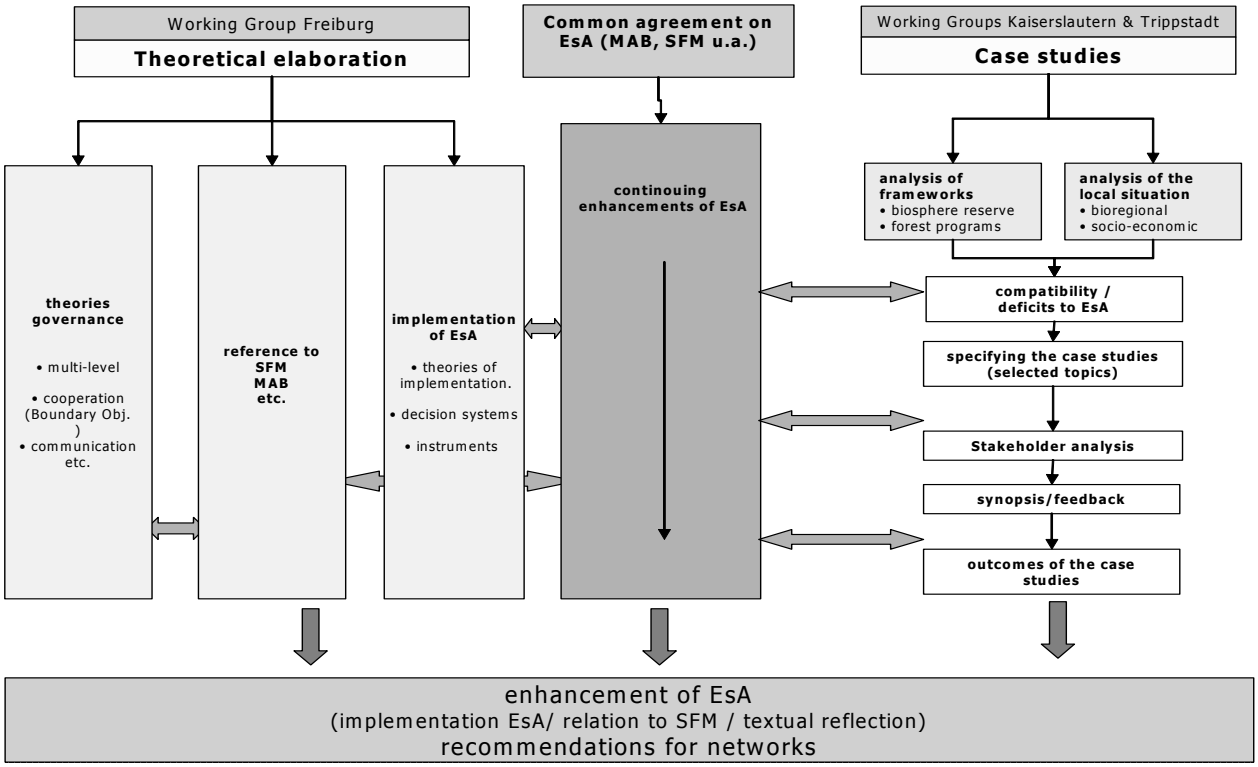

Fig. 1: Overview of the entire project structure

3 Theoretical Analysis of the Ecosystem Approach (Working Group Freiburg)

With respect to the continuous enhancement of the Ecosystem Approach through international and national expert discussions, the relations of the Ecosystem Approach to other approaches (e.g. SFM) have to be examined. Therefore, international case studies are analysed by means of a specific literature and document analysis (see figure 1).

Theoretical basics of the Ecosystem Approach

As a first step, a clarification is required concerning the question: Which core ideas are behind the Ecosystem Approach? For this purpose, it is necessary to examine specific terms like adaptive management, holism, societal choice, and environmental justice.

Structuring of the Ecosystem Approach

Based upon the results of an international expert workshop on the Isle of Vilm (see BfN-Skript 78) and the results of the abovementioned expert workshop, a classification and structuring of the Ecosystem Approach principles is supposed to be a helpful tool. As a preliminary recommendation, the principles

should be classified as normative requirements (CBD-immanent aims), normative management practices, solutions and political framework conditions.

Relationships to other international and national regulations

Differences between and congruence with the Ecosystem Approach and regulations like SFM, the Man and Biosphere (MAB) Programme of UNESCO, national forest concepts, hunting and nature conservation laws, which have different histories of origin, will be examined.

Implementation

This step of the project deals with the question: To what extent is the Ecosystem Approach set into practice in Germany (with a focus on Biosphere Reserves) and which strategies are applied to enforce its implementation? For the analysis of this topic, implementation theories will be explored and the implementation of the Ecosystem Approach into other policy programs will be examined.

Questions concerning the implementation of holistic approaches of sustainability strategies are actually of high relevance in different societal sectors (e.g. AGENDA 21). Due to this fact, it is necessary that questions of the national implementation of the Ecosystem Approach have to be linked to the societal discussions. In this context, expert interviews with national and international experts are seen to be very useful.

Current status of the debate on the implementation of the Ecosystem Approach

Regarding the abovementioned interviews, there will be an analysis of which operational elements were applied by the CBD's Conference of the Parties (COP) and its Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA). Furthermore, the question is posed: Which paths are suggested by the Ecosystem Approach principles, e.g. communication, participation etc. Moreover, it has to be taken into account how far other related approaches, such as certification schemes or National Forest Programmes (NFP), are consistent with the Ecosystem Approach. As far as the implementation of such political regulations is concerned, a main focus is on the monitoring of biodiversity conservation and its use.

Theoretical framework of ´governance´

The 'multi-level problem' of the Ecosystem Approach states that the implementation of the Ecosystem Approach is related to many societal levels and different scientific disciplines. Therefore, a literature analysis concerning solutions for a multi-level-problematic is required. This task regards to ´cooperation theory´, ´communication theory´ and ´organisation models´.

Decision structures

The project also intends to examine decision structures from the pan-European and national level down to the biosphere reserve level. This work step includes connections for a communication/cooperation model. After this analysis, and with the help of the above mentioned theoretical regards (i.e. multi-level problem), the connection points can be identified for the implementation of a communication and cooperation model, in order to carry out recommendations for network establishment in the ongoing phase of the Ecosystem Approach implementation.

4 Case Studies (Working Groups Kaiserslautern und Trippstadt)

Objective of the case studies

The main objective of this part of the project is supposed to be supported by findings and experiences from the case studies in three selected Biosphere Reserves. Case specific aspects are taken into account as well as aspects, which are comparable between the three Biosphere Reserves. In every working phase the case studies are linked iteratively to the theoretical approach of the Ecosystem Approach by the group Freiburg. The following figure 2 shows the selected Biosphere Reserves which are located along a south-west-northeast axis through Germany.

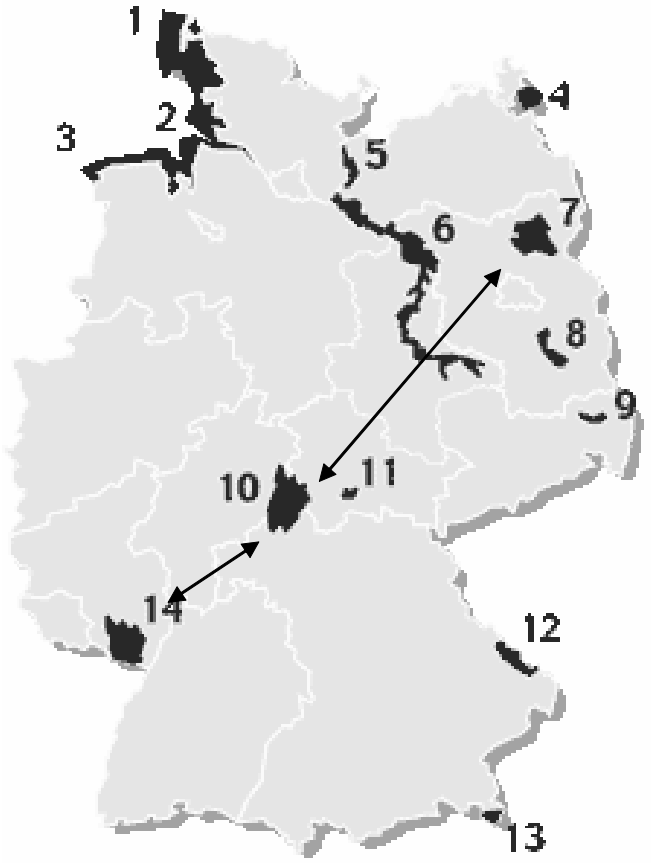

Figure 2: Selected forest biosphere reserves Pfälzerwald-Vosges du Nord (14), Rhön (10) and Schorfheide-Chorin (7)

Hence, the mid-term results of the case studies are flowing into a common comprehension of the Ecosystem Approach, SFM and the MAB approach. The results should flow back into the current process of the case studies, in order to carry out recommendations for the reformulation and implementation of the Ecosystem Approach principles.

The investigations in the Biosphere Reserves must be based on the already conducted international case studies. The existing discussion basis should be improved by this as a prerequisite for a further refinement of the Ecosystem Approach in the frame of COP 8. The results could at least serve as a foundation for the identification of "partner reserves" for the establishment of a network.

The following guiding questions were generated:

- How can the ideal implementation of the Ecosystem Approach be detected by means of concrete management in the biosphere reserves?
- Which attention and which understanding have different actors of the Ecosystem Approach?

- To what extent and by whom was the Ecosystem Approach implemented in the test areas in respect of the history of origins (e.g. the Biosphere Reserve Rhön is older than the Ecosystem Approach) and which experiences are available?

The following questions are focused directly on the question of the Ecosystem Approach principles:

- In view of the different actors, by which strategies is there an attempt to get an equality of protection and sustainable use of the biodiversity in forest?
- How far is it managed to integrate the local and regional communities and the science in terms of implication of the Ecosystem Approach?
- By whom and how are decision processes managed, and which participative elements were applied?
- Which strategies are carried out, in order to accommodate the management of the ecosystems to the better information basis and which actors are standing behind?
- To what extent is it possible to derive management concepts for the successful national implementation of the Ecosystem Approach?

Conceptual design of the case studies

The conceptual design of the case studies is presented more detailed in figure 3.

Analysis of the frameworks in the Biosphere Reserves

As a first step, it seems to be necessary to prove the common principles and basics as outcome of Seville and the national MAB-committees in their accordance, synergies and differences to the Ecosystem Approach.

The framework papers of the Biosphere Reserves serve as foundation for answering this question. The forest specific contents will be selected and reflected to the Ecosystem Approach. For the research, the different forest owner categories are relevant.

Analysis of on-site conditions

The analysis and documentation of the bioregional and socio-economic framework conditions in the test areas seem to be the presupposition for both, better understanding the on site management in the case of interpretation and implementation of the Ecosystem Approach and pointing out regional characteristics and differences between the test areas.

Moreover, the bioregional and socio-economic frameworks in the test areas are regarded to be an important basis, in order to point out synergies and differences in terms of the application of the Ecosystem Approach.

Specifying the case studies

As far as the selected Biosphere Reserves offer individually different presuppositions for the Ecosystem Approach due to the existing results it is at first suitable to carry out exemplified analyse issues which are linked to the integrative nature conservation in the forests. The issues are selected according to comparable features (zone concept, concrete forest management) and case specific (e.g. regional example projects) criteria.

For testing the application of the Ecosystem Approach it seems to be necessary to interpret and translate the Ecosystem Approach principles into local conditions or circumstances. To conduct this step of

analysis an assessment matrix is elaborated. As shown in table 1, the principles are differentiated into aims and ways in a first step. As foundation for the expert questioning within the stakeholder survey the principles are interpreted and translated to a better comprehensive form.

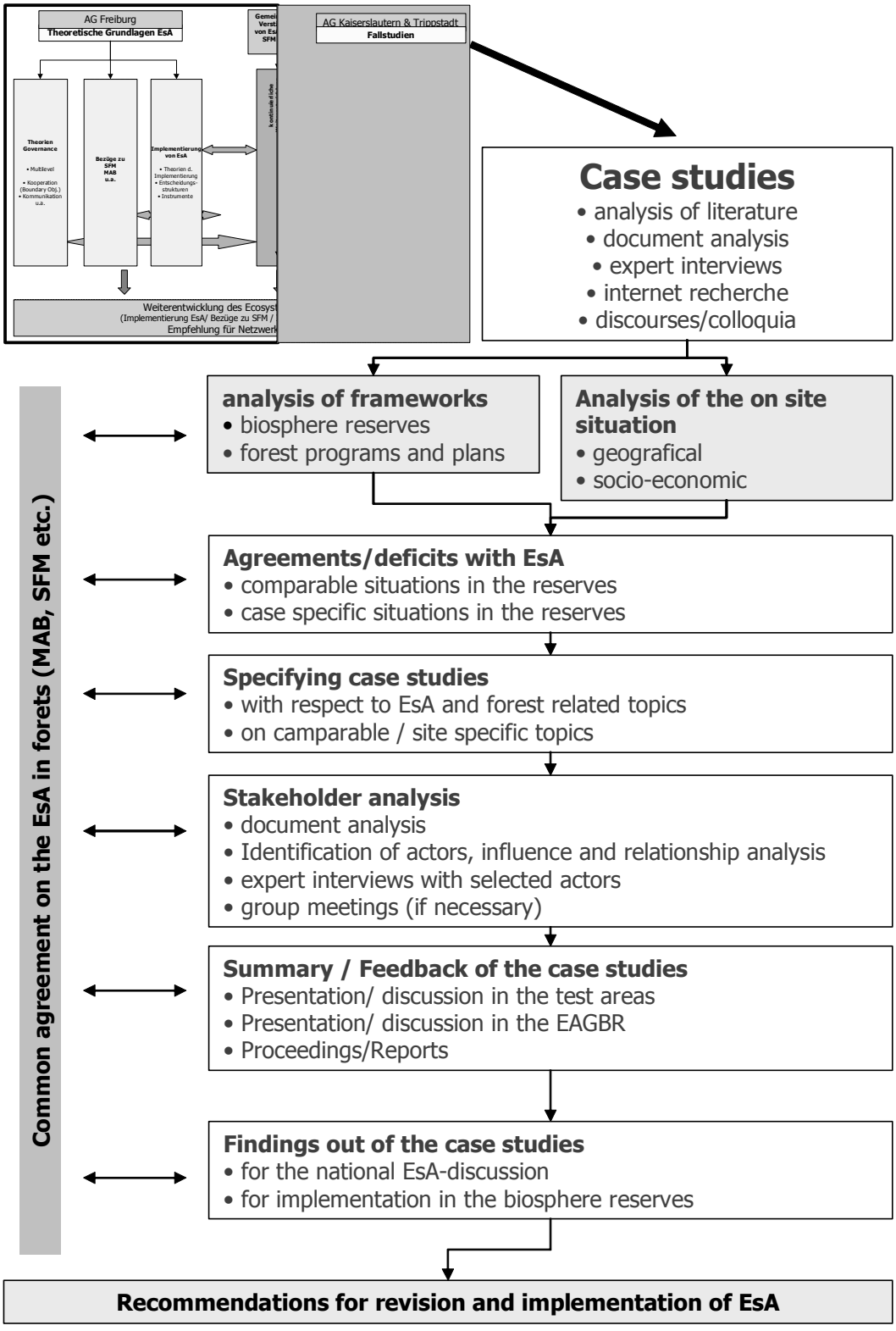

Fig. 3: Overview of the methodical concept for the case studies (working groups Kaiserslautern und Trippstadt)

Table 1: Structuring of the Malawi-principles as assessment scheme for the case studies (source: expert workshop Lambrecht 2004, following the working group ELLENBERG & BÜRGER-ARNDT, not published)

Structure of the Malawi-principles		Malawi-principles	short form of the principle	regional/ local questions
aims	normative settings	4, 5, 10	4: Managing in economic context 5: Conservation of structure and functioning 10: balance between conservation and sustainable us	
ways	Ecosystem comprehension/ science	3, 6, 7, 8	3: realizing effects on neighbouring systems 6: management in limits of functioning 7: appropriate spatial and temporal scales	
			8: long term management	
	Recommendations / rules for management	9, 11	9: adaptive management 11: integration of transdisciplinary knowledge	
	Political framework	1, 2, 12	1: societal choice 2: decentralisation 12: participation and awareness of all relevant sectors	

Stakeholder analysis

Firstly it is the objective of the stakeholder analysis to identify the most important stakeholders, their conflicting and coalitionary interactions and their institutional decision structure.

The stakeholder analysis starts from the following basic questions:

- Who are the local stakeholder groups?
- Which interests have these groups?
- By which institutions are these stakeholder groups represented?
- Which guiding ideas of management and ideologies are behind these interests?

Document analysis

By means of a literature analysis and a first qualitative questionnaire of key informants, guiding informations about involved stakeholders are obtained. Selected key informants lead to further stakeholders. Recommended is a stakeholder participation from all relevant economic, administrative and societal sectors, whereby a number of 20 actors seems to be the maximum.

The influence and institutional environment of the stakeholders is analysed by means of a document analysis and a questionnaire. In the first step personal expert interviews are conducted. As an optional

second step that depends on the currency of the interviews and the obtained results of the first step, round tables with the personally interviewed actors are foreseen.

Expert interviews with selected actors

The questionnaire is based upon the outcomes of translating and interpreting the Ecosystem Approach principles. The interviews are recorded and assessed by a qualitative textual interpretation. As above mentioned, the actors have to be selected according to their institutional function, personal engagement and social position. The actors should at least represent parts of the society and should be able to overlook societal discussion processes or decision structures, respectively.

5 Summary and feedback

After the first assessment of the obtained data a feasible way is required for linking and reflecting the preliminary findings. These findings should be presented in the single Biosphere Reserves as well as in the amplified working community of the Biosphere Reserves. At the same time it is assumed, that the interview partners are integrated in common discourses.

The preliminary results of the case studies will be reflected on the national discussions about the Ecosystem Approach and the implementation of the Ecosystem Approach in the Biosphere Reserves. The following guiding questions are posed:

- To what extent has the contents of the Ecosystem Approach been adopted or applied?
- Are the framework papers of the Biosphere Reserves and the forest programs, respectively consistent with the requirements of the Ecosystem Approach?
- Are the Ecosystem Approach principles applicable or important in the reserves, and to what extent are there obvious deficits?

In the following, the obtained findings will be combined with the results of the theoretical approach in order to carry out suggestions for reworking and implementing the Ecosystem Approach principles. The supposed findings - scientifically based recommendations for the further development of the Ecosystem Approach and for network establishment - can only be achieved by a current and close combination of the results at the end of the project.

References

For further information and references see: www.oekosysansatz.de

The Ecosystem Approach and Sustainable Fisheries

JÜRGEN RITTERHOFF

Several paper were published about the Ecosystem Approach and its relation to sustainable fisheries in recent years (e.g. FAO 2003a, 2003b) but also the Regional Seas Conventions as well as the EU on the European level and the Convention on Biological Diversity (CBD) on the global level contribute to the recent developments in this field.

Definitions

There exist several slightly different definition of the ecosystem approach. The original definition of the CBD is:
"The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Thus, the application of the ecosystem approach will help to reach a balance of the three objectives of the Convention: conservation; sustainable use; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources."

At the Joint Ministerial Meeting of the Oslo-Paris-Commission (OSPAR) and the Helsinki Commission (HELCOM) 2003 in Bremen the following definition with the major focus on the management of human activities was agreed by the Ministers. The ecosystem approach can be defined as *"the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences, which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity".*

The ecosystem approach to fisheries is defined by WARD et al. (2002; in FAO 2003b) as *"an extension of conventional fisheries management recognizing more explicitly the interdependence between human well-being and ecosystem health and the need to maintain ecosystems productivity for present and future generations, e.g. conserving critical habitats, reducing pollution and degradation, minimizing waste, protecting endangered species".*

The Reykjavik FAO Expert Consultation (FAO, 2003b) agreed that the "*purpose of an ecosystem approach to fisheries is to plan, develop and manage fisheries in a manner that addresses the multiplicity of societal needs and desires, without jeopardizing the options for future generations to benefit from a full range of goods and services provided by marine ecosystems*" .

What are the problems with the conventional fisheries management?

The conventional fisheries management has focused on a single species or stock, without looking at food-chain effects, climate change, damage from gear, incidental catch or the interactions between species and seabed habitats. Just in recent years there seems to be a change at least in the assessment process.

Major scientific problems are emerging out of:

- the uncertainty about the status and dynamics of the stocks,
- a lack of commitment to the precautionary approach,
- the priority to short-term social and economic needs, at the expense of the longer-term sustainability of the stock,
- poorly defined management objectives,
- institutional weaknesses and strict sectoral approaches.

For years, the Common Fisheries Policy limit catches primarily through output control measures such as Total Allowable Catches (TACs) and single-species quotas. However, TACs are focusing only on landings and do not reflect the real catches, the full extent of fishing mortality on target populations. Furthermore traditional fisheries science focused mainly on the dynamics of target species alone. The effects of fishing on most non-target species and habitats were neglected.

In a new fisheries management based on an ecosystem-based approach to fisheries the following ecological principles are relevant:
Fisheries have to be managed:

- according to long term objectives, which acknowledge biological limit and reference points;
- in ways, which avoid or minimise incidental by-catch e.g. of marine mammals, seabirds or benthic organisms and avoid or minimise effects upon habitats;
- by taking into account the indirect effects of the fishing activities on the other ecosystem components.

To implement an ecosystem-based approach to fisheries, thus a range of measures are necessary which are based on these principles. These are inter alia:

- bringing overall fishing mortality into line with stock size, structure and availability;
- increasing the selectivity of fisheries, reducing by-catch and discards, and preventing habitat damage;
- involving relevant stakeholders, making decision-making transparent and meeting different interests.

Good science, modelling, monitoring and reporting are the basis for the assessment of fishing activities concerning ecosystem targets as well as stock targets.

Criticism

Ecosystem-based approaches have attracted a lot of criticism. In particular that:

- there is a lack of understanding of ecosystem interactions and processes;

- the setting of ecosystem-based objectives or standards could be constrained by unacceptably costly research;
- there are no tools for ecosystem-based management, other than conventional fisheries management tools.

These critics often lead to the conclusion, that an ecosystem-based approach is not practicable as a basis for fisheries management, or that much more research is needed before it could be implemented.

Outlook

Despite this criticism an ecosystem-based approach to fisheries management is possible. There *are* policy and management measures, which can be implemented straight away. While there is undoubtedly a need for research and monitoring, much of the necessary work is underway. The emphasis should be on getting started with an adaptive management, and learning by doing, rather than by postponing action until every last detail is known.

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Applying the Ecosystem Approach in High-Mountain Ecosystems in Germany: Experiences with the Alpine Convention

AXEL PAULSCH, CORNELIA DZIEDZIOCH, THOMAS PLÄN

After signing of the Convention on Biological Diversity (CBD) in 1992, sustainable use is considered as a cross-cutting issue and case studies about the implementation within the framework of the Ecosystem Approach of the CBD are required. On the basis of those case studies, Parties and Governments should develop ways to achieve the sustainable use of biodiversity. The study presented here, prepared within the scope of the research and development project "Developing Concepts for Sustainable Use in Selected Subdomains of Biological Diversity", aims at analysing the current state and use of high mountain ecosystems in Germany, considered as a case study. The study investigates the compatibility of the sustainability principles of the Ecosystem Approach with the implementation of the Convention on the Protection of the Alps (Alpine Convention). (For the full report compare PAULSCH et al. 2003).

In the high mountain range of the Alps, climatic and geological conditions create an enormous variation of different natural ecosystems, each of them hosting a well adapted community of animal and plant species. The influence of different ice ages and the dynamics of glacial and periglacial processes are responsible for great parts of the actual morphology and appearance of recent landscapes. Next to natural conditions, human influence significantly shaped the Alpine landscape. 2,000 years ago the regular use of Alpine pastures became the dominant form of agriculture and resulted in some parts in a drawback of timberline to about 300 meters under the natural limit. This practice of Alpine pasture (German: 'Almwirtschaft') is responsible for the typical natural scenery that tourists bear in mind if they think of the Alps. Nowadays, winter tourism influences demographic changes: while urban centres in valleys and communities with mass tourism (especially in Bavaria and Switzerland) are growing more than the average, villages in remoter areas (especially in France and Italy) not only grow slower but loose inhabitants. Lots of farms were completely abandoned so that 24% of the Alpine region are without human settlement today (BÄTZING 2002). In Italy, France, Slovenia and Germany the Alps are not only a kind of periphery in a geographical point if view, but in an economic point of view, too. In Liechtenstein, Austria and Switzerland the Alps are in a central geographical and economical position.

The Alps consist of a mosaic of different types of ecosystems, that can be described along a vertical gradient of increasing altitude: valley bottoms with river beds, meadows, mountain forests, alpine pastures, alpine grasslands above timberline, and rocks in the summit regions.

Together with the bogs in various altitudes, the Alps host about 3,000 plant species (LAUBER & WAGNER 1998), 400 of which are endemic (GRABHERR 2001). Thus the Alps comprise about one third of the whole European flora.

The Alpine Convention is a legally binding document signed by all states participating in the mountain range of the Alps. In no other mountain range of the world a comparably binding framework for protection and sustainable use exists for the time being. The Alpine Convention covers an area of 190,912

square kilometres inhabited by 14.2 million people in 8 states, 53 regions and 5,800 communities (BUWAL 2000). The Alpine Convention consists of a Framework Convention and additional thematic protocols. The Framework Convention defines the aims of the Convention and the formalities of regular meetings and reports. The protocols cover specific thematic issues in depth. For the time being nine protocols have been agreed to:

- the Nature Conservation and Landscape Management Protocol in 1994,
- the Mountain Agriculture Protocol in 1994,
- the Regional Planning and Sustainable Development Protocol in 1994,
- the Mountain Forest Protocol in 1996,
- the Tourism Protocol in 1998,
- the Energy Protocol in 1998,
- the Soil Protection Protocol in 1998,
- the Traffic Protocol in 2000,
- and the Conflict Solving Protocol in 2000.

Other important issues like People and Culture, Water Management, Air Purity and Waste Management are envisaged to be tackled by protocols or other means.

Although the Alpine Convention was not formulated under the impression of the Rio summit in 1992, but years before the adoption of the CBD and the Ecosystem Approach, it covers in its Framework Convention and in its protocols the aims of the CBD, especially the conservation of biological diversity and the sustainable use of its components.

Principle 1 and 2 of the Ecosystem Approach demand that management objectives should be a matter of societal choice and management should be decentralized to an appropriate level. The Alpine Convention clearly considers these demands in a sufficient way.

Principle 3 demands managers to consider the effects (actual or potential) of their activities on adjacent and other ecosystems. This demand is clearly formulated in the Alpine Convention and its protocols. To avoid doubling of mistakes and give advice for best practice, monitoring systems are needed that consider effects on an ecosystem base.

Principle 4 demands that economic considerations have to be integrated in management efforts and Principle 10 calls for a balance between conservation efforts and sustainable use. The meaning of both principles is fundamentally integrated in the Alpine Convention and its protocols, as it is explicitly the aim of the Alpine Convention to protect and sustainably use Alpine diversity. The different protocols recommend financial support for traditional and sustainable ways of land use, forestry and agriculture if the overall market situation renders these ways less profitable.

Principle 5 calls for the protection of ecosystem functioning. The Alpine Convention as a whole takes into account that protection of the functioning of ecosystems is of greater significance for the long-term maintenance than just protection of species. The connection of Alpine national parks into a network of protected areas expresses the understanding, that ecosystems have to be protected as a whole.

Nevertheless, measures to strengthen or rebuild populations of single species threatened by extinction are added to the efforts.

Principle 6 demands that management has to be appropriately cautious and must respect the limits of ecosystem functioning. The Alpine Convention and its protocols agree on respecting these limits, knowing that mountain ecosystems are even more vulnerable and take longer to recover than other systems.

Principle 7 demands to take measures in an appropriate temporal and spatial scale. As all states partitioning at the mountain range of the Alps are members of the Alpine Convention, it can be seen as a perfect example of guaranteeing the adequate spatial scale for any measure, because the whole bundle of Alpine ecosystems is part of the area the convention covers.

Principle 8 mentions that objectives for ecosystem management should be set for the long term. As the Alpine Convention explicitly defines sustainability as main goal, the long-term approach is fundamental.

Principle 9 warns that change in ecosystems is inevitable and management has to cope with long-term changes, as e.g. climatic change. The Alpine Convention is well aware of the fact, that climatic change will have more dramatic effects in the Alps than in lowlands and urges parties to prevent soil erosion and avalanches by planting and protection of forests. Many changes that occurred in Alpine systems in the last decades are man-made and hence not inevitable. The convention sees the need to stop these changes (e.g. by limiting road construction or expansion of skiing areas, by supporting traditional farmers).

Principle 11 and 12 demand to integrate all kind of knowledge and experience from all stakeholders into management measures. The convention and the protocols call for sharing of experience between all Parties and different data networks are already implemented. Participation of non-governmental organisations was essential in formulating the convention and protocol text and still is in coordinating measures and spreading information.

As a result it can be observed that the Alpine Convention and the protocols consider nearly completely the demands formulated in the 12 Principles of the Ecosystem Approach of the CBD. Hence, the conceptual framework offers all possibilities to implement management measures that help to protect and sustainably use mountain diversity.

With the ratification of all nine thematic protocols by the three states Liechtenstein, Austria and Germany in 2002 all protocols came into effect in these member states in December 2002. Slovenia as well ratified all protocols. The Alpine Convention may also serve as a model for regional cooperation in other mountain areas e.g. for the Carpathian Convention.

Examples for the implementation of the Alpine Convention can be given on different scales. On a community scale the German community of Mittenwald launched a project to protect the remnants of some extremely species rich meadows. These meadows need labour intensive mowing which cannot be

performed by machines but has to be done by scythes. The programme encourages local farmers to keep up that tradition by incentives and the creation of a regional market for the hay and products from goat and sheep.

On an Alpine-wide scale the Network of Protected Areas in the Alps interlinks more than 300 protected areas with the aim to enable intense exchange of data, experiences and information. Common programmes for species protection, sustainable tourism and traditional agriculture were launched.

The re-introduction programme for the Bearded Vulture released more than 100 individuals of this bird of prey at four different places. The common monitoring programme spans the whole Alps and is based on international cooperation of Alpine states.

Despite these examples the successful implementation the Alpine Convention has to face obstacles. For the time being only four signatory parties ratified the protocols and it took more than a decade after the signing of the convention until a permanent secretariat was established in 2003. Large scale economic interest (e.g. mass tourism, traffic) stand against implementation efforts and the responsibility of different sectors renders decisions complicated and long lasting. Changing climate conditions endanger the success of measures already taken as e.g. lower amounts of snow can render sustainable tourism projects inefficient. Glacier melting leads to a higher risk of avalanches endangering farms and villages.

Although the Alpine Convention is a most valuable concept and considers all main ideas of the Ecosystem Approach a more forceful implementation of the Alpine Convention would need more political will by the signatory parties.

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4 Implementing the Ecosystem Approach in Central and Eastern Europe - Selected Case Studies

Theoretical and Practical Issues Regarding the Ecosystem Approach in Romania

OANA DOMINICA PENU

The concept of the Ecosystem Approach is a relatively new one, and even the experts in the area have trouble in fully and completely understand it. Considering the possibility that you want to find someone to explain it, it will be a difficult task to find that person in Romania. In theory there are a lot of notions that are explaining or trying to define what the Ecosystem Approach is, but my first question will be: Why should we implement the Ecosystem Approach in Romania? The natural answer comes when we take a look of the great biodiversity that Romania has, and desperately needs to preserve.

In Romania, 47% of the ecosystems are natural and semi-natural ecosystems; 25% of the country area is covered by forests. The forest is an important component of Romanian biodiversity as it includes the full range of European forest fauna (60% of the European brown bear and 40% of the wolf population; 50% of the lynx population). The most important parts of the Danube Delta, one of the biggest wetlands, are in Romania. In Romania, currently there are 783 habitat types, out of which 758 are terrestrial (CORINE Biotopes); 3,700 flora species (228 endemic and sub-endemic, out of which 23 are declared natural monuments; 74 are extinct; 39 are endangered; 122 threatened; 171 vulnerable; 1,256 rare); 33,800 species of animals (1,000 endemic or sub-endemic; 3 out of the 84 mammal species are threatened; 11 out of the 312 bird species are threatened; 1 out of the 25 reptile species and 3 out of the 87 freshwater species). A number of 24 species is declared natural monuments. 228 km of the Black Sea Coast belongs to Romania.

In order to protect all these, 17 national parks; 40 scientific reservations; 573 reservations for nature protection; 180 natural monuments were put in place and are currently working to achieve the goals of protection and conservation.

The necessity of implementing the Ecosystem Approach in Romania is also determined by several key concerns that are currently creating bottle necks in the proper solving of major environmental problems. The key concerns are manifesting mostly in environmental, economic and social areas, the basic triplet of the sustainable development. At environmental level the major issues are:

- The **wetland ecosystems**, because of the changes in their hydrological regime of wetlands (caused by hydro-technical works; extensive irrigation, damming)
- The **agricultural ecosystems** , due to soil degradation and erosion;
- Habitat fragmentation, especially in **forest ecosystems**, because the land ownership changes;
- Inappropriate forms of tourism and associated infrastructure in **mountain** and **costal** ecosystems;

- High pollution pressure and lack of green spaces in **urban ecosystems**

At economic level the problems that Romania confronts are:

- A relatively poor population and in most cases a very poor rural population;
- The economic value of environmental goods and services is in most cases under evaluated or deliberately ignored;
- Limited bio-economics instruments;

The key major social aspects are:

- Lack of public awareness and information;
- Lack of representation and financial power for certain stakeholders' groups;
- Lack of accountability of the decision.

Major progress has been made in the **theory** concerning the Ecosystem Approach in Romania. As it is a fashionable concept, though difficult to understand and explain, we have to admit that the first steps on the road to conservation have been made in Romania, but in most cases all the actions undertaken although fitting to the profile of an ecosystem approach, were not named as such.

The complete and full implementation of the CBD is an on-going work and Romania has made the appropriate efforts to adapt and "modernize" its legislation, to be concordant with the global requests. As an example, Romania has adopted rapidly all the major international biodiversity-related conventions, and also a new set of laws that are aligning the Romanian legislation to the international one.

- Law #137/1995 – "Environmental Law"
- Law # 107/1996 - "Water Law"
- Law #26/1996 – "Forest Code"
- Law #1/2000 – "Land Law"
- Law #58/1994 - ratification of the CBD
- The National /Regional and Local Plan for land use.

Despite all this advancement we have to recognise that much has to be done, because the biodiversity conservation activities are considered less important than (economic) activities with major ecological impacts. Another inconsistency is the incoherence of the existing legal and institutional framework for the use of natural resources, as the laws are continuously changed and it is quite difficult to follow all the changes that are made, especially considering the limited timeframe. The Romanian legislation still lacks the necessary measures to impose financial incentives for biodiversity conservation and the sustainable use of its components.

The **administrative and institutional framework** is also in place, as all the administrative institutions for a proper biodiversity management are well functioning. A new wave of young and trained people was hired by administrative institutions, and a lot of initiatives were started. However, there is a tendency of concentrating the power at central level and the responsibilities at local level. The organisational structure is the following: Central Structure – Ministry; Regional Structure; Local Structure. At central level the decision–makers are appointed using political criteria, while in the regional and local structures the biodiversity specialists are in charge. Sometimes it is difficult to create the proper mechanisms to

implement the correct decisions, as there is little cooperation between the three power levels and also because the existing institutional bodies are understaffed.

The Ecosystem Approach is heavily promoted in the academic area, as many educational programmes on systemic ecology are in place, but not only in biology but also in economics, social and agriculture areas. In the academic curricula of these institutions they promote the Ecosystem Approach, as **a theoretical concept**, but not always called as such. Many programmes on capacity building for young people and local population and education were initiated, the majority with the support of international funds.

Another area that promotes the ecosystem approach in both theory and practice are research and development activities. These are performed mainly by universities and research institutes using the Ecosystem Approach for the implementation of research and development projects. Despite the positive and innovative approach that the research is using, the domain as such is poorly supported and continuously under-paid, aspects that are encouraging the brain-drain phenomenon.

Considering the interests of all different stakeholders we notice that the local population is not very confident in collaborating for the implementation of the projects involving the Ecosystem Approach (land and forest issues). The local population is not informed and it seems that the majority of the public awareness raising projects tend to avoid this target group.

There are some industries that are interested in developing environmental–friendly techniques (fertilizer and food industry).

The media is not involved at all in nature conservation activities.

There are only a few NGOs with activities that have a major impact in this area. They are affiliated in different initiatives and promote the Ecosystem Approach by using it in the projects that are being implemented by them.

In practice Romania developed and implemented the National Biodiversity Strategy and Action Plan (NBSAP). Accounting each objective identified in the NBSAP, the following progress has been made:

Objective1: Conservation of the Romanian ecosystems and habitats by creating a national system of protected areas;

The Biodiversity Conservation Management Project, implemented since 1999, contributed to:

- The establishment of a Biodiversity Information and Management System (BIMS) and of the National Network of Protected Areas;
- the development of three models of management plans for protected areas.

Objective 2: Threatened endemic, rare wild species and those with a high economic value should be conserved both in situ and ex situ;

WWF and LIFE NATURA initiated projects on the conservation of large carnivores. The goal of these projects is to promote cohabitation of humans with large predators by supporting traditional land-use methods. Thus shepherds are encouraged to use traditional methods for herd protection during alpine summer grazing and eliminate completely the use of traps and poisoned bait.

Objective 3: Department strategies which integrate objectives for the NBSAP

A National Forest Sector Policy was developed in 2000. For the first time a sector strategy considers biodiversity conservation concerns, emphasizing the importance of biodiversity conservation in the development of the Forestry Sector.

Objective 4: Conservation and enhancement of biological diversity by the reduction of the negative impact as well as the ecological restoration of altered ecosystems and habitats;

A variety of activities were regulated through legal provisions and the ecological reconstruction started in several highly degraded areas such as Copsa Mica, Baia Mare and Petrosani.

Objective 5: Protection, conservation and restoration of the biological diversity specific to agricultural systems through implementation of technologies, which favour sustainable agriculture.

The Institute of Soil and Agro-chemistry performed an inventory of strongly eroded and polluted soils.

Objective 6: Specialists and general population trained and educated in biological diversity conservation principles

In the curricula of different universities there are proposals for the students concerning disciplines and sciences that promote an ecosystem approach.

Objective 7: Involvement of NGOs and local communities in programmes for biological diversity

The SACIM Network (National Monitoring Network for the Application of Environmental International Conventions).

Objective 8: Special research and development programmes for biological diversity conservation

National Biodiversity Information and Monitoring System Design; the Environmental Programmes for the Danube Delta, the Danube River and the Black Sea are financed by World Bank/GEF.

All the LIFE Nature projects that are being implemented in Romania are using the Ecosystem Approach as one of their methodologies in developing the projects. 17 LIFE Nature projects were implemented since 1999. The projects are very complex and are running generally in a three years period. The projects basically approach two topics:

- Elaboration of management plans for protected areas
- In-situ conservation

Using the estimates made in the LIFE Nature projects, the costs for the conservation of biodiversity were estimated at 99 Euro/ha/year (average). The least costs (5-10 Euro /ha/year) are designated for the

administration of natural and national parks, and the highest costs (60-335 Euro/ha/year) are needed for the in-situ conservation of species.

REC Romania is currently involved in a series of projects and initiatives that are actively promoting the Ecosystem Approach. The most important are:

- Initiative for Agricultural Landscape Preservation;
- Development of Sustainable Agriculture and Organic Farming in Sample Areas

Biodiversity Conservation and Sustainable Use in Romania - What is the Situation of the CBD's Ecosystem Approach?

PETER LENGYEL

The main themes are: the situation of the Convention on Biological Diversity (CBD) and its Ecosystem Approach in Romania, communication and stakeholders' involvement, forests, agriculture, river basin management, Biosphere Reserves, coastal zone management and Black Sea issues, NATURA 2000, protected area management, wildlife management and international issues. This paper presents the current state and trends of biodiversity conservation in Romania, the way how different elements from the Ecosystem Approach are used, and obstacles why this framework for action is not implemented in the country.

Introduction: Current State of Biodiversity in Romania

Romania's biodiversity is very high and very well preserved compared to European standards. Romania's territory includes five bio-geographical regions (Pannonian, Alpine, Continental, Steppe and Black Sea), the biggest number in an European country. Two of these bio-geographical regions will be new in the enlarged EU. The country is famous for the Danube Delta, a Biosphere Reserve and World Heritage Site of 580,000 hectares. The Danube Delta is a huge wetland with 331 bird species, colonies of most of the European populations of pelicans *Pelecanus onocrotalus* and *P. crispus*, 60% of the world population of pygmy cormorant *Phalacrocorax pygmeus*, 50 % of the wintering world population of red-breasted goose *Branta ruficollis*. Romania is also well-known for its Carpathian Mountains with its huge natural forests and still existing virgin forests, its 6,200 brown bears *Ursus arctos*, 4,000 wolves *Canis lupus*, and 2,000 lynx *Lynx lynx.* Even if the Romanian Carpathians are only about 1.4% of Europe's surface West from Russia, this small percentage is home for about 35% of the European wolves, 50% of the bears and 30% of the lynx. There are many endemic species of flora and fauna, mostly in isolated limestone mountains, in bogs and in caves.

However, Romania's biodiversity is under huge pressure in the new "Wild Capitalism". In Romania, everybody respects nature on a declarative level, but in fact there is only a low level of ecological con-

science. In the new democracy, the power of authorities to enforce legislation is diminished, which is especially visible in nature conservation issues. Even if formally signed, ratified and implemented, the Convention on Biological Diversity is known only by some specialists in Romania, which is also true for its key strategy for implementation, the Ecosystem Approach. However, some elements of the Ecosystem Approach are used under different approaches.

The Romanian accession to the EU will positively influence biodiversity conservation in the near future and will rise the "environment" as well as "biodiversity" issues on a higher position in the political agenda. The implementation of the EU legislation in the accession process will result in the designation of NATURA 2000 sites, forming a network on 15-25 % of Romania's surface. The level of environmental awareness will increase. The EU accession will hopefully result in a lower level of illegal logging, poaching, corruption, etc.

For the near future, negative impacts on biodiversity conservation are expected from the following issues: intensification of agriculture, forestry, industry, transportation and tourism. Competition on the common market will produce more aggressive exploitation and competition for exploitation of natural resources beyond ecologically safe level, intensified pollution, transformation of natural landscapes into more "civilized" ones. Construction of new highways will fragment populations of e.g. large carnivores, and this will increase the chances for their decline and extinction.

Challenges for Biodiversity Conservation in Romania

For managing dynamics and change in biodiversity conservation in Romania, there is a need for the improvement of the following issues:

Human resources

An independent interdisciplinary panel of specialists from honest, dedicated and reliable persons should be established. In many cases there is a big difference between the reality accepted in informal discussions, and the "politically correct" presented affirmations in official meetings and documents, which are then in line with the interest of the institution represented.

Data management

There is a need for a standardization of biodiversity data collections, a clarification of the indicators used, the establishment of monitoring schemes, the improvement of data processing, the introduction of GIS tools, the clarification of spatial and temporal distribution patterns of species and the need for a better understanding of natural processes in ecosystems, the definition of carrying capacities, modelling, i.e. the development of different scenarios regarding the future socio-economic and environmental development and the correlation of these two issues.

Planning

Vision, strategy, action plan: A "Strategic Vision" and an improved National Sustainable Development Strategy with Action Plan, and a realistic Biodiversity Conservation Strategy, which clearly indicates time frames, responsible institutions and persons, and the source of the necessary financial resources, should be developed.

Implementation: A centralized approach with general guidelines should locally be implemented by an adaptive management.

Furthermore, in the different sectors changes need to be made concerning biodiversity management:

Communications and stakeholders' involvement

After the changes in 1989, the trend was to open institutions and to be more frank in declarations. A positive development was the establishment of the Biodiversity Information Management System (BIMS) of the Ministry of Environment and Water Management, a GIS based structure, which allows for the exchange of biodiversity data between research institutions. Unfortunately, these data are not public. In the civil sector, the MediuList, a very well functioning mailing list of environmental NGOs, is efficient for spreading information and for working together on a higher level.

The legal existence of the Århus Convention, signed by Romania and ratified by the Law 86/2000, is an encouraging participatory processes, but its implementation is still very weak. In conferences, congresses, symposia and workshops on biodiversity issues, participation is generally limited to a specific audience (only from forestry, only from NGOs, only from states' water management structure etc).

Public participation and stakeholders' involvement in decision making is mostly existent on paper – at a theoretical level, but not in practice. For the common public it is a difficult task to get involved in public participation and in decision-making processes. After 50 years of political state ward by the communist regime, it is not an easy task to motivate people to develop their own ideas and to express them in the public. Furthermore, the appreciation for social concerns in a society atomised in the recent past is low.

In mass media, the environment is not a topic at the necessary level. The topic is an issue only when there is a catastrophe, which impacts people in a very visible way. Positive things about nature are very rarely presented.

In Romania, there is not enough communication between stakeholders and a low flexibility of bureaucracy. The correlation between scientific bodies, regulators (drafting laws) and practitioners in ecosystem or natural resource management, protected area management, etc. is as low as the level of acceptance of "learning by doing" and of participatory approaches in the high positions of the hierarchies (forest management, hunting, ministries etc.).

Vertical coordination (top-down) is predominant and horizontal communication and cooperation between the different sectors is weak. In forestry, water management, fisheries etc., decisions are made top-down or under the control of small interest groups with high economical and/or political power, with no regard to stakeholder involvement in strategic planning, harmonizing and respecting different interests, concerns and aspirations of local people, equitable allocation of benefits, consensus with local communities or civil society and their involvement in decision-making. Involving others implies the risks of controversial situations, disputes and debates, mostly in complex issues with many diverting interests, so, it is usual to

decide "alone". After half a century of communism, dictatorship and centralized economy, it is obvious that there is no tradition of planning together and no tradition of friendly conflict management.
A common issue in conferences, workshops, symposia, congresses etc. is the need to increase the quality of presentations and their style. Generally, there are no developed skills to clearly present the main ideas in an "easy to understand" form and supported by relevant data.
Concerning data management, data quality and availability there are still "secret" data in the research sector and in the NGOs. In many cases, data generated with public funding are not accessible for the public. Unbelievably, biodiversity data from state financed research institutes are not accessible even for the Ministry of Environment. There are problems regarding the accuracy of data in publications, many data are old, not structured, on paper and not in electronic form.
UNESCO Pro Natura supports the development of communication and stakeholder involvement through its experience in organizing stakeholders' meetings, international conferences, workshops, training courses, international study tours etc. The NGO is a partner of the StrawberryNet Foundation, and it is the manager of MediuList, the electronic network of Romanian Environmental NGOs. Electronic tools promoted by UNESCO Pro Natura are ActionApps for user-friendly web publishing, web proliferation, web design, but the NGO is also involved in the publication of hardcopies.

Forests

Huge areas in Romania are covered with natural forests and some virgin and quasi-virgin forests in the Carpathian Mountains. Since a long time, forestry has established a sustainable ecosystem management, which involves long-term thinking and adaptive management. Steps (mostly in theory) towards an integrated management of natural resources, balancing conservation, economic and social interests, are supported by a World Bank project ("Forestry Development Project", budget: 32 mil $). There is also some incipient work on the Forest Stewardship Council (FSC).
However, businessman, the state forestry sector, local authorities, police, and politicians are involved in illegal logging. Illegal logging is a way to survive, to heat homes and to cook, and a possibility to earn cash income for desperate poor people in timber-dependent communities. The forestry sector in Romania is totally centralized and finds it difficult to consider local populations' interests and their involvement in decision making. The forestry sector's main objective is timber production, using management types (species, felling system: clear-cuttings/selection logging) and silvicultural measures with no regards to biodiversity conservation. There are controversial situations between forestry and the conservation sector regarding the establishment of Strictly Protected Areas (IUCN I) versus using the areas for timber production in National Parks (IUCN II).

Agriculture

Extensive subsistence agriculture on small plots, with local breeds and low input of pesticides and fertilizers covers wide areas in Romania. Agricultural lands encompass about 9 million hectares with about 6 million owners. This fragmentation is a result of the recent re-privatization of land (Law 18/1991). Approximately two thirds of the agricultural lands are property of small holders (2-3 ha), implementing subsistence agriculture in co-existence with a high biodiversity. The actual prime minister of Romania, Adrian Nastase recently made a joke about this kind of agriculture: "*In Romanian agriculture we do have*

10 persons keeping in hand the chain of a single cow, waiting the cow to finish grassing, to be the time to go home."

The issue of peripheral cultural landscapes, where biodiversity conservation needs the traditional human disturbance through grazing, mowing, etc. to stop the succession process at a certain stage, is coupled with problems such as decreasing levels of traditional activities, aging of rural populations, rural depopulation, and land abandonment. In other areas, overgrazing and intensification of agriculture generate just the opposite problems. With the EU accession and implementation of the CAP, agriculture will probably be intensified, and losses of biodiversity will probably appear.

River Basin Management

Formally, there are established River Basin Committees in Romania, but in reality they are totally dominated by the state company "Romanian Waters". The only representative of NGOs' in each Basin Committee was nominated by them. The common public has big problems even to obtain information on what was discussed in the Committee's meetings. Thus, the established River Basin Committees do not represent public interests. The management of transboundary river basins needs more international cooperation.

Biosphere Reserves

In Romania, there are three Biosphere Reserves. However, only the Danube Delta is a real Biosphere Reserve where the protection of natural resources is combined with sustainable use and a population of about 15,000 persons in 27 rural settlements and one town is included. The Biosphere Reserve administration under the Ministry of Environment and Waters employs 103 persons and receives a governmental financial support of about 1.5 mil $ annually for its functioning and investments. The Danube Delta Research Institute employs another 100 people.

The Rodnei Mountains and the Retezat Mountains Biosphere Reserves are two relatively small protected areas established in the Carpathians, which do not include human settlements. They were recently enlarged and are administrated as National Parks by foresters. In the NP/Biosphere Reserve Retezat (established in 1935), the administration was established in 2000 as part of a GEF project. There were a few attempts with more or less success to work with the local community. In NP/Biosphere Reserve Rodnei, the administration has been established in 2004. Until now, there are no attempts to involve local people in the management of this Biosphere Reserve.

Integrated Coastal Zone Management and the Black Sea ecosystem

The Black Sea is in decline and the most polluted sea in the world. The Danube alone discharges nutrients (producing phytoplankton blooms) and pollutants (accumulating in top predators) from ten European states or 850,000 km². The seal (*Monachus monachus*) is extinct from the Black Sea, and the ca. 1,500,000 exemplars of three dolphin species (*Tursiops truncatus, Delphinus delphis* and *Phocaena phocaena*) decreased to now ca. 15,000.

Black Sea fishery is in crisis because of an alien invasive species: *Mnemiopsis leidyi*, a jellyfish from the Atlantic Ocean, got accidentally into the Black Sea with the ballast water of a ship in the early 1980s. By 1990 the weight of the jellyfish in the Black Sea was estimated 1 billion tons, approximately the weight of global fish capture for that year. Consuming fish eggs and larvae and also fish food, the invasion of the

jellyfish resulted in a decrease of fish stocks and a catastrophic decline of commercial fish catches from about 400,000 tons in 1984 down to less than 50,000 tons after 1991. Overfishing, pollution and eutrophication is deepening the crisis.
Concerning tourism infrastructure development, the northern part of the Romanian Black Sea Coast is in a natural, almost virgin state and protected by the Danube Delta Biosphere Reserve. However, the southern part is under very high pressure. There is a permanent pressure to extend tourist facilities to the northern sector. The Convention and Ministerial Declaration on Black Sea Protection and Pollution Prevention as well as the Black Sea Biodiversity and Landscape Conservation Protocol are not sufficient to change this reality.
UNESCO Pro Natura is involved in the organization of workshops, presentations and conferences regarding the Black Sea. The NGO is part of the Black Sea information management in the scope of a project financed by GEF Small Grants and it is involved in biodiversity research in coastal areas. UNESCO Pro Natura also participates in the Romanian Black Sea Environmental NGO Coalition.

NATURA 2000

Romania's most important strategic aim is to be integrated in the EU. In this respect, the implementation of both the EU's Birds and the Habitats Directives is mandatory. There are some governmental efforts for the implementation of the Directives coordinated by the Danube Delta Research Institute. The Directives are transposed into the national legislation with the Law No. 462/2001 regarding protected areas, conservation of natural habitats and wild species of plants and animals. Recently, a project involving two companies and WWF's Danube-Carpathian Programme was started (about 400,000 $).
In Romania, scientific data on biodiversity is scarce, not relevant, not standardized and badly organized, dispersed in different research structures, and difficult to access. There are problems regarding the understanding of the Birds and Habitats Directives, e.g. even researchers do not understand that the Directives do not solve all the biodiversity conservation problems, but can rather be used as tools for the conservation of specific areas and species.
The preparation of the national list of proposed Sites of Community Importance (pSCI) until the accession of Romania to the EU (2007) is under time pressure while scientific evidence (quality and quantity of available data) is missing and financial support is scarce.
UNESCO Pro Natura is participating in the Romanian NATURA 2000 NGO Coalition (formed by about 30 NGOs) and is a member of its board. It is currently working on the implementation of a PHARE Access project in partnership with the Romanian Speleological Federation and the Romanian Ornithological Society – the BirdLife Partner in Romania. The project encompasses several training courses for NGO representatives, partnership development with relevant authorities, development and publication of a NATURA 2000 toolkit, web proliferation on NATURA 2000, photo exhibitions etc.

Protected area management

Romania comprises 18 National Parks, Natural Parks and Biosphere Reserves and more than 800 other, smaller protected areas. In the Danube Delta Biosphere Reserve, a GEF project was implemented with a budget of 4.5 mil $. Another GEF World Bank project called "Biodiversity Conservation Management Project" with a budget of 8.8 mil $ for the National Parks Retezat and Piatra Craiului and the Vanatori Neamt Forest Park is under implementation. A new GEF project of 2.4 mil $ in Maramures county is

starting. Various Governmental Decisions and Ministerial Orders regulate the delimitation and internal zoning of protected areas, the establishment of their administration, and the procedures for administration and custody.

However, the protected areas cover only about 5% of the Romanian territory. At the beginning of 2004, only five of the 18 biggest protected areas and almost none of the other more than 800 smaller ones have had their own administrations. Some of the areas are protected by NGOs, but without any clear legal base. An ecological network is not existing, there are no corridors, no stepping stones etc.

Even in protected areas, information on biodiversity is scarce: this is demonstrated by the fact that in the Retezat National Park, the oldest in Romania, the number of bird species was recently doubled as a result of a baseline survey with birds being the most studied organisms.

Protected area management is mostly dependent on foreign financial resources. The new administrations of National Parks and Natural Parks are totally dominated by forestry interests and logging and hunting is continued with intensity. Recently in the Piatra Craiului National Park a huge area was started to be clear-cut. There was a strong impact of illegal fishing in the Danube Delta Biosphere Reserve (a "Mafia" of caviar and fish), but recently concessions for fishing were given to companies, which have the interest to control poaching. There are some conflicts between tourists and National Park administrations, also between administrations and local communities.

Members of UNESCO Pro Natura are participating in scientific research and in the elaboration of a legal framework for biodiversity conservation. The NGO promotes projects on information management, public participation, stakeholders' involvement, partnership building with the relevant structures, elaboration of management plans, environmental education, law enforcement by rangers, as well as practical activities: realization of signs, maps and indicative panels in protected areas.

Wildlife management

Romania still shows a high species diversity. Reintroduction projects for the beaver and the marmot are successfully implemented under the state forest authorities. However, wildlife is threatened by an extreme level of poaching, which is considered a low level crime by authorities and especially by judges. Because of poaching, some species are at the point of extinction (e.g. the chamois in the Rodnei Mountains). The issue of Italian bird hunters needs to be solved. Another problem is the introduction of alien species for hunters' interests.

Until now, there is no cooperation between governmental structures controlling wildlife management and civil society interested in biodiversity conservation. The official data on game populations is unreliable and difficult to access, however, hunting quotas are based on these data. It is an overestimation of numbers in the interest of a bigger "harvest". There is a great financial temptation for people involved in hunting, game management, quota establishment, etc.: For a brown bear a foreign hunter should pay 5,000-7,000 Euro while the medium salaries are about 150 Euro a month!

UNESCO Pro Natura is the promoter of the organization of the first game population evaluation in partnership with the local forestry and environmental NGOs (Chamois counting in Rodnei Mountains National Park and Biosphere Reserve, November 2003). It was a national campaign on wildlife management issues, involving the Romanian TV and other media. The NGO organized a NGO coalition for wildlife management. Although it does not support hunting, it initiated a win-win approach for the

protection of game populations, working with the State Forest Authority, Ministry of Agriculture, Forests and Rural Development and the National Hunter's Association.

International issues

With its thousands of pelicans, the Danube Delta, the Carpathians, with the populations of bears, lynx and wolves, Romania has a good image regarding biodiversity. Romanian specialists for biodiversity are well trained and ready for international cooperation in the future.

Regarding biodiversity conservation, there is generally a low level of participation of Romanian citizens in international processes, resulting in a low understanding of international issues, an under-representation of Romania's interests in international negotiations and a low level of understanding of the Romanian situation in the international sphere.

In many cases, biodiversity conservation is possible only through international cooperation. The use of natural resources and the transboundary environmental impacts (like air and water pollution) are a source of conflict between nations. International conflicts arose out of the series of scandals concerning Turkish fisherman fishing illegally in Romanian coastal waters, where they got in conflict with the Romanian Navy. The situation is even more complicated with shared resources, such as the fish stock of the Black Sea or the sturgeons migrating in the Danube. Because of its transboundary dimensions and the influence of the discharging river basins, the management of the Black Sea marine ecosystem is extremely difficult. A way to control the introduction of invasive alien species is not yet existent. The recently started construction of the Bystroe channel in the Ukrainian part of the Danube Delta is another controversial issue on the international scene.

Transboundary river basins need more international cooperation. A regional example is the Baia Mare cyanide spill of January 2000 polluting the Somes, Tisa and Danube rivers and resulting in an international scandal with Hungary sueing Romania and the Australian mining company Esmeralda for the damages. Even after the Baia Mare cyanide spill, the implementation of a project of a huge new gold mine at Rosia Montana is underway, with the mandatory relocation of about 2,000 inhabitants. If this mine will be realised, it will be Europe's largest open surface gold mine with huge cyanide lake and a dam 180 m high. The surface of the lake will be about 600 hectares (10 times bigger than the Baia Mare lake) and the reservoir will contain approximately 250 million tons of residual waters. By processing 220 million tons of material, it is supposed to extract more than 400 tons of gold and approximately 1,800 tons of silver. For the period of the exploitation (16-18 years), 250,000 tons of cyanide will be used. The concentration in the lake will be about 50 mg/litre, from which a cup is enough to kill a child. If realised, this investment of the Rosia Montana Gold Corporation formed by Mininvest Deva, Romania (almost 20%), and Gabriel Resources, Canada (80%) plus some small holders will be the biggest foreign investment in Romania, about 400,000-600,000 US$. The risk of pollution with leakage waters from mines is persisting and concerns running mines and closed ones.

In Romania, there is generally low interest in cross-sectoral or transboundary impacts. The risk of catastrophic floods in Romania increased because of massive logging. Illegal logging was estimated by the World Bank to produce a loss of approximately 1.5 billion US$ over the last 14 years in Romania.

As a national environmental NGO with international activities, UNESCO Pro Natura is participating in the IUCN family as well as in the "Environment for Europe" process. UNESCO Pro Natura established relations within the UNESCO framework and cooperates with NGOs, scientists and administrators from

the neighbouring countries. UNESCO Pro Natura is active in the South-East European Environmental NGO Network (SEEENN) and in Central and East European Working Group for the Enhancement of Biodiversity (CEEWEB). It is permanently working for increasing its local, national and international influence to promote biodiversity conservation and sustainable development in a real way.

Small Island of Braila Wetland System - Applying the Ecosystem Approach

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Abstract

The Small Island of Braila is the most important remnant of the former Inner Delta, a large landscape dominated by island and floodplain wetlands, located upstream the Coastal Danube Delta, from which 80% of the surface area were substituted for agricultural purposes after 1960. Recent studies on its biodiversity and biological productivity pointed out a significant similarity with the historical floodplain and based its consideration as an important protected area. A brief presentation of the opportunities, potential footprint and the framework for designing, development and implementing adaptive management plans for local natural capital and socio-economic systems includes a first rough economic valuation of its ecological functions and the main coordinates of the management programme having as base the principles of the CBD's Ecosystem Approach.

Introduction

In the Inner Danube Delta, an extensive programme for the substitution of the natural wetlands into agricultural land was carried out during 6^{th} and 7^{th} decades of the 20^{th} century. From the total surface area of 2,413 km^2 of natural wetlands, less than 20% have been maintained under natural and semi-natural conditions. The main effect included an important decrease of the natural offer of goods and services for local population and associated socio-economic systems as well as worsening of the ecological state of the ecological systems and of the migratory species on large distance, i.e. eutrophication of the Black Sea etc. (CRISTOFOR *et al* 1993, VADINEANU & CRISTOFOR, 1994, VADINEANU *et al* 1997, 1998). Re-designing plans of the ecological structure includes mainly conservation and restoration of floodplain wetlands by developing and implementing integrated management programs for its specific components. Protected areas like the Small Island of Braila (SIB) could play an important role in this respect.

Site Description

The Inner Danube Delta located on the Romanian territory, along the river stretch between Calarasi (365 km) and Braila (170 km) and between the Southern Romanian Plain and the Dobrogea Plateau, covers a total surface area of 2,413 km^2. Its main components are the Small and Big Islands of Braila (176 and, respectively, 700 km^2), the Borcea Island (801 km^2) and the lateral flooding areas (736 km^2) (see fig.1).

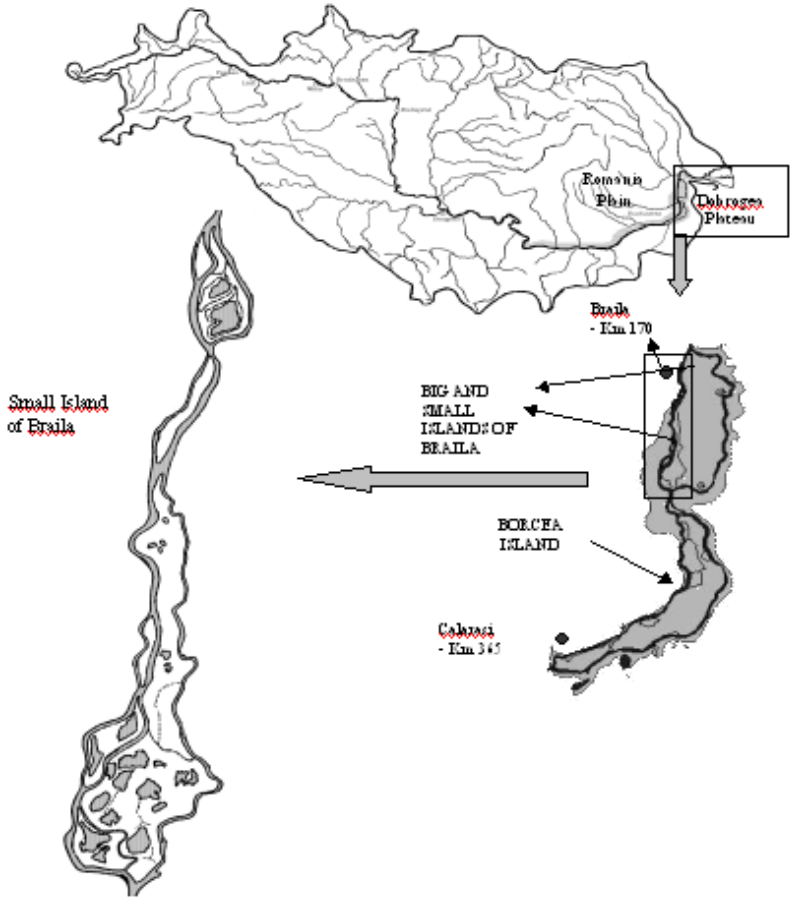

Fig. 1: Inner Danube Delta and the main component in natural flooding conditions (Small Island of Braila)

The SIB wetland system consists of ten islands located in a dynamic network of river arms and channels and comprises 13 types of habitats or categories of ecosystems with more than 345 identifiable ecosystems (table 1). A comparative analysis of the structural organization of this remnant wetland system with that of the reference system for the Lower Danube River shows a high degree of similarity (VADINEANU *et al*, 2001), indicating that the wetland system of SIB preserves, at a smaller scale, all types of habitats and ecosystems characteristic both for the former Inland Delta and for the floodplain developed along the Danube River stretch between km 75 downstream and km 840 upstream. More than 50% of the SIB constituents are natural ecosystems, about 30% are currently semi-natural ecosystems and less than 20% have been affected by direct human intervention (e.g. replacement of native species of willow and poplar by Canadian poplar in some alluvial forests or the tentative for semi-intensive fishery).

Table 1: The habitat (based on the habitat directive) types and corresponding area in the SIB wetland system

Habitat type	Cod DH	Area (ha)
Natural eutrophic lakes	3150	2318
Forested marshes	91E1*	544
Riparian Galleries and tickets	92D0	1710
Salix and *Populus* galleries	92A0	3181
Lowland hay meadow	6510	1589
Typha and reed beds and belts	7410*	2609
Riparian mixed forest	91F0	2238
Meadows	6410	1604
Alluvial forest	91E0	46
Alluvial meadow of river valley	6440	60
River with muddy banks	3270	60
Channels and Danube arms	3280/3281*	5100
Antropic systems	-	15
Total area		**21074**

*This habitat types are not listed in the EU Habitats Directive but they are considered very important for the functioning of the SIB reserve.

Material and Method

Long term series of field measurements and sampling programmes performed in the SIB as well as along the whole Lower Danube Wetland System (LDWS) in the last two decades were reviewed and used for a comparative analysis in terms of quantity and quality of existing data as well as in terms of the real trend of changes from the historical to the actual Inner Delta. Based on the CBD's Ecosystem Approach, the research program was designed at a temporal and spatial scale that would cover and assess the heterogeneity and dynamics of this complex wetland landscape, including not only the associated natural capital but also the adjacent socio-economic systems.

The main monitored variables include structural and functional parameters for the following tropho-dynamic modules: phyto- and zoo-plankton, macrophytes and zoo-benthos for the aquatic systems and phases, herbaceous, shrub and tree communities, invertebrates, amphibians and birds for the terrestrial ones as well as for the following hydrogeomorphologic units: morphometric indices, nutrients in water and soils/sediments, grain-size, pH etc.

Three different and complementary research directions were approached: i) to characterize spatial heterogeneity of the Small Island of Braila for different levels of biodiversity (e.g. species, ecosystems, ethno-cultural) ii) to describe main changes induced by human activity and iii) to identify the bioproductive potential and carrying capacity as a base for the development of an integrated management plan.

Different methods and techniques of data processing have been implemented, including satellite images (Eurimage – Landsat full standard scene, with ETM sensor), GPS measurements and GIS analysis, to

develop a spatially referenced information system for the adaptive and integrated management of this protected area.
In all stages of the development of the management plan the guiding principles of the Ecosystem Approach were followed. In fact, the scientific foundation of the management plan is a key element for a successful and trustful management plan.

Results and Discussion

One very important issue, which was taken into consideration when the management plan was developed, was linked with principle 6 of the Ecosystem Approach. Thus, the structure of the local economical systems was designed according to the productivity and carrying capacity of the ecological systems. Based on that it was a need to identify the structure and functioning of the systems from the Small Island of Braila area.

The comparison of the historical data concerning species or higher taxa inventory in the LDWS (ANTIPA, 1910) with the data recorded recently by field investigation conducted in the SIB (VADINEANU *et al* 2001, SARBU *et al* 1999, GHEORGHE & TOPA, unpubl. data) shows that in spite of many changes the wetlands of the SIB preserves a high taxonomical diversity. The vegetation structure of SIB wetland system is currently dominated by 147 species belonging to two main vegetation groups: i) floodplain vegetation dominated by tree and shrub associations (U) and ii) reed and rush marshes (R) dominated by aquatic vegetation.

A significant richness of bird species has been recorded in the last years (1999-2001) for the SIB wetland system: 136 species, from which 47 species are listed on the annex of the EU Birds Directive and 34 species are listed on the annex of Bern Convention. By providing eleven types of habitats for nesting, feeding and resting, the SIB wetland system together with the coastal Danube Delta plays the role of a major node in South-Eastern Europe along the bird migration routes.

A rich fauna of invertebrates consists in: i) 49 higher taxa of terrestrial invertebrates, each represented by many species (e.g. 166 species of carabids); ii) over 100 species of *Gastropoda* and *Bivalvia*; iii) 12 higher taxa of benthic organisms with more than 60 species identified and; iv) about 120 species of *Cladocera*, *Copepoda* and *Rotatoria*. In the river stretches, channels, marches and lakes of the SIB, over 176 species of planktonic algae and eight species of submerged macrophytes have been identified. The fish association is still composed by 65 species, even if the stock of most of them has declined severely. Ten of these fish species are listed in the annex of EU Habitats Directive. Eleven species of mammals and 13 species of amphibians and reptiles have been also identified from which four species (two of mammals and two of amphibians) are listed in the EU Habitats Directive.

Preserving all types of ecosystems identified in this wetland complex is very important for maintaining its structural and functional diversity. The small, ephemeral and transitional water bodies, shallow lakes,

marshes, levees and other kind of flooded areas, including meadows, pastures and even salted soils play a special role in this respect (VADINEANU et al 2001).

Natural or semi-natural wetland ecosystems of the SIB behave as very efficient production units that are continuously fuelled by diluted solar energy and/or natural auxiliary energy. The structure and functioning of these wetland systems follows a non-linear dynamic driven by specific natural and antropic forces. The outputs of their functioning are: i) production of renewable resources; ii) carrying out ecological services and; iii) self regulation of structural and functional parameters. The associated renewable resources and ecological services have social and economic values for running the metabolism of the surrounding socio-economic systems (fig. 2).

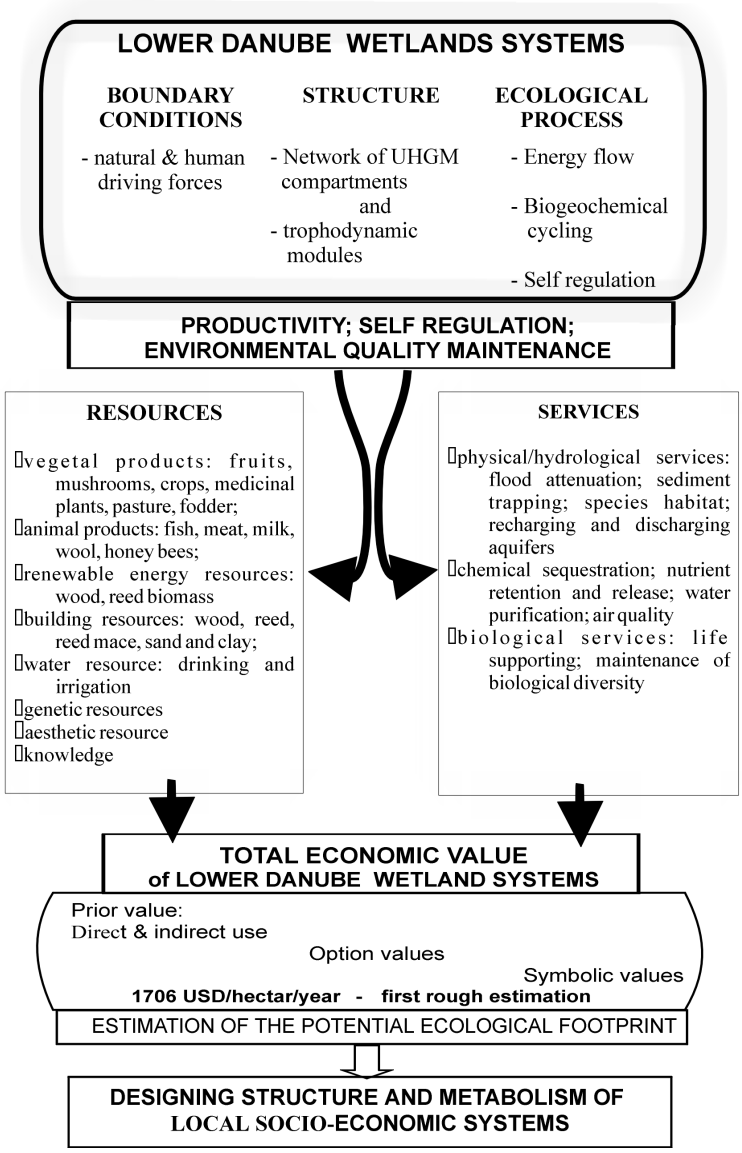

Fig. 2: A framework view on SIB wetland system as resources and services provider (potential footprint) to the local socio-economic system

A first rough estimation of the total economic value for the respective wetlands show a value of 1,706 US$ ha^{-1} y^{-1} (table 2). About 70% of the total economic estimated value comes mainly from three major services: nutrient retention, flood attenuation and maintenance of biological diversity. The positive effects of these services occurs both at local and regional scales. Although not yet valuated, the other two resources related to or delivered by the SIB wetland system, namely knowledge and genetic resources should be also taken into consideration for the SIB and LDWS management plan. The special attention from the academic community, local authorities, components of the civil society and governmental institutions received by the SIB in the last two decades resulted in its recent official nomination as "Natural Park" (Law No.5/2000 and Law No. 462/2001) and international recognition as Ramsar Site (09 July 2001) as well as in its integration in the network of "Special Protected Areas - SPA".

Table 2: Average economic values of the Lower Danube Wetlands (US$ ha^{-1} y^{-1})

Type of Goods and services	Valuation method			
	Direct (tradable goods)	Indirect (mitigation cost)	WP – willingness to pay	Total
Fish biomass	100			
Animal products	50			
Food (vegetable and cereals)	150			
Timber, reed biomass	50			
Honey bees + Medicinal plants	20			
Subtotal	370			370
Recreation			150	150
Nutrient retention		876		876
Flood control		200		200
Biodiversity maintenance			110	110
TOTAL				1706

The use of the productive potential (including services) by avoiding any structural damages or overexploitation and sustainable use for the socio-economic development has been addressed in the management plan.

With respect to the first principle of the Ecosystem Approach it is of a great importance to promote and protect the rights of local people to access and use the resources and services of the ecosystems.

The gained knowledge concerning the SIB dynamics, productivity and carrying capacity, as well as the expertise for designing sustainable economic activities using the SIB as a footprint, has to be applied to other potential components of the ecological footprint of local economy. It should also apply to the design of the structure and metabolism of socio-economic systems itself. In this respect, the SIB has been integrated together with the coastal Danube Delta in the national network of sites for long-term research and integrated monitoring. Extensive research and monitoring programmes are carried out since a few years. A specific Information System dedicated to the transfer towards local policy and decision makers, managers and the general public has been designed and is currently developing.

The Natural Park SIB has to function as a pilot zone for sustainable development. According to the above statements and overall aim, long-term objectives have been established, as follows: i) conservation of

biological diversity and land-waterscapes or ecological structure and its quality, productivity and carrying capacity; ii) improvement and development of understanding and monitoring of the structural and functional dynamics of natural, semi-natural and man-controlled production units or ecological systems of the SIB and its surrounding area; iii) design and development of a local Decision Support System in order to bring into reality the overall aim of sustainability through balancing conservation of natural capital of the area as potential footprint with local socio-economic development. iv) design, development and implementation of an adaptive management plan for balancing the conservation or the sustainable use (including ecological rehabilitation or restoration activities when needed) of the natural capital of the area with the sustainable development of the local socio-economic system.

In order to bring into reality all this knowledge, information and data, apart from the Decision Support System developed, the local community in form of the Administrative Council of the reserve as well as the academic society gathered in form of Scientific Council was involved, and thus addressing the principles 11 and 12 of the Ecosystem Approach.

Conclusion

Same important aspects emerged from this confrontation between theory and practice:

(a) having a scientific based management plan proved to be the best solution for designing the adaptive management plan;
(b) involving the stakeholders proved to be the most difficult issue;
(c) in two major pilot areas from LDWS, namely Coastal Danube delta and Small Island of Braila wetland system, the Information and Decision Support System, as well as the integrated and adaptive management plans are already developed and applied (e.g. Coastal Danube delta) or they must be applied (e.g. SIB wetland system).
(d) Positive and negative experience, especially that related to the public information and involvement in the decision making process or to the way of protecting the rights and interests of local population are currently assessed in order to facilitate the negotiations outside that pilot areas and to improve the management within the areas itself.
(e) The principles of the CBD's Ecosystem Approach were taken into account and they proved more than helpful addressing this kind of complex systems;
(f) The protected areas organized at space and temporal scale according with the principles of Biosphere Reserves seem to provide the most appropriate model for the testing and development of expertise in the field of sustainability.

The high diversity and importance of the floodplain wetlands in the international context as well as the footprint for local socio-economic development are the main reasons for considering special policies and measures for conservation and sustainable use. An integrated management plan for the SIB was established based on the principles of sustainable use and biodiversity conservation. Experiencing its implementation will help to design and implement a long term management plan for the reconstruction of

the LDRS as one of the major components of the ecological footprint of local economics and as a major mechanism for the rehabilitation of the North-Western Black Sea System.

Acknowledgments

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Black Sea Ecosystem Recovery: Policy, Actions, Outcome

VICTOR KARAMUSHKA

The Black Sea Ecosystem

The Black Sea is the most isolated from the World Ocean and one of the most damaged marine area in the world. During last 35-40 years the Black Sea resource and recreation potential has dramatically decreased. Its ecosystem has been evolving from a highly biodiverse ecosystem characterised by a high biological productivity to a ecosystem of low biodiversity dominated by a gelatinous food-chain. The explosive development of opportunistic autotrophic and mixotrophic phytoplankters, and of invasive organisms characterise the instability of the marine ecosystem.

Beside human activities in the region, peculiarities of geographical location and physical parameters of the Sea are causes of additional vulnerability to the ecosystem. The Black Sea is connected to the Oceans via the Marmara and Mediterranean Seas through the Bosporus, Dardanelle and Gibraltar straits. The surface area of the Black Sea is 423,000 km^2, the water volume amounts to 547,000 km^3, the maximum depth is 2,200 m with an average depth of 1,240 m. The catchment area of the Black Sea is over 2 million km^2 and includes the second (Danube), third (Dnepr) and fourth (Don) largest rivers in Europe. The ratio of its surface and its catchment area exceeds 5. The drainage basin covers entirely or partially six littoral countries (Bulgaria, Georgia, Romania, Russian Federation, Turkey, and Ukraine) and 16 other European countries (Albania, Austria, Belarus, Bosnia-Herzegovina, Croatia, Czech Republic, Germany, Hungary, Italy, Macedonia, Moldova, Poland, Slovakia, Slovenia, Switzerland, and Yugoslavia) with more than 160 million inhabitants. The Black Sea coastal zone is densely populated with approximately 16 million inhabitants and with 4 million tourists visiting the seacoast in summer seasons.

For this reason, the Black Sea is very vulnerable to pressure from land based human activities and its ecological structure and functioning is equally dependent from the coastal and non-coastal states of its basin. As a result of the recent decades of inadequate management of marine resources and of the pollution from the economic activities, the ecosystem of the Black Sea is destroyed and drastically reduced in its biological resources.

Perceived Major Environmental Problems of the Black Sea

The Black Sea Transboundary Diagnostic Analysis (TDA) has been conducted by professionals from riparian and partner countries in 1995-97 [1]. According to this analysis, the following problems were identified as most essential:

- Loss of habitats, notably wetlands and shelf areas, supporting important biotic resources; degradation of the Black Sea landscapes;
- Loss or imminent loss of endangered species and their genomes; replacement of indigenous species with exotic ones;
- Decline in commercial fish stocks;
- Inadequate protection of marine and coastal resources from maritime accidents;
- Unsanitary conditions in many beaches, bathing and shellfish-growing waters.

Underlying Causes of Environmental Degradation of the Black Sea Ecosystem

The TDA not only indicated the problems beyond national jurisdictions, but also their roots as well as actions proposed to eliminate them. The identified causes of environmental degradation can be grouped into three clusters: pollution, overexploitation of the resources, and invasion of alien species.

Marine environment pollution by nutrients, heavy metals, oil, and other harmful substances

The Black Sea TDA presented impressive data on pollution introduced into the Sea:
1,035,635 t/year of Biochemical Oxygen Demand (85% of total amount was introduced via river transport); 53,976,963 t/year of Total Suspended Solids (99% was introduced by rivers); 51,726 t/year of total P (82% was introduced by rivers); 391,864 t/year of Total N (62% was introduced by rivers); 111,000 t/year of oil (48% was entering from Danube river). An analysis of the data recorded since 1960 on the changes in the structure and functioning of the Black Sea ecosystem in relation with concomitant changes in nutrient delivery by rivers concluded that man-induced changes in the river watershed (land use, agricultural practices, detergents, hydraulic management) since the 1960s were the driving force of the observed dramatic changes in the Black Sea ecosystem.
The TDA has indicated as well that 30% percent of the nutrients (mainly nitrogen and phosphorus compounds), which causes the most severe problem of the Black Sea in terms of its coverage and impacts on ecosystems (eutrophication), was emerging from countries other than the coastal ones which are located in the wide water catchment basin of the Black Sea. This means that the Black Sea ecosystem cannot be protected without consolidated efforts of all countries located in the catchment area.

Overexploitation of natural resources – reduction of fish stock

By the 1960s, 26 species of fish were considered as commercially valuable; by the 1980s this number declined to five. Landings of fish drastically declined from 360,000 t in 1971 to 250,000 t in 1991 (total in the region). Trends in fish landing are typical for all countries except of Turkey (increase in landings fish by this country was achieved only due to significant increase in fishing efforts).

Invasion of exotic species

The most spectacular and unpleasant example is the introduction of the exotic ctenophore *Mnemiopsis leidyi*. The first specimens were reported in 1982, and until the late 1980s, its total biomass in the Black Sea was estimated as close to one billion tonnes. *Mnemiopsis* feeds on planktonic crustaceans, mollusc larvae and pelagic fish eggs and larvae, which resulted in a sharp decline in anchovy stocks in the Azov and Black Seas.

Policy Development to Protect and Rehabilitate the Black Sea Ecosystem

The basic international document that outlines the framework for common regional principles is the Convention on the Protection of the Black Sea against Pollution (Bucharest Convention), which was signed in 1992 and ratified by all riparian countries by 1994. The main objective of the Convention is to set up favourable conditions for concerted action to preserve the Black Sea's and the Sea of Azov's environment and living resources, taking into consideration the economic, social and health aspects of their pollution. The Ministerial Declaration on the Protection of the Black Sea (Odessa, 1993) outlined the political framework for the implementation of the Convention. It was based on the Rio Declaration and called for immediate, reasonable and continual actions at all levels to protect and, where necessary, rehabilitate the marine environment and ensure the sustainable development of the Black Sea.

Programmatic activities

Following the establishment of the legislative framework for cooperation in the region, the international Black Sea Environmental Programme (BSEP) started in 1993 under support of GEF, UNDP, EC and the coastal states in order to coordinate the endeavours of the Black Sea coastal countries to implement the Bucharest Convention. BSEP Activity Centres and corresponding Focal Points were set up in every participating country and focused on the following main activities:

- Emergency Response,
- Routine Pollution Monitoring,
- Biodiversity Conservation,
- Development of Fisheries and Marine Aquaculture,
- Special Pollution Monitoring, Impact Assessment Programmes and Environmental Quality Standards,
- Integrated Coastal Zone Management.

In spite of the absence of direct references, the BSEP was based on an ecosystem approach and treated the Black Sea like an integrated system.

The first phase of the BSEP ended in 1996 and the Strategic Action Plan was signed in October. A second BSEP phase was started in 1997 to implement national strategic action plans. The GEF/UNDP Black Sea Ecosystem Recovery Project started in 2001 and is aimed to assist the countries of the Black Sea catchment in reducing the levels of nutrients and other hazardous substances to such levels necessary to permit the Black Sea ecosystems to recover to similar conditions as those observed in the 1960s. It is expected that the second phase of the Project will start in August, 2004, and will be completed in 2007.

The international support provided was very important for the capacity building necessary to improve the management of the marine resources and the protection of the marine ecosystem in the riparian countries [3].

Outcome of undertaken cooperative activities in the region

At the level of policy development:

- The Black Sea Transboundary Diagnostic Analysis (1995-97) is completed;
- The Strategic Action Plan (SAP) for the Rehabilitation and Protection of the Black Sea was developed and signed (1996);
- National Action Plans compatible with the regional SAP were developed and approved at national level;
- The Black Sea Contingency Plan was developed and signed (2003);
- The Black Sea Biodiversity and Landscape Conservation Protocol was developed and signed (2002);
- The Protocol on the Protection of the Black Sea against Pollution from Land-Based Sources is in the process of revision (2004)
- The Convention of the Black Sea Fisheries is in the process of development;

At the institutional level:

- The regional coordinating organ envisaged by the Convention (Black Sea Commission and its Secretariat) was established and became operational (2000);
- Network of Emergency Response Centres was established (1994);
- Network of Centres for Routine Pollution Monitoring was established (1994);
- Network of Centres for Biodiversity Conservation was established (1994);

- Network of Centres for Development of Fisheries and Marine Aquaculture was established (1994);
- Network of Centres for Special Pollution Monitoring, Impact Assessment Programmes and Environmental Quality Standards was established (1994);
- Network of Centres for Integrated Coastal Zone Management was established (1994).

The Black Sea Commission and the International Commission for the Protection of the Danube River (ICPDR) have initiated cooperation on a wider Black Sea basin scale (River Basin Strategic Partnership). The portfolio of investment projects of regional significance was prepared and a series of country-related investment projects was executed through the World Bank-GEF Nutrient Investment Facility.

National efforts and regional - international cooperation in the framework of the Bucharest Convention as well as structural changes in the economy of the riparian countries brought the first signs of recovery to the Black Sea. These are according to the report of the Commission on the Protection of the Black Sea Against Pollution [2]:

- Inputs of pollution from the priority sources of pollution are decreasing;
- Inputs of insufficiently treated waters are decreasing;
- Number of oil spills and volume of spilled oil show decreasing trends;
- Content of nutrients in the marine waters are getting lower, - phosphorus has reached the levels of 1960s, although nitrogen is still higher than in 1960s;
- The algae bloom is becoming less heavy and less frequent;
- The biomass and abundance of *Mnemiopsis leidyi* has been reduced following the invasion of the *Beroye ovata* that feeds on this destructive species;
- The abundance of fodder zooplankton is increasing;
- An increase in the stocks of small pelagic fish was reported in the last couple of years.

These optimistic signals shall not hinder the pursuit of existing problems:

- The above changes are unstable and still in the early stages. With any additional pressure, they can revert.
- Algae blooms are still heavy, pollution, although localized, still affects biological communities.
- Fish stocks of commercially valuable species, such as sturgeons and turbots, still drastically suffer from illegal fishing, pollution and destruction of their habitats.
- There are gaps and lack of scientific knowledge and information on many processes and phenomena in the ecosystem that are needed for policy and decision-making.

Therefore, the intermediate target (to prevent the increase of pressures from human activities when transitional economies of the Black Sea coastal states begin to recover) and the strategic target (to achieve environmental conditions in the Black Sea similar to those observed in 1960s) are vitally important for the efforts of national and international communities aimed at the rehabilitation and protection of the Black Sea.

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The Ecosystem Approach in Ukraine

SERGIY MATVYEYEV

In 1991, the adoption of the Law on "Environmental Protection" introduced some elements and principles of the Ecosystem Approach into the legislation of Ukraine. The Law regulates relations in the domain of natural resources conservation, use and recovery, of genetic stocks, of landscapes, other natural complexes, etc. It introduces the concept of integrated management into the domain of nature protection in Ukraine, practising the consistent scientific-technical policies with respect to nature protection and natural resources use, coordinating the relevant practices of ministries and other state executive bodies, of industrial facilities, and of relevant agencies and organizations. The law allows self-government to coordinate practices of local administrative authorities, industrial facilities, agencies and organizations located in the territory of a local Council. It introduces the right to the public to participate in the development of environmental plans and programmes and provides the public with free access to environmental information. The Law on "Environmental Protection" is a basic law, which implies that any legislation related to land, water, forest, flora, fauna and other natural resources has to be developed on its basis. Furthermore, the respective legislation has to contain regulations about the integrated management in the domain of nature protection.

The Water Code of Ukraine was developed on the basis of the Law on "Environmental Protection". This Code defines that the state management in the sector of water resources use, protection and recovery considers the basin principle. The Ministry of Environment and Natural Resources executes integrated management in the field of water resources protection, in the application of the consistent scientific-technical policies with respect to water resource use and protection, and it coordinates the relevant practices of ministries, state departments, (industrial facilities) enterprise, agencies and organizations accordingly.

The strategic direction of the current Ukrainian environmental policy is towards the harmonisation with the European and international environmental legislation. Thus, in 1994 Ukraine joined to the Convention on Biological Diversity (CBD) and some other legal instruments. To fulfil the CBD, the Cabinet of Ministers of Ukraine adopted in 1997 a Strategy for Biodiversity Conservation in Ukraine. The first line of activities in biodiversity conservation defined by the Ukrainian Strategy is the conservation of marine, coastal, and freshwater ecosystems, of meadows and of steppe, woodland and highland ecosystems.

The Strategy for Biodiversity Conservation in Ukraine is realised in line with the objectives of the CBD and in the context of the requirements of the Pan-European Biological and Landscape Diversity Strategy (PEBLDS). With regard to the PEBLDS and the development of a Pan-European Environmental Network, Ukraine developed and adopted the Law on "The State Programme of Ukraine's National Environmental Network Development for Years 2000-2015". It allows for the conservation of typical and valuable ecosystems, in particular through the creation of 29 new national natural parks.

Since 1997, the global environmental movement has faced some changes, new trends and approaches appeared, which resulted into the necessity of a modernisation of the Strategy for Biodiversity

Conservation in Ukraine and in the creation of mechanisms for its realization. The foundation of such mechanisms was laid in the Conception of a State Programme for Biodiversity Conservation in Ukraine, which is currently in the process of adoption. This Conception facilitates the implementation of the Ecosystem Approach (i.e. the integrated management of land, water and living resources) and of an ecosystem based management.

The implementation of the Ecosystem Approach and its principles is a complicated task and can entail some risks. In Ukraine, these are in particular:

- Inertia of awareness and practises of consumption and non-sustainable use of bio-resources;
- Bureaucracy;
- Lack of proper funds;
- Lack of co-ordination between authorities and society groups activities'
- Hasty privatisation.

At the same time, the democratic way of development in Ukraine produces its first results: people implement modern principles of nature conservation and resource management without awaiting the adoption of corresponding laws or programmes. The bright example is the establishment of the National Natural Park "Gutsulshchyna", which was done on the basis of Principle 1 of the Ecosystem Approach: "The objectives of management of land, water and living resources are a matter of societal choice". After catastrophic floods in the Carpathian region, which were mainly caused by deforestation, the local population of the Kosiv district in the Ivano-Frankivsk region began to defend the forests from cutting and demanded to protect them by the creation of a national natural park. Local inhabitants operated both independently and through local self-government. The Ministry of Environment and Natural Resources supported the initiative of the population and in result the new National Natural Park "Gutsulshchyna" with more than 32,000 hectares was created in the Kosiv district of the Ivano-Frankivsk region.

It is necessary to emphasise that the Ministry of Environment and Natural Resources of Ukraine will continue to direct its activity towards the implementation of the CBD and its Conference of the Parties, towards the requirements of the PEBLDS, and in particular, towards the implementation of the CBD's Ecosystem Approach and its principles.

The Ecosystem Approach in the National Environmental Network Development in Ukraine

OLEKSANDR BON

Today, the improvement of the regulatory and legal framework for the preservation, expansion, restoration and protection of areas under natural conditions and the development of a network of landscapes, other natural complexes and unique areas, is of eminent importance for Ukraine. Through the

establishment of special protected areas on its territory, Ukraine contributes to the reduction, prevention and elimination of negative impacts of business and other man-made activities on the environment, to the preservation of natural resources and of the natural gene pool. The Ukrainian environmental management system is developing rapidly and its main goal during this transitional period is to incorporate environmental concerns into the economic and social development policies of the country.

The State Programme of Ukraine's National Environmental Network Development for the period 2000-2015 was developed in the context of the requirements related to the further refinement, improvement and development of the environmental legislation of Ukraine. It is in line with the recommendation of the Pan-European Biological and Landscape Diversity Strategy (PEBLDS) to develop a pan-European Eco-Net as a spatial network of areas in natural or only partly altered state.

The main objective of the Programme is to increase the size of areas under natural conditions to a level, which is sufficient for the preservation of their close to natural diversity. This includes the development of an integrated spatial system built to maintain natural corridors for the migration and propagation of plants and animals. The National Eco-Network should meet the requirements of the Pan-European Eco-Net and perform the leading functions with respect to biodiversity conservation. The Programme should also contribute to the balanced and sustainable use of natural resources in the economy.

One of the main tasks of the Programme is to agree upon the integration of national protected areas with transboundary components for the establishment of the pan-European Eco-Network. The Programme provides for the establishment of transboundary-protected areas of international importance and for the integration of the National Eco-Net with Eco-Nets of neighbouring countries that are members of the Pan-European Eco-Net. This is done, for example, by setting up transboundary elements of the national Eco-Net in cooperation with the Republic of Poland, the Republic of Belarus, the Russian Federation, Romania, the Republic of Moldova, the Slovak Republic and Hungary.

The following shall be the components of structural elements of the environmental network:

- areas and objects of the natural reserve funds being the major natural elements of the environmental network, namely: natural and biosphere reserves, national natural parks, regional landscape parks, sanctuaries (landscape, forest, botanical, general zoological, ornithological, entomological, ichthyologic, hydrological, general geological, palaeontological, and karst/speleological), natural monuments, as well as their protection zones; artificial objects (botanical gardens, dendrological parks, zoological parks, parks being monuments of the landscape architecture);
- water objects (sections of a sea, lake, water reservoir, river), wetlands, water protection zones, coastal protection belts, allocation belts, coastal belts of waterways and sanitary protection zones, which make up the relevant basin systems;
- forests of the first and forests of the second group;
- resorts and curative areas with their natural resources;
- recreational areas for the organisation of public recreation and tourism;
- other natural areas (areas with steppe vegetation, meadows, pastures, rock placers, sands, saline lands, etc.);
- land plots, where plant species and species groups grow that are listed in the Green Book of Ukraine;

- land plots, where species of animals and plants stay or grow that are listed in the Red Book of Ukraine;
- partly, extensively used agricultural lands: pastures, meadows, hay harvesting areas, etc.;
- radioactively polluted lands, which are not used and are subject to special protection as natural regions with specific status.

It is planned to implement the Programme until the year 2015 in two stages (2000-2005 and 2006-2015). At the first stage, it is planned to ensure the increase in the area of individual elements of the national environmental network, to apply economic incentives for the support of their development in lands of all ownership forms, to develop the appropriate regulatory and legal framework, to undertake the necessary scientific research and to undertake organisational actions.

At the second stage, it is planned to bring the area of the national environmental network to the level required for ensuring the environmental security of the country, commissioning a stable system of the environmental actions aimed at the preservation of the landscape and biological diversity.

The Programme implementation will ensure the preservation and restoration of landscape diversity and contribute to:

- maintaining the environmental balance on the territory of Ukraine;
- creating the natural conditions for the life and development of human beings in an environmentally balanced environment brought as close as possible to natural landscapes;
- preventing the irreversible loss of a part of the gene, demographic, cenotic and ecological pool of the country;
- ensuring the balanced and sustainable use of the nature in a considerable portion of the territory of Ukraine;
- developing the resource base for tourism, recreation and making the population healthier;
- increasing the natural resource potential in agricultural lands adjoining the national environmental network;
- improving the regulatory and legal framework for environmental protection and harmonising it with the international legislation;
- developing the Pan-Europian Environmental Network;
- ensuring the restoration of bio- and geochemical turnovers in the environmental, reducing the threat of degradation and loss of fertile lands;
- restoration of lands withdrawn from agricultural use;
- strengthening the coordination of activities of central of local executive agencies, local self-administration bodies, and public environmental organisations, in the field of solving the problems of the environmental security of Ukraine.

The State Programme of Ukraine's National Environmental Network Development for period 2000-2015 is an example for the implementation of the Ecosystem Approach in Ukraine and the actions stipulated by it are directed towards the maintenance of the integrated management of land, water and living resources.

Conservation and Sustainable Use of Grasslands in Slovakia

VIERA STANOVA, JAN SEFFER, DOBROMIL GALVANEK, RASTISLAV LASAK

Background

For many years European grasslands were not recognized as a unique ecosystem representing an association of wildlife and pastoral/mixed agriculture. As a result, the recognition of grassland biodiversity was on a much lower level than in areas such as tropical rainforests or the plains of Africa. Until relatively recently, Europe was a region in which people were a closely integrated part of relatively sustainable ecological system. Human land-use and wildlife had developed alongside each other.

This long association of Central European wildlife and pastoral or mixed agriculture is often overlooked. Some of these systems have been developing for 7,000 years, supporting over 300 generations of people without significant external inputs. Much of Central Europe is essentially a managed landscape - and its grasslands together with the present day wildlife are partly the result of farming systems and partly of activity of large herbivores, including those, which are now extinct or very rare.

Due to Slovakia's geological, geomorphologic and climatic conditions the region is rich in grassland ecosystem diversity. The sustainable management of grasslands should be a top priority because grasslands represent valuable habitats, contribute significantly to Slovakia's biodiversity and contain a high number of threatened and endemic species. 17% of Slovakia's total area is covered with grasslands and 77% of its endemic plants are growing on grasslands (Slovakia's area is 49,036 km² and there are 232 endemic plants in total).

Four main groups of grasslands can be distinguished in Slovakia: 1) dry thermophilic grasslands, 2) mesophilic grasslands, 3) wet grasslands, and 4) alpine meadows, altogether containing 17 types included in NATURA 2000 (STANOVA, V. & VALACHOVIC, M. 2002).

Small-scale species diversity is extremely high in Slovak mountain meadows – a maximum of 75 species of vascular plants/m^2 and 106 species/25 m^2 was recorded at the calcareous grasslands of the Slovensky raj National Park. The grasslands of the Bílé Karpaty Mountains in Czech Republic are famous for their species diversity. 103 species have been reported over an area spanning 24 m^2 (KLIMEŠ 1997). Wooded meadows on calcareous soils in Estonia have an exceptionally high species richness on a small scale - the maximum of 74 species of vascular plants/m^2 was recorded at the Vahenurme wooded meadow (KUKK, T. & KULL, K. 1997).

Threats to Grassland Biodiversity

The development of agriculture since the 1940s has caused substantial damage to natural environments. Traditional land use practices on private lands were almost destroyed and replaced by cooperatives and

state farms. During the socialist period, a high number of subsidies for ploughing and the "intensification" of grasslands destroyed species rich meadows throughout Slovakia's mountain and lowland areas. The use of hybrid seed mixtures, over-fertilization and intensive grazing resulted in habitat degradation and destruction. As a result of such fierce cultivation the biodiversity value was strongly diminished; some vegetation types almost disappeared and many plant and animal species have become rare and endangered.

After the economic and political changes in the 1990s and the transformation to a market based economy, other unique problems have appeared. In particular, the decrease of subsidies has led to dramatic declines in the number of cattle and sheep, which, while often degrading the fields due to overgrazing, at least kept some of the fields open. Subsequently, many unprofitable meadows have been abandoned and the biodiversity of several central European grasslands is seriously threatened as these lands revert to scrubland. In the meantime, surviving cooperatives continue their intense fertilization and ploughing practices.

Mitigation Opportunities

DAPHNE wants to reverse some of the land damage, protect the meadows and grassland from further destruction and ensure that a representative sample of these grasslands and their associated biodiversity survive. The Slovak "Central European Grasslands Conservation and Sustainable Use" project, for which the Medium Size GEF Grant TF 023 781 in the amount of US$ 0.750 million was approved and become effective under the Letter of Agreement between the International Bank for Reconstruction and Development acting as implementing agency of the Global Environment Facility and DAPHNE – Institute of Applied Ecology of June 8, 2000. It was the first World Bank biodiversity project with the non-profit institution acting as executing agency.

The following mitigation opportunities were identified in the project document:

- It is necessary to develop a multilevel approach – research, management planning and the implementation of their results in the targeted model areas will help prepare an information framework for increasing public awareness and accelerating actions on a national level.
- Policies having a perverse impact on the management of the meadows will be identified and incentive schemes for adopting biodiversity friendly practices developed to provide a framework for grassland management.
- National inventory and development of grassland information system will help to plan and realize appropriate actions for protection of grassland biodiversity within entire Slovak territory.

Project Objectives

Specific objective of the Project is to Assist Slovakia in maintaining representative samples of unique grassland ecosystems and their biodiversity in both protected areas and in productive landscapes, through the promotion of management practices for restoration, conservation and sustainable use.

In particular, the Project is aimed to promote the sustainable use of the meadows of the Slovensky raj National Park (SrNP) and the Mala Fatra National Park (MFNP), and grassland restoration in the Morava River floodplain and the Olsavica valley through:

(a) The preparation and implementation of scientifically sound and consensus based restoration and management plans;
(b) The analysis and introduction of incentives to encourage farmers to adopt biodiversity friendly and sustainable meadow management practices;
(c) Development of a Slovak Grassland Information System as information framework for the preparation of a national policy for grassland biodiversity conservation;

Status of Project Implementation: Planning - Preparation of Management and Restoration

Development of Management Planning Guidelines

As Management Plans were to be elaborated it was soon realized that the existing Slovak conservation management planning methodology was not comprehensive enough to support management planning for NATURA 2000 sites, international standards had to be used. Therefore, the management planning exercise started with the review and discussion of a few European conservation-oriented management-planning guidelines. Simultaneously, the new nature conservation legislation compatible with the EU Birds and Habitats Directives and other sites of international importance has been prepared. The working group included experts from State Nature Conservancy and DAPHNE.

The Management Planning Guidelines (MPG) have become a very detailed and practical tool for elaborating management plans for the project's pilot sites. Furthermore, the structure of the management plan according to the MPG was incorporated into the new Regulation of the Ministry of the Environment of the new Act No. 543/2002 about Nature and Landscape Protection. The Regulation is one of the administrative tools for the implementation of the new Act.

Preparation of management and restoration plans for pilot sites

Mala Fatra and Slovensky raj are national parks located in the Western Carpathians. The management plans were finished in December, 2002 and submitted to the State Nature Conservancy (SNC). According to an agreement with SNC, the implementation started in 2003. The functioning of the Management Planning Guidelines was tested on these two pilot sites.

In the Morava River floodplain, where DAPHNE has long-term activities, the main focus was put on the restoration of arable land in the active floodplain area to grasslands (SEFFER et al. 1999). The restoration plan was finalized in June 2001 and is already under implementation.

Olsavica Valley is a rural and remote area. Until the 1960s it was a typical Carpathian landscape with traditional land use in narrow strips of fields and grasslands on hills. The field terraces, which originated from ploughing on contour lines, did not only protect against soil erosion but created the original landscape image and provided for rich biodiversity. The intensification of agriculture was pursued between the 1960s and the 1980s. Terraces were destroyed, the whole area and wetland systems were drained by underground drainage and grasslands were changed to arable land. Cereals started to be produced on unfertile mountain soils. In the 1990s, soil erosion and floods became quite frequent as negative consequences of landscape structure change. Local people, who are all related to land as landowners or users are dependent on agriculture.

For the outsider, it is quite clear that farming practices and landscape structure should be changed. However, a change of mind in the local community (especially farmers) is not easy to achieve, because many of them still believe that all the technical measures, which were implemented on their land, were useful and represent progress and development. The strategy of the project was to cooperate with water and soil management specialists, which are authorities not only for local people, but also for regional governmental institutions (water management, agriculture, land cadastre) what is crucial to secure restoration actions and results in the future. The cooperation with the Technical University from Bratislava was crucial for convincing stakeholders of the implementation of the restoration plan. It was clearly documented by experts that the intense erosion is due to current farming practices and will impair future generations. Against this background the project finally achieved the commitment of farmers to cooperate and to implement the restoration plan.

At the beginning of this activity DAPHNE was asked by a local NGO to implement a participatory approach focused mainly on the local community - well known in Western countries. DAPHNE refused this “temptation” because the experiences gained in the Morava floodplain showed that a successful restoration activity needs a solid base of scientific knowledge from different fields – ecology, soil and water management are crucial. This is very important for scaling up, because even if it is possible to convince local communities of “green” arguments, the change of minds in “technocratic” institutions on the regional and national scale by ecological arguments only, however, proved to be much more difficult.

Implementation of Management and Restoration

Morava River

The restoration plan was implemented in the middle section of the river in the years 2001 and 2002. 130 ha of arable soil were restored by a private farm, which manages arable land that was selected for restoration and seeded with a native seed mixture. The lower part of the Morava river floodplain was declared as one of the pilot areas where agri-environmental measures in the frame of the SAPARD programme were applied, as result of the successful lobbying of DAPHNE at the Ministry of Agriculture. DAPHNE helped in rising public awareness and assisted farmers with the preparation of the projects. The information seminar on agri-environmental programmes was held in September 2003 organised in co-operation with the Society for Protection of Birds in Slovakia and the SAPARD Agency. The seminar provided the necessary information on how to prepare agri-environmental projects.

Although only three farming companies prepared respective projects in the Morava river floodplain, all of them were main land users in the area. 765 hectares of grassland were certified in the Morava river floodplain. They represent 66% of all grassland in the lower part of the floodplain area. The farmers should be contracted to manage these grasslands according to the conservation limits for a period of five years. Starting from summer 2004, farmers, who were not yet included into the agri-environmental programme, can apply for projects for the sustainable management of valuable grassland.

Olsavica Valley

A participatory approach to identify, design, and undertake the implementation of sustainable grassland management was used. The implementation of the restoration plan started in 2003 and was conducted by the local agricultural farm Olsavica-Brutovce, which is the main partner and stakeholder in the region. Its main task is grassland restoration on 41 hectares, which are located on sloppy hills above the village and which were specified in geodetic plan. A locally specified hybrid seed mixture was used, containing eight grass species. In 2003, ten hectares were restored and the rest will be done in 2004. The main goal is to achieve ecosystem functioning of grasslands, e.g. to have as dense herb root systems as possible to slow down erosion and to secure the capacity to retain water. For increasing of biodiversity of restored grasslands valuable grasslands in the surrounding were selected, which are mostly not managed any more. Restoration management and mulching of these grasslands was done in late summer on area of 5 hectares. Grasslands will be mowed in summer 2004 and its biomass, containing ripe seeds of native species will be distributed on the restored grasslands enriching their species composition.

Mala Fatra

The management plan for the park and its buffer zone was prepared by the NP administration in close cooperation with DAPHNE. The management encompasses 2,189 ha of grasslands with a very complicate ownership structure including small private owners, companies, community ownership and big cooperative farms, operating on rented land. At least 800 landowners are involved in the negotiations on the implementation of grassland management plans. The project approach is not to solve the implementation of the management plan, this will be the task of the SNC in the future, but to show positive examples and to motivate farmers to manage valuable grasslands for biodiversity by pilot restoration measures. It will allow them to fulfil conditions for future and sustainable financing from the agro-environmental programme.

The project team selected priority mountain grasslands, which are mainly located in the buffer zone of the park and most threatened and most valuable. In spring and early summer, owners and users of pre-selected grasslands were visited and conditions for management and sustainability were discussed and contracts were prepared and signed. The two biggest cooperative farms were willing to participate. The agricultural farm Parnica realised the cutting of trees and shrubs on overgrown grasslands of 45 hectares, which will allow them to include these grasslands into the agro-environmental programme, which is accessible for open and managed grassland only. The agricultural farm Nova Farma is another big stakeholder for the project, having more grassland than they can use. They are not willing to manage a quite substantial part of traditionally used grasslands located in the tourist centre of the National Park and attracting many tourists. It was agreed that Nova Farma would do clearing of trees and shrubs on 37.4 ha of overgrown grasslands in the NP and on 8 ha in buffer zone. Restoration mowing and grazing of

degraded parts will be done as well. The majority of work will be done in 2004, but some restoration management measures were implemented in 2003 already.
Valuable abandoned dry grasslands with orchids are located in the buffer zone of the National Park in the vicinity of the village Dolna Tizina. The pre-selected grasslands are community-owned. Clearing of grasslands was done on an area of 11.2 ha. The community of Dolna Tizina is interested in securing the future management of grasslands and DAPHNE will assist with the preparation of a project on agro-environmental schemes.
Most problematic and at the same time valuable are grasslands in the vicinity of the village Bela pri Varine. The grasslands are owned by small owners - some owning as little as 0.3 ha. These grassland owners are neither registered as farmers nor interested in traditional grassland management. It was difficult to define and find these owners, local media, the municipality office and the major as well as individual consultations were involved. Finally, contracts were signed with four individuals and restoration management was implemented on an area of 3 hectares. The area is dedicated by the NP administration as an example for the reintroduction of traditional management practices to other stakeholders.

Slovensky raj

The management plan for the park and its buffer zone was prepared by the NP administration in close cooperation with DAPHNE. There are 1,621 ha of grasslands in similar conditions as in Mala Fatra and both areas may serve as demonstration sites for other parks in the Carpathians. The majority of grasslands is located in the National Park and NP administration prefers to cooperate with bigger owners and with agricultural farms.
Priority attention was paid to securing the sustainable management of calcareous species rich grasslands, belonging to hot-spots concerning species richness in Europe. A contract was signed with the agricultural farm Hranovnica, which is user of most of these sites. Hranovnica agreed to do claering of trees and shrubs on an area of 35 hectares and to do restoration mowing and mulching on an area of 32 hectares. Restoration management started in 2003 and 10 hectares of grasslands were mowed.
With funds by the EECONET Action Fund (EAF), DAPHNE bought 15 hectares of scattered grassland spots from small private owners in this part of the NP. In the frame of the cadastre reform, DAPHNE applied for alternative land use in the most valuable complex of Kopanec grasslands, to be able to secure sustainable management. The municipality office of Dedinky was also involved into the project with restoration mowing of 5 ha of grasslands in the vicinity of the village.
The project bought a mowing machine for the NP administration to enable the manage of valuable and hardly accessible grasslands in remote and sloppy areas by park rangers. In 2003 the machine was tested on 2 hectares of grasslands in the nature reserve Male Zajfy. From own resources the NP administration arranged the management of 10.5 ha of grasslands in the localities of Kopanec and Nizna zahrada.

Development of an Information and Monitoring System for the Grasslands

In 1998, the National Grassland Inventory in Slovakia was initiated with the preparation of a methodology and the training of mappers. The aim of the project is the inventory of grasslands with

natural species composition in Slovakia. The results of the mapping are processed into a database and digitized for GIS, creating a national Grassland Information System. After the first year of the mapping it became the most comprehensive information system on non-forest habitats in Slovakia. It covers the data of about 11,184 grassland polygons (localities) and of 635,777 higher plant species records in these polygons (situation on March 12, 2004). The System covers 61.9% or 844,000 hectares of the potential grassland area in Slovakia. According to the preliminary results of the inventory it is estimated that in Slovakia there are approximately 312,000 hectares of grassland with natural species composition.

The mapping follows the grid of military maps in the scale 1:25 000 covering the whole territory of Slovakia. The area with the expected presence of grassland is printed on field maps. The expected occurrence is based on satellite image analysis. Since 1998, about 100 vegetation experts were involved into the inventory. The completion of the national inventory is envisaged for 2005.

The Grassland Information System played an important role in the process of the NATURA 2000 areas identification in Slovakia. Currently, more than 50,000 ha of valuable grasslands are included into the Governmental proposal of protected habitat sites.

At the end of the year 2003, the Grassland Information System was used as a base for a subsidy system for Agri-Environmental Schemes within the Rural Development Plan and its pilot program SAPARD. Only high quality grasslands included into the Grassland Information System received subsidies based on a certificate from DAPHNE. Fifteen certificates were prepared for the farmers from the SAPARD pilot areas in an area of 6,600 ha.

In the implementation of the Rural Development Plan (2004 – 2006) and specifically of its scheme for the protection of natural and semi-natural grassland, DAPHNE will be responsible for the certification of farmers on sites with natural and semi-natural grasslands according to our Information System on Grasslands. Together with management, measures will be recommended.

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Protection of Ecosystems in the Republic of Macedonia and Future Activities

SASHKO JORDANOV and ROBERTINA BRAJANOSKA

The Republic of Macedonia is situated in the central part of the Balkan Peninsula and occupies an area of 25,713 km^2 with 40% forests, 51% agricultural lands and 9% non-productive land. The richness and heterogeneity of species and ecosystems appear to be the basic characteristics of the biodiversity in the Republic of Macedonia. Biodiversity in Macedonia is represented by over 18,000 taxa of flora, fauna and fungi, of which over 900 are endemic taxa. Based upon an analysis of biodiversity richness within the countries of the European continent, the Republic of Macedonia holds the top position on the "European Hotspot" list.

A case-study on the implementation of the CBD's Ecosystem Approach in the Republic of Macedonia has not been prepared yet. The principles of Ecosystem Approach are considered in the National Biodiversity Strategy and Action Plan, prepared in 2003 by the Ministry of Environment and Physical Planning (MoEPP). The main objective of the Strategy is to protect biological diversity and to ensure its sustainable use for the benefit of people, taking into account the unique natural values and the rich tradition of the Republic of Macedonia.

The Biodiversity Strategy includes some issues, which are connected to the Ecosystem Approach:

1. Data on the key ecosystems in the Republic of Macedonia
2. Key sectors affecting biodiversity
3. Identification of fundamental causes for biodiversity loss
4. Direct causes for biodiversity loss
5. Protected areas network as a model for biodiversity conservation
6. Legal and institutional framework for biodiversity conservation
7. Priority activities for biodiversity conservation

Ad 1: Key ecosystems

The richness and diversity of ecosystems within the state territory is a result of the heterogeneity of natural conditions, such as relief and geological features, climate, soils etc. In accordance with their importance, range, genetic and species diversity richness, ecological functionality, as well as economic values, the following key ecosystems may be distinguished in the Republic of Macedonia:

- Forests
- Dryland/grasslands
- Mountains
- Aquatic ecosystems/wetlands

Ad 2: Key sectors affecting biodiversity

With regard to the significance of their individual impacts on biodiversity, the different sectors can be preliminary ranked as follows:

- Agriculture
- Transport

- Energy
- Industry and mining
- Tourism
- Forestry
- Fishing
- Civil engineering

Ad 3: Fundamental causes for biodiversity loss

- A low level of education and a lack of information, especially in rural areas, which has contributed to a low awareness in the common public concerning the relationship between human activities and the environment, the sustainable use of biological resources and the sustainable transfer of biotechnology.
- Growing poverty, which inhibits the recognition of the principles for sustainable development.
- Inadequate and incomplete legislation, which fails to clarify duties or to address the overlap in responsibilities and competencies within the agencies responsible for enforcement.
- Non-compliance with existing regulations.
- Outdated spatial planning with insufficient continuity, improper land use changes, construction of infrastructure systems and previous agricultural conversion.
- Uncontrolled urbanisation, abandonment of traditional land use and industrialisation.
- The continual process of migration of the population from villages to towns. Increased concentrations of people in urban centres represent a growing problem not only from the global, socioeconomic point of view, but also under spatial aspects.
- Stagnation of the economy and use of outdated technologies, low energy efficiency resulting from low economic power and lack of treatment of wastewater and waste gases, which leads to the pollution of air, soil, surface waters and groundwater.

Ad 4: Direct causes for biodiversity loss

The direct causes of biodiversity loss are many and varied. Most of them are common to all types of biodiversity, while some are specific to either flora, fauna or ecosystems:

- Inadequate water management in aquatic ecosystems
- Drainage of marshes and swamps
- Construction of hydropower reservoirs in river gorges
- Lack of water treatment plants (concerning riverine and lake ecosystems)
- Mine excavations and other geological works
- Construction of ski lifts, transmission lines, television transmitters and other antenna systems
- Loss of habitats (or their parts) through unplanned expansion of urban centres, weekend settlements and tourist-recreation zones
- Modification and fragmentation of habitats, mainly due to traffic infrastructure, where highways intersect habitats that are important as vertebrate corridors (particularly for large mammals). When aquatic habitats are artificially fragmented, recommendations for maintaining ecological minimum flows in watercourses are not followed
- Destruction of areas with natural vegetation (halophytic and meadow)

- Uncontrolled destruction of forests through forest fires and clearing in order to provide building land, for the construction of roads and railroads, for the expansion of tourist settlements and through forest desiccation
- Uncontrolled collection of medicinal plants, fungi and wild animals.

Ad 5: Protected areas network as a model for biodiversity and ecosystems conservation

- *National protected areas network*

  The network of protected areas in Macedonia includes 74 entities of nature with a total area of 187,895 ha, i.e. 7,31% of the national territory. The largest part of the protected areas belongs to the National Parks (Pelister, Mavrovo and Galicica) and represents 4,22% of the country's area (see table 1). The categorization of protected areas is done according to the Law on Protection of Natural Rarities ("Official Gazette of SRM" No. 41/73).

Table 1: Categories of protected areas in the Republic of Macedonia

PROTECTED AREA	NUMBER	AREA (IN HA)	% IN RELATION TO THE STATE AREA
National Park	3	108,338	4.22
Strict Nature Reserve	4	12,855	0.50
Area with Special Natural Characteristics	3	2,338	0.09
Individual plant and animal species	14	2,709	0.10
Natural Monument	50	61,655	2.40
TOTAL	74	187,895	7.31

The new Law on Nature Protection, which is in Parliamentary procedure and expected to be adopted soon, incorporates the IUCN criteria related to the categorization of protected areas. In that regard, the following categories have been incorporated:

- Strict Nature Reserve
- National Park
- Natural Monument
- Natural Park
- Protected Landscape
- Managed Resource Protected Area

- *Emerald Network*

  The development of the Emerald Network in the Republic of Macedonia started in February 2002 after signing the project contract between the Agency of Environment within the Ministry of Environment and Physical Planning and the Council of Europe. The objective of the pilot-project was to develop a pilot database containing a fair proportion (10%) of the Areas of Special Conservation Interest (ASCIs) that will be included in the National Emerald Network. The pilot-project is a starting point that will lay the basis for development of the Emerald Network at the national level. In the pilot phase, three sites were selected: National Park Galicica, Strict Nature Reserve Ezerani and Monument of

Nature Dojran Lake. The selected sites were declared to the Standing Committee of the Bern Convention in February 2003. In April 2004, the second phase for the development of National Emerald Network started, in which about 30% of ASCIs will be selected and submitted for designation to the SC of Bern Convention.

- *Pan-European Ecological Network*
  The Pan-European Ecological Network (PEEN) was formulated as part of the Pan-European Biological and Landscape Diversity Strategy and endorsed by the Third Ministerial Conference "Environment for Europe" in Sofia 1995. The project "Indicative map of PEEN in South-Eastern Europe" started in mid 2003, coordinated by ECNC. It aims to outline the contours of the PEEN in this region with identification of core areas, existing corridors, buffer zones and stepping stones.

Ad 6: Legal and institutional framework for biodiversity and ecosystems conservation

I Organizations involved in biodiversity conservation and management

1. Government of the Republic of Macedonia
   The National Committee for Biological Diversity, established by a decision of the Government of the Republic of Macedonia as a State obligation arising from the CBD. Its objectives are to monitor the implementation of the Convention at the national level, and to contribute to quality decision making on biological diversity conservation issues by the MoEPP
   The MoEPP conducts activities related to: monitoring of the state of the environment; conservation of water, soil, biodiversity; protection of geodiversity; protection of national parks and other protected areas etc.
   The Ministry of Agriculture, Forestry and Water Management conducts activities related to: agriculture, forestry and water management; use of agricultural land, forests and other natural resources, hunting and fishing; protection of livestock and plants from diseases and pests etc.
2. Public institutions for the conservation and management of biodiversity
   - National Parks Administration
   - Administration of the National Park Pelister
   - Administration of the National Park Mavrovo
   - Administration of the National Park Galichitsa
3. Local structures: The new Law of Nature Conservation regarding local communities delegates the authority for nature conservation to the local level. There are no organisational structures in place specifically for biodiversity conservation in local communities.
4. Non-governmental organizations (NGOs): Within the Republic of Macedonia exist and work over 50 NGOs on the issues of biodiversity conservation. Their priority areas are education in environmental issues, nature protection, public participation etc.

II National legislation

1. Constitution of the Republic of Macedonia (1991)
   According to the Constitution of the Republic of Macedonia environmental protection and promotion are fundamental values of the constitutional order of the Republic: “All the natural resources of the Republic of Macedonia, the flora and fauna, amenities in common use, as well as

the objects and buildings of particular cultural and historical value as determined by law; are items of common interest for the Republic and enjoy particular protection."

2. Laws related to biodiversity and ecosystems conservation
   - Law on the Protection of Natural Rarities (1973),
   - Law on the Protection of National Parks (1980),
   - Law on the Conservation of Ohrid, Prespa and Doyran Lakes (1977), which at the same time is an Act of proclamation,
   - Law on Environment and Nature Protection and Promotion (1996, 2000, 2002).
3. Laws of other sectors related to biodiversity and ecosystems conservation:
   - Law on Forests (1997),
   - Law on Pastures (1998),
   - Law on Hunting (1996),
   - Law on Fishing (1993),
   - Law on Cattle Breeding (1997),
   - Law on Veterinary Health (1998),
   - Law on Plant Protection (1998) etc.
4. New Law on Nature Conservation

   The Ministry of Environment and Physical Planning prepared a new Law on Nature Conservation, which is in a Parliamentary procedure and is soon expected to be adopted by the Parliament. The Law includes conservation of species, habitats and ecosystems.

III International agreements

The Republic of Macedonia has ratified the following international documents in the field of biodiversity and ecosystems conservation:

- Convention on Biological Diversity (Rio de Janeiro, 1992), ratified in 1997;
- Convention on the Conservation of Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar, 1971), ratified 1977. The Republic of Macedonia accessed this Convention by succession from former Yugoslavia in 1991;
- Convention on the Protection of World Cultural and Natural Heritage (Paris, 1972), ratified 1974. The Republic of Macedonia accessed this convention by succession from former Yugoslavia in 1991;
- Convention on the Conservation of the European Wildlife and Natural Habitat (Bern, 1979), ratified in 1997;
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979), ratified in 1999;
- Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) (Washington, 1973), ratified in 1999;
- European Convention on the Protection of Vertebrata Animals used for Experimental and Other Scientific Purposes (Strasbourg, 1986), ratified in 2002;
- Agreement on the Conservation of Bats in Europe (London, 1991), ratified in 1999, (Amendment to the Agreement ratified 2002);
- Agreement on the Conservation of African-Euroasian Migratory Species of Waterfowls (Hague, 1995), ratified in 1999;
- Cartagena Protocol, signed by the Republic of Macedonia in 2000;

- European Convention on Landscape Diversity (Florence, 2000), ratified 2003.

Ad 7: Priority activities for biodiversity conservation

⇨ Implementation of the National Biodiversity Strategy and Action Plan.
⇨ Preparation of case-studies for the CBD's Ecosystem Approach.
⇨ Implementation on the principles and guidelines of the CBD's Ecosystem Approach to achieve the integrated conservation and management of land, water and living resources.
⇨ Integration of the CBD's Ecosystem Approach into agriculture, fisheries, forestry and other sectors that affect biodiversity.
⇨ Capacity building for CBD's Ecosystem Approach (CHM, strengthening the capacity of responsible authorities - ministries, agencies, local communities, NGOs).
⇨ Adoption of a new Law on Nature Protection
⇨ Preparation of the National Nature Protection Strategy
⇨ Preparation of the National Strategy for Sustainable Development
⇨ Development of Ecological Network as an important model for biodiversity protection
⇨ Establishment of transboundary protected areas as a model for biodiversity conservation
⇨ Preparation of management plans for protected areas.

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Management and Protection of Biodiversity in Agricultural Landscapes

LECH RYSZKOWSKI AND JERZY KARG

1 Reconciliation of Agriculture with Biodiversity Protection

Agriculture and living resources protection seem to be contradictory activities for many people. The argument usually put forward is that farmers striving for higher and higher yields try to eliminate all competitors to crops for water, nutrients and place. Thus, wild biota are eradicated from cultivated fields and from their vicinity if there is the possibility that they can easily invade arable land. The elimination of refuge sites, use of pesticides, tillage activities, change of soil moisture conditions etc. are endangering

the existence of many plant and animal species. One can conclude therefore, that the interests of agriculture and nature conservancy are contradictory.

The pressing need to feed increasing numbers of people makes it obligatory to intensify food production, which leads to productivity enhancing technologies on already cultivated areas due to lack of significant virgin ecosystems, which could be converted into cultivated fields. One therefore can expect widespread appearance of environmental threats. Erosion, pollution of ground and surface waters, shortage of water resources and impoverishment of biodiversity were recently recognized not only by scientists but also by decision makers and stakeholders as factors undermining prospects of efficient production. Thus, the world started to look for new models of modern agriculture to satisfy growing population demands, which simultaneously could retain improving yields and providing incomes while being more environmentally friendly. Problems of living resources protection have become the central theme not only among biologists but also in political and administration bodies. These concerns culminated in the proposal of the Convention on Biological Diversity (CBD) during the World Summit in 1992 being the clear expression of the recognition of the importance of biodiversity protection by politicians.

In the follow up to the CBD, several policies were recommended by the Council of Europe as well as by the European Commission such as the Pan-European Biological and Landscape Diversity Strategy, the European Ecological Network, or NATURA 2000. In all those policies the integration of nature protection with sectoral activities was stressed. This claim indicates the substantial change from the previous point of view that nature should be shielded against human activity in order to ensure its successful protection. The reason for that change, still opposed by many biologists, was stimulated by an emerging consensus that the way, in which the resources have been used, rather than the fact that they are used at all, has caused threats to nature. With respect to agriculture, the possibilities that agriculture could be integrated with biodiversity protection are related to a change of cultivation technologies (SRIVASTAVA et al. 1996) and to the management of the agricultural landscape structure in order to provide survival sites for biota (BALDOCK et al. 1993, RYSZKOWSKI 1994, 2000).

In the declaration of the Pan-European Conference on Agriculture and Biodiversity (2002) held in Paris on 5-7 June 2002 and organized by the Council of Europe, UNEP and the French Government, the multiple functions of agriculture were clearly recognized. Beside providing food and fibre for people, agriculture can also sustain biodiversity and landscape structure, which are providing other goods and services. The options for biodiversity conservancy and landscape-sensitive management in “the wider countryside through agri-environmental programmes” were emphasized. The recognition of the relationships between the structure and functioning of landscapes and biodiversity protection in rural areas during the Paris conference was an important political step in search for guidelines of reconciliation of agriculture and biodiversity protection.

The CBD’s Ecosystem Approach provides more detailed grounds for the reorientation of nature protection activities. The Ecosystem Approach is “a strategy for the management of land, water and living resources that promotes conservation and sustainable use in an equitable way” (SMITH and MALTBY 2003). This definition corresponds well to the ecosystem concept proposed by TANSLEY (1935) that an

ecosystem is consisting of organisms and of a whole complex of physical factors interacting between themselves and constituting the system. The integrity of biological and physical or chemical processes is the basic foundation of a modern ecosystem or landscape ecology approach. The recognition of this functional relationships leads to conclusion that biodiversity cannot be successfully protected by isolation from a hostile surrounding only, but by the active management of the landscape processes aiming at minimising threats (RYSZKOWSKI 2000, 2002).

In Poland the protection of biodiversity is guaranteed by the Nature Protection Act and many other regulations including the National Ecopolicy approved in 2001 by the Parliament. The Polish Strategy of Protection and Sustainable Use of Biological Diversity was enacted by the Polish Council of Ministers in 2003 fulfilling the regulation of the National Ecopolicy. The Council of Ministers stated in this last document that the nature protection activities, which have been carried out hitherto, were not sufficiently successful and recommended the following actions:

- The protection of biodiversity should encompass the whole territory of the country, not only already protected areas.
- New methods of biodiversity protection, especially in rural areas, should be invented and implemented.
- A set of biodiversity indicators should be invented to monitor efficiency of the protection policies.
- The enhancement of biodiversity should be observed in all sectoral policies relevant for the implementation of sustainable development.
- The achievement of stakeholder participation in programmes of biodiversity protection, adjusted to regional conditions, is crucial for the protection of biodiversity.
- Efforts should be increased to reach a better recognition of the biodiversity status and to disclose the reasons of its impoverishment.
- A sustainable development policy of rural areas is badly required, in which biodiversity protection will play an important role.

The timetable for the implementation of these recommendations is also included in the Polish Strategy of Protection and Sustainable Use of Biological Biodiversity.

2 Landscape Diversity and Biological Diversity

To show the prospect for biodiversity protection in mosaic agricultural landscapes, the results of long-term studies that were carried out by the Research Centre for Agricultural and Forest Environment in the neighbourhood of Turew village located in the Wielkopolska region, Poland, are presented. These complex landscape studies include climatic, soil, water; relief characteristics as well as information on energy fluxes, matter cycling, as well as plant and animal communities (RYSZKOWSKI et al 1996, RYSZKOWSKI 2002b).

The vicinities of Turew in the western Wielkopolska region of Poland are distinguished by a specific agricultural landscape formed at the end of the 1820s by the introduction of shelterbelts (small afforestations

in cultivated fields). The area of about 10,000 ha surrounding Turew became at that time the field of activities of one of the outstanding agriculturists in that part of Europe – General Dezydery Chłapowski.

The agricultural landscape in the neighbourhood of Turew is now abundant in shelterbelts (in the form of strips, alleys and clumps) located in upland parts of the landscape or along the banks of the drainage water system as well as in other non-crop habitats, such as small water reservoirs, meadows, canals, marshy habitats and so on.

The component with most advantages for the landscape are the shelterbelts. Some of them were planted in the 19th century, others in the 1950s and more recently in 1995-2003. There are more than 800 shelterbelts forming a network on an area of 17,200 ha. Cultivated fields make 70% of the total area, forests and shelterbelts 15% and grasslands 9%.

The studies on plant and animal communities appearing in the Turew landscape were synthesised in publications of KARG and RYSZKOWSKI 1996, RYSZKOWSKI and KARG 1996, and RYSZKOWSKI et al. 2002.

In long-term studies on animal communities in the agricultural landscape, it was found that the mean biomass of total above-ground insects is almost four times higher in perennial crops and meadows than in spring cereals, while winter cereals and row crops show intermediate biomass values. Grasslands and tree patches show the highest biomass of herbivores and predators, and perennial crops like alfalfa show an intermediary level of biomass in comparison to cereals cultivations. Estimations on insect larvae biomass in the soil also show the highest values in stretches of meadows, moderate values in alfalfa and the lowest ones in the cereal cultivations.

Quantitative analyses indicated that both, invertebrates and vertebrates as well as plants and fungi communities are considerably richer in the mosaic landscapes of Turew than in uniform ones. During ten years of studies carried out in mosaic landscapes, the occurrence of 59.6 insect taxonomic families with a mean density of 61.9 indiv.·m^{-2} and a biomass of 55.0 mg d.w.·m^{-2} were reported. In the uniform landscapes 49.1 taxonomic families with a mean density of 40.7 indiv.·m^{-2} and a biomass of 40.3 mg·m^{-2} were detected. The studies carried out simultaneously in Poland and in Romania on the above-ground insect fauna in uniform and mosaic landscapes showed similar results (RYSZKOWSKI et al. 1993).

The animal species of the Turew agricultural landscape with its many refuge sites represent a considerable share of the faunistic inventory of the total Wielkopolska region. For instance, despite a relatively poor water network in the studied area, the occurrence of 36 dragonfly species (Odonata) were found, that is 50% of the recorded species in the whole country; 40 species of water bugs (Heteroptera) were detected, which constitute 80% of the species number known in the Wielkopolska region; and more than 90 species of water beetles were found, which makes 62% of the water beetle species in the region. Among terrestrial invertebrates, high species diversity was found in mites (Acarina), Macrolepidoptera, and Apoidea.

Among vertebrates 12 species of amphibians were found, which represent the complete list of these animals appearing in the lowland areas of Poland. High species richness and abundance are characteristic

for the avifauna of a mosaic agricultural landscape. In the different types of shelterbelts in the vicinities of the Turew landscape, the density of breeding pairs was found to be between 181-226 per 10 hectares (KUJAWA, 1997). About 70 bird species are nesting in the shelterbelts and, including the migratory birds, the total number of species observed in Turew shelterbelts amounts to 89 species (KUJAWA personal information). These numbers are significantly larger than the densities reported for forest ecosystems. The observed number of species in forests is lower and varies from 25 to 55 (JERMACZEK 1991, TOMIAŁOJĆ 1984). This indicates a very high diversity of the bird species in agricultural landscapes with shelterbelts. Also the structure of the mid-field afforestations influences the bird species diversity. The highest number of species is detected in small mid-field patches of forests and shelterbelts composed of several parallel rows of trees, and the lowest one is found in one row alleys. During the last 30 years, no larger changes, except an increase in the number of species (from 44 to 52), have been found in the composition of the bird community of the agricultural landscape in the neighbourhood of Turew (GROMADZKI 1970, KUJAWA 2002).

The mammal community is composed of 47 species, which approximate almost the total number of species, which can be found in the region.

The similar situation was observed in plant communities. The number of species found in cultivated fields only amounts to 200 vascular plant species. However, the survey of the total mosaic landscape including grasslands, afforestations, and water reservoirs, resulted in more than 800 identified species. The stretches of grasslands show the highest diversity. As many as 14 totally protected and 9 partially protected species exist in the studied mosaic landscape. Beside that, 44 species were found that are threatened according to the red book list. The highest number of protected and threatened species appears in small patches of grasslands and in water bodies.

The presented results of the long-term, complex studies clearly indicate that impoverishment of the biota caused by agriculture could be modified by maintaining or introducing diversified landscape patterns. The survival of specific biota apparently depends on the presence of refuge sites providing better conditions for survival. The less disturbed by tillage activities the habitats are, the better conditions for survival they provide. The soils of the spring crops with the most frequent impacts of till activities usually show a lower abundance of animals than it is observed in soils of overwintering and perennial crops, while the highest abundance is detected in meadows, shelterbelts and mid-field forest patches. New planted shelterbelts in cultivated fields are rapidly populated by mobile animals like insects or birds. In the soils of old as well as of new planted shelterbelts, 12 to 15 times more individuals overwinter than in soils of cultivated fields.

Thus, by the introduction of refuge sites like hedges, shelterbelts, stretches of meadows, small mid-field wetlands or water reservoirs, the negative effects of agriculture intensification on biota could be mitigated to some extend. The fields in a mosaic landscape, where animals were eliminated by tillage, could be quite fast re-colonised by mobile animal groups from unaffected refuge sites. Thus, one can suppose that the main factors counteracting biodiversity decline are a mosaic structure of agricultural landscapes and the dispersal properties of species among both plants and animals. The size of refuges and their

connectivity should match the requirements for breeding, food or nutrient acquisition, dispersion abilities and others existence demands of the species in question. The mosaic plant cover structure is of special interest not only for the survival of animal species in the agricultural landscape but also for the enrichment of the plant communities themselves. While changing environmental conditions (e.g. microclimate), some plant species create niches for the survival of other plant species.

In agricultural landscapes with a rich network of refuge places, the biodiversity can be maintained on a high level. Due to the mosaic structure of the landscape, even quite spectacular examples of colonisation could be observed. The appearance of rare birds such as raven, little owl, great grey shrike, crane, ortolan, and bunting was recently observed in the Turew landscape. Shelterbelts, small wetlands, small mid-field and forest patches harbour large mammals such as wild boar, red deer, badgers and foxes (RYSZKOWSKI et al. 2002).

The high biodiversity detected in the mosaic agricultural landscape of the Wielkopolska region is consistent with findings of other studies over the world. Natural and semi-natural habitats functioning as refuges have a positive bearing on the diversity of plants and animals in agricultural landscapes (PAOLETTI et al. 1992, BUNCE and HALLAM 1993, BUREL 1996, DUELLI 1997, LAGERLOF et al. 2002, MARSHALL and MOONEN 2002 and many others). Studies on the influence of hedgerows on bird populations indicate that a well developed network of hedgerows can sustain rich bird communities (PARISH et al. 1994, VICKERY et al. 2002).

Differences in biological characteristics of various taxa influence the habitat preferences of species and therefore, landscape characteristics have wide-ranging impacts on the particular assemblages of organisms. JEANNERET et al. (2003) found that the diversity of spiders communities in agricultural landscapes depends on the intensity of habitat management practices exerted by farmers. The pattern of landscape structure has little influence for that arthropods are randomly dispersed in the landscape. The opposite is true for butterflies. The species richness of wild bee assemblages is influenced both by the complex structure of the habitat and by a mosaic pattern of the landscape while ants species diversity is strongly influenced by the landscape mosaic (DAUBER et al. 2003). Thus, it is understandable that various groups or organisms will react differently in respect to their diversity in the landscape pattern because of their biology. But there is no doubt that a landscape with many refuge sites houses much richer and more diverse plant and animal communities than does a uniform landscape that is composed of large cultivated fields and largely lacks other non-cultivated landscape components. The intensity of farming activities directly impoverishes the richness of biota, or indirectly by changing the environment. For example nutrients leached from cultivated fields into small mid-field ponds pollute the water and change the original plant species composition into communities, in which weedy species like cattails (*Typha spp*.) or common reeds (*Pharagmites australis*) displace native plant species (ZEDLER 2003). The negative impacts of pesticides, ploughing and other means of agro-technologies on biodiversity are well documented, but in mosaic landscape the loss of biodiversity in intensively cultivated fields can be restituted. Thus, a trade off between farming intensity and pattern of refuge sites must be established in order to reconcile agricultural activities with biodiversity protection (RYSZKOWSKI et al. 2002).

3 Conclusions

With increasing production, farmers subsidise energy in order to simplify plant cover structure both within cultivated fields (selection of genetically uniform cultivars and weeds elimination) and within agricultural landscapes (elimination of hedges, stretches of meadows and wetlands, small mid-field ponds). Animal communities in cultivated fields are also impoverished (RYSZKOWSKI 1985, KARG and RYSZKOWSKI 1996). Farmers interfere with the matter cycling in agro-ecosystems directly by inputs of fertilisers, pesticides, etc., or indirectly by changing water cycling and by decreasing the storing capacities of soils for chemical compounds. In addition, agricultural activity often leads to a decrease of humus contents. The increase of used equipment's power enables not only stronger impacts on the soil but also land surface levelling, modification of water drainage systems etc., which leads to a change in the geomorphological characteristics of the terrain. These effects of farming activities result in the development of a less complex network of interrelations among the components of agro-ecosystems. As a consequence of this simplification, relationships among agro-ecosystem components are altered and less tie-up is in the local cycles of matter. Thus, increased leaching of soils, blowing off, volatilisation and the escape of various chemical components and materials from agro-ecosystems should be expected (RYSZKOWSKI 1994).

Many environmentally negative effects of agriculture intensification are connected with the impoverishment or simplification of the agro-ecosystems structure. In order to obtain high yields, the farmer eliminates weeds, controls pests and pathogens, ensures that nutrient are easily accessible only for cultivated plants during their growth, increases mechanisation efficiency etc. These agricultural activities aiming at higher and higher yields lead inevitably to the simplification of agro-ecosystem structure, which in turn causes further environmental hazards. While applying intensive means of production, farmers cannot prevent threats to agricultural lands such as leaching, blowing-off, volatilisation of various chemical compounds, which cause an increase of diffuse pollution of ground and surface waters, evolution of greenhouse gases (N_2O, CO_2) and water or wind erosion. It must be clearly said that although farmers can moderate the intensity of these processes through proper selection of crops and tillage technologies, they are not able to eliminate them entirely. The higher control efficiency of environmental threats evoked by agriculture could be achieved by structuring agricultural landscape with various non-productive components like hedges, shelterbelts, stretches of meadows, riparian vegetation, small ponds and so on (RYSZKOWSKI et al. 2002b). Therefore, any activity to maintain or increase landscape diversity is important not only for aesthetics and recreation reasons, but even more for environment protection and the protection of living resources in rural areas.

The above considerations lead to the conclusion that activities both aiming at the optimisation of farm production as well as at environment and biodiversity protection should be carried out in two different but mutually supportive directions. The first one involves measures within cultivated areas. Their objective is to maintain the high level of the storing capacities of the soil and to preserve or to improve its physical, chemical and biological properties. They include agro-technologies, which increase organic matter contents or counteract soil compaction, and rely on differentiated crop rotations. An important effect of organic matter contents augmentation would be an improved water storage capacity, more intensive processes of ions sorption etc. Integrated methods of pest and pathogen control and proper dosing of

mineral fertilisers adapted to crop requirements and to the chemical properties of the soil allow to diminish non-point pollution. The effectiveness of these activities, which could be called methods of integrated agriculture, depends on good agricultural knowledge.

The second programme component for the integration of farm production and nature protection is the management of landscape diversity. It strives for the differentiation of the rural landscape in order to create various kinds of so called biogeochemical barriers, which restrict the dispersion of chemical compounds in the landscape, modify water cycling, improve microclimate conditions and provide refuge sites for living organisms. In landscapes with mosaic structure, higher doses of fertilisers can be applied than in homogenous ones that are composed of arable fields only (RYSZKOWSKI 2002). This is a very important conclusion concerning sustainable development in rural landscapes. The implementation of these ecological guidelines into the integrated agriculture policy will help to develop new environment friendly agro-technologies, which at the same time enable the balancing of intensive production with the ability of natural systems to absorb side effects of agriculture without being damaged.

Studying the reasons for impoverishment of biodiversity, one finds that it is the way, in which the biota are treated by humans rather than the fact that they are exploited or influenced, which causes threat to living resources. Traditional nature conservation debates often focus on apparent effects of disasters e.g. fish poisoning or eradication of some group of organisms and others, rather than on the diminished functions of ecosystems to support the biotic community. However, it is impossible to protect e.g. a riparian forest when the habitat is drying out. The same situation occurs when oligotrophic plant communities receive high inputs of nutrients. No animal will survive if its refuge sites are eliminated. Thus, the protection of endangered species, or plant and animal communities cannot be successful without understanding the underpinning processes enabling their existence. In other words, in order to protect living resources now and to ensure living conditions for given species for the future, it is necessary to change attitudes away from the conservation of objects to the management of ecosystems and landscapes. The ecosystem approach to biodiversity protection is imperative in a world dominated by humans.

The ecosystem approach as the result of present day ecological knowledge emphasizes the need for the recognition of basic processes, which determine ecosystem function. Without such knowledge the management of ecosystems in order to protect biological diversity is not possible. A partition of solar energy is driving a set of basic ecosystem processes determining the functioning of ecosystems, e.g. the cycling of water and other chemical compounds. Control mechanisms consisting of various negative feedbacks between the system's processes are heading for the evolution of co-adaptation between all ecosystem components (biotic and abiotic) and towards the most efficient use of available energy (RYSZKOWSKI 2000, 2002a). One has to maintain the life supporting processes for biota for the successful conservation of plant and animal species. This guideline was very clearly stated in the World Conservation Strategy published by IUCN in 1980.

Attempts to reconcile economic activity, e.g. agriculture, with biodiversity protection are presently based on some sort of "cross compliance", where the receipt of a nature conservancy benefit is made conditional

upon action to improve the environment. A much better recognition of reasons for biodiversity impoverishment based on ecosystem processes is urgently needed. While changing the basic paradigms of nature protection, an ecosystem approach to biodiversity protection will help a more successful development of efficient guidelines for nature conservancy.

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Management of Water Resources in Agricultural Landscapes

ANDRZEJ KĘDZIORA AND LECH RYSZKOWSKI

1 Introduction

Water - a mysterious substance which not only supports the life on Earth but also plays three very important functions; (i) it is the main component of all living organisms, (ii) it transports the solar energy through the whole globe by oceanic currents and atmospheric vapour cycling, and (iii) it transports the matter on the earth surface through soils and plants. Water conditions in agricultural landscapes are the most important factor determining the process of transforming the solar energy into organic matter and determining the agro-potential of an agricultural landscape. The water cycling, which was stabilised during the long-term geological evolution, has been disturbed by human activities recently. The environment suffers from very deep drought on the one hand and from flood on the other. These climatic

disasters are becoming more frequent and less predictable. The distribution of water resources over the world is not regular (LWOWICZ 1979). Central Europe is rather poor in water resources. The increasing water demands and the probable change of climate will bring about new problems to a water management that intends to support the sustainable development of agriculture in Central Europe. The development of alternative strategies for water management in agricultural landscapes seems to be necessary for the future of agriculture in Central Europe. The development of the energy approach was the important break-through in landscape ecology studies concerning water cycling. Only an energetic approach ensures the correct estimation of evapotranspiration – the main component of the water balance.

2 Radiation, Heat and Water Balances of Ecosystems and Landscapes

All processes occurring on Earth can run due to the existence of a spatial differentiation of potential energy. Thanks to the perpetual solar energy flux, the realisation of all thermodynamic processes, which are the essence of nature being, is possible. The most important processes are the matter cycling processes, especially the water cycling process. The stability of energy and matter flow is an absolute premise for sustaining the functioning of landscapes.

All energy fluxes into the system and outgoing from it must be balanced in order to keep the system in equilibrium. The set of all energy fluxes is called the heat balance equation. Thus, the water balance equation is defined as the set of all water fluxes into the system or outgoing from it (KĘDZIORA 1995).

The relation between energy input and water supplies determines the climatic condition as well as the primary production of the landscape. The energy and water conditions are best described by the equations of heat and water balances:

$$Rn + LE + S + G + A + F + M = 0$$

$$P + E + H \pm \Delta R = 0$$

with: Rn - net radiation, LE - latent heat of evapotranspiration, S - sensible heat of air heating, G - soil heat, A – heat of advection, F – heat of biogeochemical processes, M – heat stored by plant cover (all expressed in watts per square meter), P - precipitation, E - evapotranspiration, H - run-off, ΔR - changes bin soil water retention (all expressed in mm).

These two balances are coupled by latent heat of evapotranspiration LE and evapotranspiration E (fig. 1). Usually, from quantitative point of view, the two last components of heat balance are neglected because their small values not overcoming 2% of net radiation. The structure of these two balances depend on many factors, but one of the most important is plant cover. Forest can use for evapotranspiration as much as 88% of net radiation, while bare soil uses for this process only 55% (tab.1).

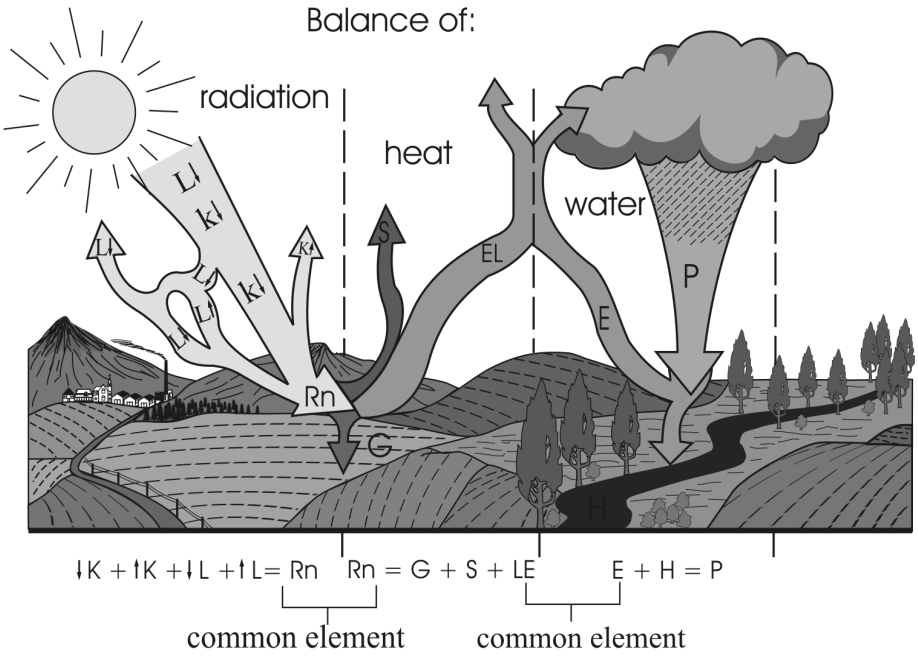

Fig 1: Balance of radiation (left part), heat balance (central part) and water balance (right part)

During three summer months, 225 mm of water can be evaporated; during the warm half of the year 413 mm, and during the whole year 515 mm can be evaporated. The annual precipitation in Wielkopolska region reaches a little more than 600 mm. Soil and air heat fluxes depend mainly on temperature gradients existing in near-surface air and soil strata, but they also depend on the amount of solar energy reaching the soil. The latter is a function of the density and structure of the plant cover. Plant cover and habitat moisture are the main factors determining the partitioning of net radiation into different internal energy processes of the ecosystems, especially under convection conditions.

Table 1: Heat balance structure (MJ·m^{-2}) and evapotranspiration (mm) during the plant growing season (March 20 to October 31) in Turew agricultural landscape. Modified after Ryszkowski and Kędziora (1987)

Parameter[a]	Landscape element					
	Shelterbelt	Meadow	Rapeseed	Beet field	Wheat field	Bare soil
Rn	1730	1494	1551	1536	1536	1575
LE	1522	1250	1163	1136	1090	866
S	121	215	327	339	385	651
G	87	29	61	61	61	47
LE/Rn	0.88	0.84	0.75	0.74	0.71	0.55
E	609	500	465	454	436	346

[a]Rn – net radiation, LE – latent heat of evapotranspiration, S – sensible heat, G – soil heat, E –evapotranspiration

These two balances are coupled by latent heat of evapotranspiration (heat balance) and flux of water vapour (water balance). The same amount of energy (2.5 MJ) can be used for evaporation of one kg of water or for heating 33 m³ of air by 60 degrees. Because of the link between energy and water fluxes, if the energy flux is changed, water fluxes will be changed too, and vice versa. We must bear this in mind if we take any measures in the agricultural landscape (fig 2).

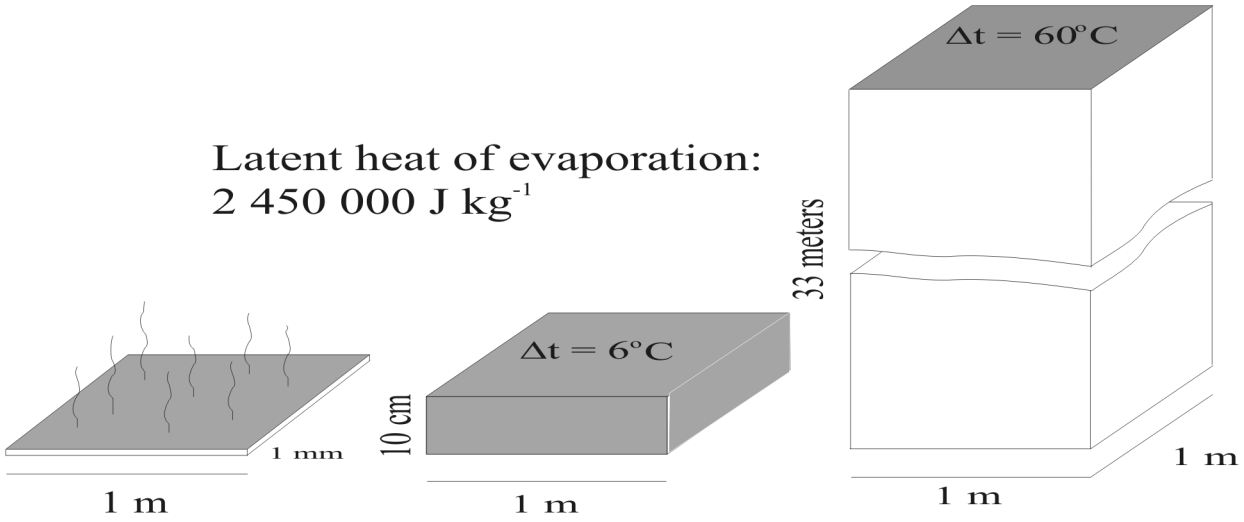

Fig. 2: Effect of applying the same amount of energy for evaporation, water heating and air heating

3 Factors Determining Heat and Water Balance Structure

There are many factors determining the value of particular components of the heat and water balances. The main factors are the following:

Net radiation is a function of:
- solar radiation determining the density of energy flowing towards the active surface,
- relative sunshine expressing the time of full solar radiation,
- temperature of evaporating surface determining the energy flux density emitted from the surface,
- water vapour pressure in the atmosphere which is main factor determining the atmospheric ability for absorption of the energy emitted by the earth surface, and the same determining amount of energy reemitted by the sky towards earth surface,
- albedo of the evaporating surface determining the amount of solar energy reflected by the active surface.

Soil heat flux depends mainly on:
- temperature gradient in the soil, which is the driving force of energy flow into the soil,
- soil moisture, which is the main factor of soil heat capacity,
- thermal diffusivity of soil determining the rate of heat flux incoming to the soil.

Evapotranspiration and latent heat of evapotranspiration depend on:
- habitat moisture,
- energy available for evapotranspiration processes,
- evaporation demands of the atmosphere.

The energy available for evapotranspiration is a sum of net radiation and heat advection.

Habitat moisture depends mainly on:
- precipitation,
- soil water retention.

Heat advection is a function of:
- the horizontal gradient of air temperature, which is driving force of horizontal heat flow,
- aerodynamic parameters of active surface determining the coefficient of turbulent exchange,
- wind speed determining the intensity of horizontal flow of air mass.

Atmospheric demands of evaporation are a function of:
- wind speed,
- saturation water vapour pressure deficit.

Surface runoff depends mainly on:
- intensity of rainfall,
- coefficient of water infiltration of the soil,
- physiography.

Most of these factors are controlled by plant cover. The better developed the plant cover, the higher is the intensity of evapotranspiration lowering the temperature of the active surface and increasing the pressure of water vapour in the atmosphere. The cooling of the active surface caused by the intensive evaporation of the plant cover causes the horizontal temperature gradient. Plant cover impacts on micrometeorological conditions of the landscape as well as on conditions of surface runoff and water infiltration rate. The higher the plant cover, the higher is the roughness parameter of the surface and the intensive turbulent exchange of energy and matter between the earth's surface and the atmosphere. It should be kept in mind that plant cover is the most important factor controlling heat and water balances of the landscape.

The worsening of water conditions in rural area has been observed for a few decades. Increasing water deficits, decreasing soil retention ability in the face of the growing water demands are the main threats to agricultural development in Central Europe. Decreasing water retention in the environment, acceleration of run-off and decreasing precipitation are the main negative results of land use changes, especially of deforestation.

4 Impact of Landscape Structure on Heat and Water Balances

The variability of plant structure channelling solar energy increases the diversity and variability of energy fluxes within the various ecosystems of the landscape. However, stabilizing effects on the different energy flows are achieved at the landscape level because of the energy gradients that exist between the different ecosystems, which form the landscape. For example, air movement induced by thermal gradients could transport surplus heat from one ecosystem to another. The values of net radiation in ecosystems of the Turew landscape range from 1,494 to 1,730 $MJ \cdot m^{-2}$ for the vegetation season (tab. 1). The lowest net radiation was observed in the meadow ecosystem, while the highest was observed in the shelterbelt. Crops of rape seed, beets, and wheat have similar values of net radiation. The net radiation of meadow is slightly lower than that of cultivated fields. The high net radiation in shelterbelts is partly a reflection of the low albedo of these ecosystems. The different ecosystems use the net radiation energy in different ways. The range of energy values used for evapotranspiration (LE) is from 866 $MJ \cdot m^{-2}$ (bare soil) to 1,522 $MJ \cdot m^{-2}$ (shelterbelt). The shelterbelt uses nearly 5.5 times less energy for air heating (S) than does bare soil. The energy used for evapotranspiration by crops and meadows also differs. Wheat has the lowest evapotranspiration value and meadow the highest (LE in tab. 1). Energy used for heating the soil (G) is the smallest part of net radiation and ranges from 29 $MJ \cdot m^{-2}$ in meadow to 87 $MJ \cdot m^{-2}$ in shelterbelts. However, the soil heat flux in bare soil during early spring can reach more than 300 $J \cdot s^{-1} \cdot m^{-2}$, which is sometimes equal to the net radiation value. The average value of soil heat flux during the whole vegetation season is small because the warming up of the soil ceases at the beginning of August, when the soil begins to cool again. Thus, although the average values of the soil heat flux are rather small in comparison with the other components of the heat balance during the whole vegetation season, nevertheless, at the beginning and at the end of the vegetation season, the energy used for soil heating in spring or the energy lost in autumn, can be high and can equal or sometimes exceed the net radiation value. These data illustrate the high diversity of the ecosystems. The shelterbelt uses about 40% more energy for evapotranspiration than does the wheat field; while the wheat field diverts approximately three times the energy to air heating than does the shelterbelt (tab. 1). This means that a shelterbelt can evaporate about 170 mm more water than a field of wheat. There are two main reasons for this difference. First, there is a difference in the structure of plant cover. Trees have much longer roots than wheat, which allows them to absorb water from deeper layers of the soil. In effect, more water is within reach of the tree roots. Since trees have greater amounts of water available for their use than cereals, tree leaves have smaller stomatal resistance than cereal leaves. Shelterbelts also have a greater canopy roughness than wheat, which together with a higher wind speed in the shelterbelt canopy results in more intensive turbulent exchange over shelterbelts. The differences among the various crops are mainly related to the differences in the time span that plant cover exists on the field. After harvest, crop fields resemble bare soil. A study of the heat balance has shown that shelterbelts influence evapotranspiration much more than meadows and at the same time exert a cooling effect on the air. However, shelterbelts heat the soil to a greater extent than grasslands. During the vegetation season, water evaporated by shelterbelts surpasses the precipitation of this period by 62% (tab. 1) which has a drying effect on the surrounding fields. This deficit in the Turew landscape is counterbalanced by late autumn and by the winter precipitation. The cultivated field has lower evapotranspiration rates than shelterbelts and meadows.

One of the most effective control measures of energy and water balance structure is the introduction of shelterbelts into monotonic landscape. This causes:

- increasing evapotranspiration from the landscape;
- decreasing evapotranspiration from the cultivated fields (as in the case of fields protected against wind by forests or shelterbelts, where evapotranspiration is lower than in open spaces) and reduced surface runoff, both due to an increase of infiltration and evaporation;
- slowing down and increasing time extension of subsurface runoff from soils characterized by higher contents of humus (in underflows situated in ground covered by forest water flows all year round while ditches, situated among fields under cultivation, are dry in summer, even in a year of average precipitation);
- an increase of forested lands by 1% increases precipitation by 2 to 18 mm (BAC 1968) and reduces runoff (DUBROWICZ 1956).

High evapotranspiration rates from the canopies of trees exert cooling effects, which stimulate temperature gradients between afforestation and cultivated fields. The horizontal transport of heat with wind (called head advection) brings transfer of heat from warmer to cooler places. When wind blows from cultivated fields to shelterbelts, the moving air transports heat energy generated in cultivated field, which in turn can increase transpiration of trees. Under such conditions the shelterbelts of Turew landscape can use up to 40% of energy more for evapotranspiration than canopies. The structure of the landscape has an important bearing on heat advection processes. As was pointed out above, cultivated fields convert larger proportions of increasing solar energy into heat than do forests or shelterbelts.

In terms of landscape heat and water balances, cultivated fields can be considered as “landscape ovens” and shelterbelts or forests as “landscape water pumps”.

5 Guidelines for Landscape Water Management

Improving landscape structure

Many results of investigations show that landscape structure is the most important factor determining natural resistance of environment against threats (RYSZKOWSKI and KĘDZIORA 1987). The more heterogeneous the structure of a landscape, the higher the degree of landscape resistance. The best way of improving the landscape structure of agricultural lands is the introduction of shelterbelts, strips of meadows and bushes, the restoration of damaged postglacial ponds and the maintenance of wetlands and riparian ecosystems. The saturation of landscapes by ecotons and biogeochemical barriers is the most efficient tool for controlling energy flow and matter cycling, and the same is necessary for a sustainable development of agriculture (RYSZKOWSKI, KĘDZIORA 1987, KĘDZIORA et al. 1995, RYSZKOWSKI, KĘDZIORA 1995, KĘDZIORA OLEJNIK 2002).

The proper structure of plant cover within agricultural landscapes exerts a strong positive effect on water cycling. The structure of plant cover, especially of shelterbelts, plays a particular part in improving water conditions. They exert a favourable influence on the microclimate by: reducing wind speed by 35-40%, increasing relative air humidity, decreasing potential evaporation, increasing snow depth, and reducing

the melting rate of snow in spring. When taken altogether, in areas covered with shelterbelts these measures increase the water income to the soil by 300 m^3 ha^{-1} compared to open areas.

Introduction of shelterbelts

The plant cover structure is a factor, which increases the diversity and variability of energy fluxes within the various ecosystems of the landscape through channelling solar energy. However, stabilising effects on different energy flows are achieved at the landscape level because energy gradients exist between the ecosystems, which form the landscape. For example, induced air movement by thermal gradients could transport surplus heat from one ecosystem to another. Thus, the heat balance of the entire landscape will not be the simple sum of the heat balance components of all ecosystems treated separately.

The shelterbelts introduced into grain monoculture landscape change the microclimatic conditions of the field as well as the aerodynamic characteristics of an active surface. Shelterbelts cause only little increase of actual evapotranspiration of a landscape taken as a whole by reducing wind speed, stomatal resistance and increasing the humidity, turbulence and net radiation, but also decrease actual evapotranspiration from the cultivated fields lying between shelterbelts (fig. 3). During plant growth season, the introduction of shelterbelts can save as much as 40 mm of water in non-irrigated fields, and as much as 200 mm in heavily irrigated fields surrounded by dry and hot areas.

In early spring, the landscape areas with shelterbelts can collect about 20 to 80 mm more water than an open landscape. This is due to the fact that surface runoff after the thaw in springtime is smaller in landscapes with shelterbelts. Additionally, rain water remains longer in landscapes with shelterbelts. Thus, in open landscapes water is lost more rapidly. We can conclude that landscapes with shelterbelts is characterised by a more efficient water economy than open landscapes.

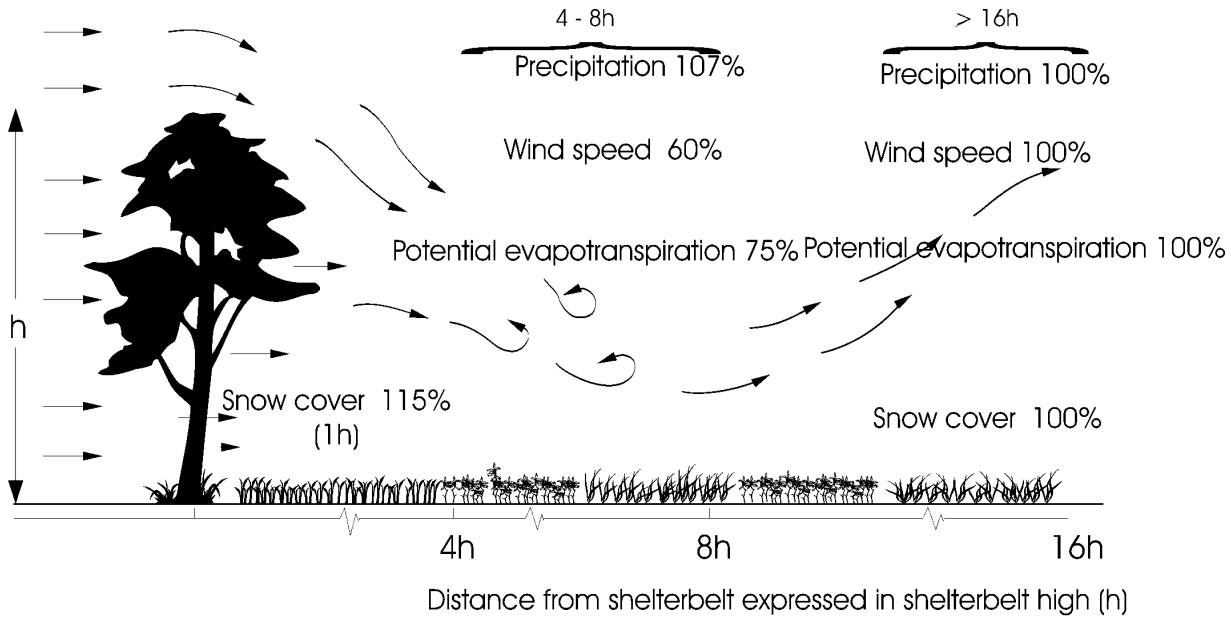

Fig. 3: Impact of shelterbelts on the micro-climate of an agricultural landscape

Restoration of small mid-field ponds

Mid-field ponds play a triple role in the agricultural environment: improving of microclimatic conditions, storing of water for small scale irrigation, intensifying the water cycling, controlling of chemical's migration and providing habitats for mezzo-fauna, especially amphibians. By intensive evaporation, water bodies use nearly all solar energy, so the heating of the air is much weaker than over land surfaces. In the night, the heat stored in the water body prevents the deep cooling of the area in the vicinity. Because small ponds use for evaporation not only absorbed solar energy but also additional sensible heat of advection, they evaporate more intensively than big lakes. A hundred small ponds can evaporate even 30% more water than one big lake of the same surface does. Small ponds store water also cause an increased soil water contents thanks to the higher of the ground water table (RYSZKOWSKI and KĘDZIORA 1996). The ratio of water stored in the soil to the water stored in the pond is bigger for smaller ponds. The collection of water in small field reservoirs in the spring can increase water storage in rural catchments by an amount equal to 20 mm of precipitation.

Improving of soil water retention and hydraulic properties

The content of organic matter is one of the most important factors improving hydropedological properties of the soil. Organic matter increases soil retention because it retains more water than non-organic matter. Specifically this means an improvement of soil structure by increasing the medium size pores, which determine the amount of water readily available for plants. The increase of organic matter content in the upper soil layer by 1% causes the increase of available water by 30 mm, which in the scale of the country gives the increase of water supply equal to the volume of all artificial reservoirs in Poland. An improved structure of upper soil layers also results in increased infiltration rates, which allows to catch more water from precipitation and to reduce surface runoff. The increase of organic natural fertilisation is only one way to increase the organic matter in the soil.

6 Conclusion

To improve the water conditions in an agricultural landscape the following principles must be kept in mind:

1. Develop the landscape complexity by the introduction of shelterbelts, meadow strips and the restoration of mid-field ponds;
2. Increase the organic matter content in the soil;
3. Keep as much water as possible in the landscape for as long as possible, taking care that it is properly allocated;
4. Ensure that as much water as possible moves from the soil into the atmosphere via plant transpiration, but not as evaporation from the soil to the atmosphere;
5. Unsystematic and partial draining should be used more widely and every opportunity for retaining draining runoffs in a catchment area should be utilized;.
6. Supplementary to drainage retention, amelioration measures for improving the physical water properties of soils and increasing their retention capacities and, consequently, decreasing water deficits for plants during the summer, should be widely applied;

7. The scope of necessary amelioration must take into account negative impacts of farm work mechanization on soil structure by compacting surface soil layers.

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Estimating the Minimum Need for Strictly Protected Forests in Estonia

KAUPO KOHV, ASKO LÕHMUS, KAILI VIILMA, ANNELI PALO

In nature conservation practice, one of the most central questions is: ”How much is enough?”. This is usually a very emotional and political question and the answer to it is usually an agreement between different stakeholders. This was also the situation in Estonia in 1997 when it was stated in the Forest Act that at least 4% of the forested land in Estonian should be left alone. This figure was at the very beginning questioned by many ecologists who claimed that this area would be too small for effective conservation. As a result of the pressure by ecologists, the Estonian Forestry Development Program put up the task to estimate the ecologically sound needed minimum area of strictly protected forests in Estonia.

The reserves were planned to consist of management-incompatible habitats in critical amounts for the viability of their specialist species, and a ’buffer amount’, which is temporarily lost in disturbances (severe wind throws and suppressed wildfires). The main steps were (1) estimation of mean frequency of stand-replacing disturbances for Estonian forest site types; (2) reconstruction of the structure of natural forest area by age classes and forest site types; (3) comparison of the natural age structure with that in

managed forests to define management-incompatible age-classes; (4) for each forest site type, estimation of the historical area of these age classes, critical threshold of its loss for specialist species, and the 'buffer' area; (5) defining gaps by comparing reserve need with current protected forest area.

Management-incompatible forest (over 100 years since last stand-replacing disturbance) covered historically 32–42% of the current forest land. Theoretical minimum need for strictly protected forests was determined at 8.5–11.3% of the current forest land, one quarter of which is the 'buffer'. However, if current reserves retain their status, filling the gaps for underrepresented forest site types yields in a 10.4–13.2% total coverage. The difference between the theoretical and the proposed protection level is mostly due to the high present coverage of heath forests and oligotrophic paludifying forests (low silvicultural interest) and drained peatland forests (not a natural site type).

A study by LÕHMUS et al. (2004) demonstrates that with current scarce knowledge of ecosystem processes combined with knowledge gained in population ecology it is possible to reconstruct the ecology of natural systems and use this knowledge in making ecosystem level management decisions. The authors also stress the importance of ecological thresholds that must be the base of ecological arguments in making compromise with short-term economic ambitions.

Reference

Lõhmus, A., Kohv, K., Palo, A., Viilma, K. 2004. Loss of old-growth, and the minimum need for strictly protected forests in Estonia. Ecol. Bull. 51, in press.

5 Background Material

Decision VII/11 Ecosystem approach

(adopted at the seventh Conference of the Parties to the CBD, Kuala Lumpur, 2004)

For the complete text see: http://www.biodiv.org/decisions/default.aspx?lg=0&m=cop-07&d=11

Contents

Glossary of Acronyms

ASCI	Area of Special Conservation Interest (Emerald Network)
BfN	Bundesamt für Naturschutz (German Federal Agency for Nature Conservation)
BSEP	Black Sea Environmental Programme
CAP	Common Agricultural Policy (EU)
CBD	Convention on Biological Diversity
CEEC	Central and Eastern European Country
CEEWEB	Central and East European Working Group for the Enhancement of Biodiversity
CHM	Clearing-House Mechanism
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COP	Conference of the Parties
CORINE	Coordination of Information on the Environment (EU programme)
EAF	EECONET Action Fund
EC	European Commission
EECONET	European Ecological Network
EAP	Environmental Action Programme of the EU
EfE	Environment for Europe
EU	European Union
EUFORGEN	European Forest Genetic Resources Programme
FAO	United Nations Food and Agriculture Organization
FLEGT	Forest Law Enforcement Governance and Trade
FSC	Forest Stewardship Council
GEF	Global Environment Facility
GIS	Geographic Information System
HELCOM	Baltic Marine Environment Protection Commission (Helsinki Commission)
ICPDR	International Commission for the Protection of the Danube River
IFF	Intergovernmental Forum on Forests
IPF	Intergovernmental Panel on Forests
IUCN	The World Conservation Union (International Union for the Conservation of Nature and Natural Resources)
LDWS	Lower Danube Wetland System (Romania)
MA	Millennium Ecosystem Assessment
MAB	Man and the Biosphere Programme of UNESCO
MCPFE	Ministerial Conference for the Protection of Forests in Europe
MoEPP	Ministry of Environment and Physical Planning (Republic of Macedonia)
NBSAP	National Biodiversity Strategy and Action Plan
NFP	National Forest Programme
NGO	Non-Governmental Organisation
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic ("OSPAR Convention")
PAG	Project Accompanying Working Group

PEEN	Pan-European Ecological Network
PEBLDS	Pan-European Biological and Landscape Diversity Strategy
PHARE	Pre-accession instrument of the EC to assist applicant countries of Central Europe in their preparations for joining the European Union
pSCI	proposed Sites of Community Importance (for NATURA 2000)
REC	Regional Environmental Centre
SAP	Strategic Action Plan
SAPARD	Special Accession Programme for Agriculture and Rural Development (EU)
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice (CBD)
SEEENN	South-East European Environmental NGO Network
SFM	Sustainable Forest Management
SIB	Small Island of Braila (Romania)
SNC	State Nature Conservancy (Slovakia)
TAC	Total Allowable Catch
TBFRA	Temperate and Boreal Forest Resources Assessment
TDA	Transboundary Diagnostic Analysis (Black Sea)
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forest
WWF	World-Wide Fund for Nature

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Workshop Programme

Wednesday, 05.05.2004

Arrival of the participants at the Isle of Vilm

18.30 Dinner

21.00 Welcome of the participants, opening of the meeting

Thursday, 06.05.2004

08.00 Breakfast

09.00 **HORST KORN, BfN:**
Introduction to the topic:
The development of the ecosystem approach in the framework of the CBD, presentation of the principles and guidance to implement the ecosystem approach

I Relationship of the CBD's ecosystem approach to other approaches (part 1)

09.30 **MARTA GAWORSKA, MCPFE Liason unit Warsaw;**
DARIUSZ PIECHOWSKI, Poland:
1st session of the MCPFE Ad Hoc Working Group in cooperation with PEBLDS on "Development of Pan-European understanding of the linkage between the Ecosystem Approach and Sustainable Forest Management" – final results and conclusions.

10.00 **WOLFGANG LEXER, Austria:**
Implementation of the ecosystem approach in forest ecosystems of Austria

10.30 Coffee/Tea break

11.00 Guided tour in the nature reserve of the Isle of Vilm

12.30 Lunch

13.30 **ULRICH MATTHES, Germany:**
The ecosystem approach in selected forest biosphere reserves

14.00 **AXEL PAULSCH, Germany:**
Applying the Ecosystem Approach in High-Mountain Ecosystems in Germany: Experiences with the Alpine Convention

II Implementing the ecosystem approach in Central and Eastern Europe -Selected Case studies (part 1)

14.30 **OANA DOMINICA PENU, Romania:**
Theoretical and practical issues regarding the ecosystem approach in Romania

15.00 **PETER LENGYEL, Romania:**
Situation of the ecosystem approach in Romania

15.30 Coffee/Tea break

15.45 **CRISTIAN MIHAI ADAMESCU, Romania:**
Small Island of Braila – a new Ramsar site in Romania

16.15 **VICTOR KARAMUSHKA, Ukraine:**
Black Sea Ecosystem Recovery: policy, actions, outcome

16.45 Coffee/Tea break

17.00 **SERGIY MATVYEYEV, Ukraine:**
Using of the ecosystem approach in creation and management of protected areas in Ukraine

17.30 **OLEKSANDR BON, Ukraine:**
Ecosystem Approach in the National Environmental Network Development in Ukraine

18.00 **VIERA STANOVA, Slovakia:**
Conservation and sustainable use of Grasslands

18.30 Reception at the invitation of the German Federal Agency for Nature Conservation

Friday, 07.05.2004

08.00 Breakfast

I Relationship of the CBD's ecosystem approach to other approaches (part 2)

09.00 **JÜRGEN RITTERHOFF, BfN:**
The ecosystem approach and sustainable fisheries

II Implementing the ecosystem approach in Central and Eastern Europe - Selected Case studies (part 2)

09.30 **ROBERTINA BRAJANOSKA, SASHKO JORDANOV, Macedonia:**
Protection of Ecosystems in the Republic of Macedonia and future activities

10.00 **LECH RYSZKOWSKI, Poland:**
Management and protection of biodiversity in agricultural landscapes

10.30 Coffee/Tea break

11.00 **ANDRZEJ KEDZIORA, Poland:**
Management of water resources in agricultural landscapes enhancing richness of biota

11.30 **KAUPO KOHV, Estonia:**
Ecosystem approach for defining the minimum area for strictly protected forests in Estonia

12.00 **MACIEJ KAMINSKI, Poland:**
Integrated management of aquatic ecosystems in Wigry National Park, Poland

12.30 Lunch

III Working Groups

14.00 Discussion of the following topics:

- Relationship and synergies between the CBD's ecosystem approach and other approaches (main focus on forests),
- Lessons learned from Case studies

15.30 Coffee/Tea break

IV Plenary

16.00 Presentation of the working groups

Finalization of the workshop report

18.30 Dinner

20.30 Finalization of the workshop report

Saturday, 08.05.2004

08.00 Breakfast

09.20 Ferry boat to Lauterbach; all day excursion to the Biosphere Reserve South East Rügen