Conflicts between human activities and the conservation of biodiversity in agricultural landscapes, grasslands, forests, wetlands and uplands in the Acceding and Candidate Countries (ACC)

A Report of the BIOFORUM project, March 2004

Juliette Young, Lubos Halada, Tiu Kull, Antoni Kuzniar, Urmas Tartes, Yordan Uzunov and Allan Watt (Editors).
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The BIOFORUM project
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1. Executive summary

Agricultural landscapes

1. Agriculture in the Acceding and Candidate Countries (ACC) was marked by a huge period of intensification in the mid 20th century, followed by a wave of drastic changes following the collapse of the communist regime in 1989. The agricultural landscapes of East European countries are now characterised by a combination of divergent factors and trends. On the one hand, strong state policies have created intense and largely homogeneous landscape changes due to intense management and intensive agricultural techniques over extensive areas. On the other hand, a large variety of traditional types of management and landscape uses have been preserved on many peripheral areas.

2. The intensification of agriculture in the ACC, especially between WWII and 1989 increased the use of fertilisers, the spread of monocultures and the use of heavy machinery. These trends resulted in eutrophication, loss of species-rich habitats, and loss of landscape heterogeneity.

3. However, while intensification of agriculture is still a local source of conflicts in Northern Poland, Western parts of Slovakia and central Lithuania, for example, abandonment is much more widespread and important at present. Land reforms and land restitution after 1989 brought about the abandonment of fields, pastures and meadows, because of market value loss. Together with fields, the number of cattle and other grazers decreased causing under-grazing and abandonment of pastures and meadows. The main threat for biodiversity associated with abandonment of agriculture is the loss of habitats and species especially in mountainous pastures and valuable meadows where successional changes take place after abandonment. This is especially serious for species with a narrow ecological niche, or those depending on manure application. Another factor to take into account is the fact that abandoned fields greatly facilitate the spread of invasive species. Abandonment is likely to increase even more after joining the EU unless EU agricultural regulations see the environment as a central focus and consider ways of preserving extensive farming practices.

4. Another conflict concerns the support to sustainable farming. Due to the need to distinguish between sustainable and non-sustainable farming for the sake of distribution of financial support from EU sources, it has been necessary for farms to meet a set of requirements in order to be listed as “sustainable” and to be allowed to mark their production as coming from an ecologically approved technology. However, most small traditional farms cannot meet these requirements due to the high investments needed for the microbial control of milk and meat production, which often exceed the financial capacities of these farms and do not fit in with the traditional farm architecture and traditional technologies of food production.

5. Conflict resolution strategies include political and administrative frameworks facilitating the control and organisation of monitoring of biodiversity; legal regulations to regulate the protection of biodiversity, restrict the introduction of alien species, and control the use of GMOs; compensation and subsidy schemes; the marketing of environmentally friendly (labelled) goods; buying land; raising awareness of biodiversity value and training of local people and interested volunteers; identification and use of social links; increasing communication among stakeholders and improving access to information.

1 Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia.
6. Possible indicators in the evaluation of agricultural landscapes could include the relative area of semi-natural grasslands or the number of alien species when comparing areas of agricultural landscape.

7. As a conclusion, it is expected that as a result of accession to the EU, the abandonment process will spread to more countries and regions. The whole enlarged European landscape will however benefit from more biodiversity rich areas such as semi-natural grasslands. The existence of these large areas of semi-natural communities will become a potentially important factor towards the development of sustainable agriculture attracting eco-tourism and an increased awareness of biodiversity.

**Grasslands**

8. Grasslands are among the most important habitats for biodiversity in agricultural landscapes and have primarily been used for the provision of forage and/or fodder to livestock. After World War II, grasslands were used to cater for the increased need for meat and milk products and this led to the intensification of grassland use. The demand for grassland products has changed in Europe since the 1950s and the multiple roles of grasslands have shifted to a more environmentally oriented use, including an increase in recreational activities. Beside their economic importance, grasslands provide important plant, animal and microbiological biodiversity. Unique habitats exist in the lowlands, such as *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils; Mediterranean tall humid grasslands of the *Molinio-Holoschoenion*; alluvial meadows of river valleys of the *Cnidion dubii*; Eastern sub-mediterranean dry grasslands of the *Scorzoneretalia villosae*; sub-contintental steppic grassland; Pannonic steppes; semi-natural dry grasslands and scrubland facies on calcareous substrates; sub-contintental steppic grasslands; Alpine and sub-alpine calcareous grasslands; inland salt meadows and humid dune slacks. Many are listed in Annex I of the Habitat Directive.

9. In recent decades, permanent meadows and pastures in the ACC have decreased in area due to grassland intensification including increased fertilisation, herbicide and insecticide application, early first cutting and frequent mowing, increasing stocking rates and overgrazing, land drainage, ploughing and reseeding and the merging of small grasslands patches and creation of large homogeneous hayfields. This intensification has led to the homogenisation of grasslands and impoverishment of floristic composition. The conflicts that emerge in association with intensification are between profit-maximisation and conservational priorities. In cases when nature conservation can compensate for financial drawbacks of ecologically sound management or the extensive use of grasslands is otherwise reasoned, the conflicts rarely emerge.

10. Abandonment of grasslands in the ACC has been compounded by several factors. These include the long-term gradual changes in the economy of agriculture linked with the market demand of agricultural products, overproduction and the ability to produce the same amount of products on a smaller area with intensive management, focusing production in the most suitable natural conditions and the abandonment of sites with less favourable conditions. Collectivisation in agriculture led to the loss of land ownership, as well as the technical and economic basis for farming (machines, animals, buildings) and more importantly to the loss of traditional knowledge and interest for farming. After the restoration of land ownership in the 1990s, very little interest remained to establish private farms. Social trends, demographic changes and population decline in rural areas represent other reasons for the abandonment of grasslands. Changes in economic, subsidy and new ownership systems after 1989, and the new phenomenon of application of the market economy in agriculture resulted in an unstable economic situation and even the bankruptcy of some agricultural sectors influencing land use and grassland management.

11. Although the scale of the conflicts between infrastructure development and biodiversity conservation in the ACC is not as important as abandonment, for example, the situation is changing in connection with economic and political development in individual countries and therefore development has a different impact on grasslands in various countries. Urban, industrial, and infrastructure development (including tourism infrastructure) and hydro-energy initiatives can all lead
to the direct loss of grasslands if these are located near areas used for construction. They can also affect grasslands indirectly through fragmentation, intensification of use, increased access, pollution (including increased garbage accumulation) and other effects. This trend is likely to increase in the future and it is feared that constructors are more likely to want to build on grasslands rather than productive land such as agro-ecosystems, orchards and vineyards or wetlands, which are considered to be sites unsuitable for construction.

12. Spatial planning can play a major role in terms of alleviating conflicts between development and biodiversity conservation by finding adequate locations for all required activities and functions in the landscape. However, in many ACC, competences for spatial planning are delegated from the government to regional or local levels. These decision makers have little or no experience, and often have different approaches and priorities, thus potentially causing conflicts.

13. Nature conservation itself can also represent a source of conflict relating to grassland biodiversity conservation. The establishment of protected sites for example often resulted in cessation or changes of grassland management regimes either because of lack of funds for conservation or the lack of knowledge regarding grassland management. Different conservation priorities can also represent sources of conflict. Typical examples of such conflicts are associated with the protection of wooded meadows and pastures, Nordic alvar grasslands or alluvial meadows, which all need grazing or mowing to be preserved. In case of cessation of management these communities change to a broad-leaved forests, Juniperus communis formations, or alluvial forests, which also have very high value for nature conservation. In such cases a choice has to be made over which type of community will be preserved and maintained.

14. Successful resolution of conflicts could include the following steps: identification of the severity of threat to biodiversity and/or dimension of conflict, identification of stakeholders and their interests, involvement of all recognised parties in the solution finding process, identification of best (dependent on specific case) conflict resolution strategy and choice of guidelines, application of chosen strategy and guidelines and measuring the success through research and monitoring of both biodiversity and social aspects. The most successful conflict resolution will be one that results in a change in society’s attitude towards drivers of conflict so that similar conflicts will not emerge again.

15. Practical resolution methods can include the promotion of best practices, including the promotion of extensive grasslands and appropriate timing and methods of hay cutting in order to reap the maximum biodiversity advantages. The identification of ecological importance and prioritisation of grassland habitats through grassland inventories will be important in helping to plan their conservation or estimate the level of connectivity between these areas. Ownership of abandoned grasslands has to be addressed, especially in vulnerable grassland habitats where it may be better to buy the land from the owner or leave the land to the state. Legal protection of species or habitats for nature conservation, and policies, strategies and other legislative regulations (e.g. restrictions to applicants of agri-environmental support) are likely to have both a direct and indirect impact on grassland diversity and could play a major role as a conflict resolution strategy. Ecotourism and agrotourism can also to grassland conflict management by acting as useful education and awareness tools for the appreciation of biodiversity, and representing a source of income for farmers. Finally, the increased financial support for cattle and sheep breeding will have positive effects on grassland utilisation and often on grassland biodiversity as well.

16. In terms of changes due to the accession process, the single most important factor affecting grasslands in the ACC is likely to be the Common Agricultural Policy (CAP), with market pressure from other EU countries potentially resulting in more intensive utilization of productive grasslands and to the abandonment of less productive or less accessible grasslands. However, agri-environmental schemes could represent a powerful tool for the support of management of environmentally important grasslands. Accession to the EU is also likely to lead to major infrastructure developments that could result in grassland loss and fragmentation, although this process might be alleviated by the use of Environmental Impact Assessments (EIA). Although it is impossible to predict the changes at this
stage, the status of grasslands in individual countries will change and it is necessary to monitor impact of these changes to grasslands, especially to semi-natural, extensively used, species-rich and locally specific types.

17. Monitoring the conflict management process in grasslands will require a combination of indicators assessing the losses or gains in ecosystem quantity or quality, the relative number of threatened and extinct species in time, and factors such as human population trends, pollution data and invasive species that are likely to affect biodiversity both now and in the future.

**Forests**

18. The forests of the ACC are usually more diverse than Western European forests due to climatic and bio-geographic conditions, less intensive use of forest in the Middle Ages and the impact of human activity having been determined mostly by grazing and deforestation for agriculture rather than industrial needs. The Carpathians, for example, are home to Western and Central Europe’s last and largest populations of virgin forests and large carnivores. Although world conflicts triggered destruction of large expanses of forest, the total forest area increased in all ACC after World War II, mainly because of afforestation of agricultural lands and drainage of wetlands.

19. The role of alternative (non-wood) use of forests was limited in the beginning of the century in Baltic countries but grew towards the end of the 20th century and included herding, haymaking, mushroom gathering, berry picking, resin extraction, medicinal herb picking, and beekeeping. Hunting for recreational purposes still occurs in forests, but the excessive protection of game species (deer, red deer, bear, lynx) has led to huge damage to trees.

20. Air pollution, climate change and other anthropogenic factors are important in certain ACC such as Poland. Air pollution was a main component of the Sudenten ecological disaster, where an area of over 160 km² was deforested. A recent, multi-dimensional problem that affects biodiversity directly is the increasing number and area of forest fires, mostly due to burning of stubble-fields, burning of returned land and forests and arson. These are probably connected with the socio-economic conditions during the transition toward market economy.

21. Issues leading to possible conflicts can stem from miscommunication arising from the different definitions and purposes assigned to forests by different user groups and stakeholders. The land reform and ownership restitution process has also been a source of conflict, with most of the small scale private owned forest being clear-cut or overexploited, and illegal cutting becoming a serious problem. Large forest or real estate companies, often international, have also purchased many forest areas, and often seek to make the maximum profit out of them, regardless of sustainable exploitation or biodiversity conservation. This situation creates a major social problem, with the destruction of forests gradually weakening the social structures depending on forests directly for survival. There are much less biodiversity conflicts on state-owned forests than in private forests, although forest industry pressure to increase cutting level over sustainable use is very strong.

22. Gaps in legal frameworks, and weak supervisory systems allow for the misuse or illegal use of forest resources. This is compounded in forests ecosystems by the extremely long production period, complex timber production methods, difficult natural conditions (steep slopes, terrain constraints) and the use of inappropriate equipment resulting in application of clear-cut techniques rather than techniques based on ecological management. As a result of insufficient financial resources, a limited number of bodies supervise forest management, forest management plans are not thoroughly accomplished, quality of production suffers and the tasks in development and protection of forests are not being performed. This is the most serious shortcoming in forestry and represents the most significant factor interfering with the ecological principles of forest management and thus also with the principles of nature conservation.
23. Conflict management strategies focusing on the technical or “substance” dimension such as refined silvicultural guidelines, proper forest inventory and management plans (based on appropriate information provided both by experts and local people) can be used, although both local and national approaches should be used in forest planning. Often management of large areas of public-owned forests provides efficient measures to guarantee the multifunctional role of forests and sustainable use of its resources. The political or “process” dimensions are an equally important measure. With the accession to the EU, most local laws and regulations have been harmonised with EU legislation, but the challenge will be in implementing them and will require adequate supervisory systems with financial compensatory systems of protection and the development of environmentally friendly produced forest products. The ability for stakeholders to communicate with each other should be the starting point for both substance and process applications. For effective participation, a common language is needed and can be achieved through education, public awareness and better understanding of forest biodiversity for local people, managers and scientists.

24. Monitoring the outcome of the conflict resolution process is an integral component of conflict management. Key biotypes, such as the area of primeval forest and protected forests are some general indicators for biodiversity. Each conflict management process should be monitored from the process and relationship point of view to provide better conflict resolution strategies for the future.

25. Although ACC forests are likely to continue facing high economical pressure with accession to the EU, new regulations should provide new ways of reaching appropriate solutions to maintain forest biodiversity. Opened borders may also facilitate more innovation-based industry and forestry. The inclusion of large areas of species-rich and diverse forests as well as valuable experience and expertise in forest management within the European network will be a very important event. To protect, study and use these forests creates unique opportunities and challenges for the new Europe.

Wetlands

26. Agriculture is still commonly recognized as one of the main sectors creating conflicts and affecting wetland biodiversity by causing variation in water quality and quantity and deterioration of water habitats. Eutrophication of wetlands in the ACC is common, with phosphorus and nitrogen enrichment (from both agricultural and urban sources) having both local and trans-boundary effects. The agricultural sector is also responsible for draining large areas of valuable aquatic habitats, resulting in wetlands losing much of their nutrient retention capacity.

27. Other human impacts on wetlands have included various civil engineering works, peat extraction in raised bogs and fens, changes in ownership patterns, the introduction of alien species and the loss of traditional land uses and lifestyles.

28. By default, the accession process requires integration of EU Directives and Regulations, such as the EC Habitat Directive, Bird Directive and recent Framework Water Directive as well as many of international agreements such as the Ramsar Convention, Bern Convention, Bonn Convention, Washington Convention (CITES) and Convention on Biological Diversity, relating to biodiversity protection and water management within national legislation. This top-down approach to avoid and/or solve conflicts has generally been accepted and implemented by all ACC (in spite of some country specific issues). The institution of Environmental Impact Assessments (EIA) and Integrated Pollution Prevention and Control (IPPC) practices are considered to be important instruments for preventing and avoiding conflicts between biodiversity conservation and changing industrial technologies, land-use changes and practices.

29. In many cases, however, integration of EU legislation and Multilateral Environmental Agreements (MEAs) are not enough to make national legislation operational without proper public capacity such as proper structure of governmental and local authorities as well as NGOs and professional, scientific or academic interest groups.
30. Top-down approaches should also be complemented by bottom-up participatory schemes. It is necessary to create a kind of “institutional infrastructure” providing a forum for negotiations and dialogue. Participants in such a forum should be well aware of the other stakeholders within the conflict resolution process as well as the international/multilateral agreements, regional conventions, national legislation and local decisions affecting the process. This forum should also include scientists, who can speak the “same language” as policy makers, administrators and local people. This means providing them not only with a conceptual frame but also with understandable messages, comprehensive data and alternative scenarios for future actions.

31. The temporal and spatial scales need to be well framed and take into account the different scales involved in ecosystem dynamics and socio-economic processes, in order to achieve a more sustainable conflict resolution.

32. In general, monitoring activities are considered to be an integral part of the management process by providing feedback information on the effectiveness of the actions undertaken. Because of the complexity of the ecosystems and their response time, both phase and step-by-step approaches should be jointly implemented in a monitoring procedure taking into consideration temporal and spatial scales.

33. Monitoring the substance dimension can be provided by the changing physical, chemical and biological parameters of the water bodies in achieving target goals and/or selected thresholds. The process related dimensions of monitoring should assess the implementation of the agreed actions and the progress in achieving the goals through regular observation of the organization charts and timetables of the plans and programmes by independent external bodies. Economic parameters of the resolution may also be monitored. The monitoring of the conflict resolution process should also include relational dimensions or good communication between stakeholders involved in conflict resolution process as well as changing perceptions of local people, awareness raising, training and level of involvement within the resolution process.

Uplands

34. Uplands in central and south-eastern Europe are represented by the extensive Carpathian range, Caucasus and the mountains of the Balkan Peninsula. They contain various types of habitats: grasslands, scrubs- *Pinus mugo*, *Juniperus sibirica*, *J. oxycedrus* (only in the South), peat bogs, woodlands (coniferous, deciduous and mixed), caves, screees, lakes, karst, riparian communities and springs. The role of mountains in the Balkan Peninsula is important for the speciation and the maintenance of a rich gene pool after the post-glacial re-colonisation of Central and Northern Europe. Alpine and sub-alpine zones in the ACC represent vulnerable, fragile ecosystems with slow recovery after disturbances due to both natural causes and human activities.

35. The different activities and pressures in uplands that may lead to conflicts with biodiversity can be due to land use change (due to agriculture, forestry or game management), direct use of resources (like wind farms, hydroelectric power or extraction of minerals), access and recreation (tourism and infrastructure) and indirect pressures (like atmospheric deposition or climate change).

36. Ploughing land excessively has led to the creation and consolidation of inappropriate spatial structures such as badly planned agricultural land, scattered settlements and a linear infrastructure. Other problems include large concentrations of overpopulated and technically weak farms and a low standard of wastewater and sewage treatment. Land abandonment is an important issue in ACC uplands and can lead to the loss of traditional knowledge as well as the loss of indigenous local breeds and plant species.

37. Hunting and increased tourism can also be at the root of conflicts, resulting in a loss of species, as well as soil trampling, compaction and eutrophication. New infrastructure creation in the ACC linked to recreation activities, transport corridors, road building, together with uncontrolled and illegal
building contributes substantially to the conflicts. Overbuilding in mountain areas with large hotels causes high anthropogenic pressure, waste accumulation, sewage pollution, commercialisation, and the potential loss of local identity and local traditions.

38. Indirect pressures such as trans-boundary pollution effects and climate change can also threaten mountainous forests. Sustainable forestry development in mountainous regions will depend on the technical infrastructure as well as on the socio-economic situation of particular provinces and villages, more ecologically friendly management schemes, afforestation of the post-agriculture areas and increased control of forest fires.

39. General resolution strategies in ACC upland areas could be applied through: i) legislation and control measures, ii) subsidies/incentives; iii) training, education and dissemination of information; iv) technology measures; v) specific measures.

40. Agri-environmental and afforestation schemes could be instrumental in the future, promoting practices and agricultural production methods related to landscape conservation thus limiting environmental threats resulting from marginalisation or intensification of agricultural production. Similarly, afforestation pilot projects can be set up in regions with a high percentage of poor and marginal soils in order to promote activities aiming at afforestation enlargement on private agricultural land taking into consideration optimisation of landscape structure, reduction of erosion processes and greenhouse gases. The pre-accession PHARE and SAPARD programmes provide several opportunities in this field.
2. Introduction

2.1 The BIOFORUM project and its objectives

The BIOFORUM project is a Concerted Action funded by the European Union through its Fifth Framework Programme. The primary objective of this project is to create a European forum – BIOFORUM – for dialogue between stakeholders to reduce the conflict between the conservation of biodiversity and other human activities.

The objectives of this forum are:
- To identify and analyse the principal sources of conflict between biodiversity conservation and human activities in key thematic areas;
- To identify measures for conflict management;
- To identify current best practices in biodiversity management, particularly where these relate to biodiversity-related conflict management;
- To identify and evaluate methods for monitoring progress in managing conflicts.

The following key thematic areas were selected:
- Agricultural landscapes,
- Grasslands,
- Forests,
- Freshwater habitats (including wetlands),
- Uplands (including alpine regions).

A series of workshops were held to consider sources of conflict, conflict management and monitoring progress in managing conflicts in each thematic area.

2.2 Conflicts and the scope of BIOFORUM

There are a vast number of conflicts, in the widest sense of the word, between the conservation of biodiversity and other human activities. Even in the context of biodiversity the word “conflict” may be used in different ways. At one extreme are the conflicts which arise when a human activity is known to have, or is perceived to have, an impact on biodiversity and, in addition, stakeholders disagree about the course of action that should, or should not, be taken. One example could be the clearance of remaining old-growth forests for economic or other reasons. Many people including foresters, scientists, members of NGOs and others in the wider public will be aware that the clearance of old growth forests is a threat to biodiversity and this could lead to an open conflict between those...
who wish to conserve these species and those who wish to clear the forest. We might describe this type of conflict as a realised conflict.

In contrast, many human actions that have a negative impact on biodiversity go unnoticed by all or most people. Other impacts may be noticed but their full significance may be unknown. Yet other impacts on biodiversity may be apparent and significant but all stakeholders agree on a particular course of action (or inaction). If we take a human-centred view, none of these cases are conflicts, although some may become conflicts. We might refer to some of these as hidden conflicts, others as latent conflicts. From a human-centred perspective they may be described as potential conflicts. It is nonetheless important to identify potential conflicts in order to resolve them before they become realised conflicts.

Among realised conflicts, there are large differences in the way that people are involved. In the above example of clearance of old-growth forest, the relevant actors are likely to be evident – those who wish to clear the forest, on the one hand, and those who want it left as it is, on the other. In most cases, however, many of the relevant actors will be unknown. In rivers, for example, it may not be clear who is responsible for the pollution that is threatening aquatic biodiversity. In such cases, it is likely that many people will be responsible, although individually they are unlikely to be causing significant pollution. An even more extreme example is climate change, where the actions of society are in conflict with the conservation of biodiversity.

Although these and other complications were evident at the start of the project, it was decided that the project would not be limited to genuinely human-centred (realised) conflicts. Although such conflicts may be the most important in terms of their significance for biodiversity, it was decided that the project would at least initially take a very broad view of conflict. It was, however, clear from the outset that the actions taken to manage conflicts would necessarily involve people, that many conflicts are the result of human perceptions (and are not evidence-based) and that conflicts concerning biodiversity are often intertwined with conflicts concerning, for example, human health and animal welfare. These issues are discussed at the end of this report. Nevertheless, the starting point of this project was to identify and analyse those conflicts that were most likely to be having an impact on biodiversity.

2.3 Report format

The main part of this report is five chapters, each dealing with conflicts in the five thematic areas described above. Although it is evident that there are many similarities between the conflicts occurring in different thematic areas and that some conflicts involve more than one thematic area (e.g. grasslands in upland areas), there are many aspects that are unique to each thematic area. Many of the case studies discussed at the project workshops were relevant to particular thematic areas and these are included in the relevant chapters.
3. Agricultural Landscapes


3.1. Foreword

Although the members of the ACC Agricultural Landscapes working group acknowledge that the conflicts described in previous BioForum publications are all valid in the ACC, their impacts and resolution may be quite different.

3.2. Introduction

European landscapes have been shaped to a great extent by agricultural activities. Many species have adapted to agricultural activities and landscapes and have spread through these activities. Although both Eastern and Western Europe saw a huge intensification period in the mid 20th century, the eastern European countries faced another wave of drastic changes starting in 1989 when the communist regime lost its power. The agricultural landscapes of East European countries are now characterised by a combination of divergent factors and trends. On the one hand, the strong state policy has created intense and largely homogeneous landscape changes due to intense management and intensive agricultural techniques over extensive areas. On the other hand, a large variety of traditional types of management and landscape uses have been preserved on many peripheral areas. Accordingly, in addition to intensively managed land, the East European countries still possess relatively large areas of semi-natural communities comprising high levels of natural biodiversity. Thus, there are simultaneously co-existing areas of very strong conflicts and areas of well-preserved nature, which entails some remarkable contrasts.

Among the administrative and political factors, the main driving forces shaping agricultural landscapes are land reforms, agricultural reforms, political campaigns and land policies (Sepp 1999). All these may, and have, caused an array of conflicts. As well as the administrative and political factors, the demographic processes, technological development, communication network growth, and various globalisation effects have played an important role in shaping agricultural landscapes. A specific feature of agriculture in Eastern Europe has been a relatively strong influence of territorial division of labour, or functional differentiation and specialisation due to a centralised organisation of economy. The collapse of the regulating structures around 1990 led to the reduction of such specialisation causing a new agricultural transition that led to large-scale changes and specific conflicts. A general reason for conflicts is connected to the use of centralised or heavy technological resources in agricultural productions. Under such production schemes, short-term returns are emphasised instead of long-term and ecologically sound aims. This is a major threat to biodiversity.
and the sustainable use of agricultural landscapes that need to be considered more thoroughly in EU policies on agricultural subsidies.

3.3. Description of conflicts

3.3.1. Intensification of agriculture

The growing market for foodstuffs after WW II caused intensification in all types of agricultural operations in the ACC, creating many conflicts that still persist today in some countries (e.g. Poland) or regions within a country (e.g. in areas of Slovakia or Estonia). A process of resumption of agricultural intensification is now visible in Bulgaria, especially in Northwest Dobruja and the central part of the Trakia valley. Intensification of agriculture can be damaging to the natural flora and fauna (Iremonger et al. 2002), notably birds and mammals, and can lead to the loss of specific habitats and species, and a rather monotonous landscape.

The intensive use of chemicals is one of the main pressures on biodiversity associated with the intensification of agriculture leading to the loss of soil fauna and flora diversity as well as changes in habitat structures and animal communities. Furthermore, these chemicals impact the quality of ground water and surface water and thus extend well beyond agricultural landscapes. The amount of chemicals used in agriculture in the ACC was very high until the end of the 1980s due to cheap and heavily subsidised. Still, the level of agrochemicals applied varied between regions and could be negligible in some areas. After the political turn in 1990 they became too expensive for many agricultural producers and, consequently, the amounts of chemicals used in agriculture decreased manifold. The use of mineral fertilisers, pesticides and insecticides all showed downward trends (Figure 3.1).

Figure 3.1. Dynamics of mineral fertilisers use in Estonia in the 20th century

Because of this reduction in chemical use, biodiversity, especially soil fauna, partly recovered and water quality improved. However, in recent years, an increase of the total quantity of mineral fertilisers has been recorded in most countries, as for example the nitrogen fertiliser increase in Bulgaria between 1998 and 2002. The quantities of phosphate and potassium fertilisers used are respectively 16 and 40 times lower than the nitrogen fertilisers, which is the most unfavourable proportion of nutrients observed over the last decades (Table 3.1). The unbalanced fertilisation with superiority of the nitrogen is a permanent trend for the country (Table 3.2).
Table 3.1. Mineral fertilisers used in Bulgaria in 1998-2001

<table>
<thead>
<tr>
<th>Year</th>
<th>Total kg/ha</th>
<th>N kg/ha</th>
<th>P kg/ha</th>
<th>K kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>113146</td>
<td>24,11</td>
<td>97497</td>
<td>20,77</td>
</tr>
<tr>
<td>1999</td>
<td>156344</td>
<td>33,31</td>
<td>140269</td>
<td>29,88</td>
</tr>
<tr>
<td>2000</td>
<td>163569</td>
<td>34,85</td>
<td>144928</td>
<td>30,88</td>
</tr>
<tr>
<td>2001</td>
<td>178734</td>
<td>38,06</td>
<td>167962</td>
<td>35,77</td>
</tr>
</tbody>
</table>

Source: National Service for Plant Protection (Bulgarian Ministry of Agriculture and Forestry)

Table 3.2 Amount of mineral fertilisers used (kg/ha) as an average in 2000-2002.

<table>
<thead>
<tr>
<th>Country</th>
<th>N</th>
<th>P</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>33.3</td>
<td>2.6</td>
<td>0.5</td>
</tr>
<tr>
<td>Estonia</td>
<td>56</td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>Lithuania</td>
<td>97.7</td>
<td>41.6</td>
<td>56.4</td>
</tr>
<tr>
<td>Poland</td>
<td>50.3</td>
<td>17.9</td>
<td>22.6</td>
</tr>
<tr>
<td>Romania</td>
<td>16</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Eutrophication of natural habitats as a result of spreading fertilisers to the neighbouring areas has caused a massive decrease of both terrestrial and aquatic oligotrophic communities. The soil degradation as a result of mineral fertiliser use, and the use of heavy machinery have been general features of larger farms and have considerably decreased the diversity of soil fauna in the agricultural lands.

The replacement of semi-natural communities, such as semi-natural grasslands and pastures, with cultivated crops went hand-in-hand with the increased use of chemicals in agriculture. The near exclusive use of heavy machinery was another factor in turning small semi-natural meadows into large fields. Since the semi-natural communities are generally the most species-rich (Kukk & Kull 1997), their replacement means a considerable loss in biodiversity. The agrarian reform in Bulgaria for example brought about a process of alteration of the permanent use of agricultural lands with meadows and pastures being ploughed up and the uprooting of vineyards and fruit orchards, threatening the following species: *Tulipa urumoffii, T. splendens, T. aureolina, T. hageri, Leucojum aestivum, Pancratium maritimum, Cypripedium calceolus, Castanea sativa, Quercus thracica, Minuartia mesoginata, Cerasium velenovskyi, Dianthus urumoffii, Paeonia tenuifolia, P. mascula, Medicago carstiensis, Vicia amphiarpa, Lens ervoides, Rhododendron arctostaphylos, Vaccinium arctostaphylos, Artemisia pedemontana, Medicago rhodocea, M. falcate var. rhomanica, M. cartiensis, M. coronata, M. litoralis; Trifolium constantinopolitanum, T.squarrosum, T. squamosum, T. pratense, T. repens, T. resupinatum, T. hybridum; Vicia incisa, V. amphiarpa, V. pisiformis.*

Melioration and drainage have been used across large areas that turned the mosaics of small fields and natural communities into large homogeneous fields. As an effect of melioration, the decrease of small natural streams, open ditches and small ponds together with their riparian biota has been considerable.

Insufficient irrigation is a problem in countries like Slovakia for example because of drought caused by climate change and subsequent crop loss. This new phenomenon has affected arable land, and, more recently, meadows and grasslands. As the old and insufficient irrigation systems do not cover the needs for irrigation, there is a pressing need to build new and repair old systems.

The replacement of local breeds with introduced ones also contributes to the disappearance of local diversity. Collective livestock breeding with more productive breeds and the abandonment of traditional or nomad types of breeding after WWII threatened many local breeds. After 1989, the chaotic transition from cooperative to private agriculture, privatisation of the animals, and lack of financial resources all restricted the protection of the small remaining gene pool that survived the
previous decades. The attempts to introduce GMOs in the 1990s led to the further loss of local breeds, a loss of traditional management practices and threatened the possibilities for sustainable farming.

3.3.2. Abandonment of agriculture

Although intensification of agriculture is a local source of conflicts in parts of Northern Poland, Western Slovakia and Central Lithuania for example, abandonment is at present much more widespread in the ACC as a whole. During the intensification period of WWII to 1989, many small fields and natural meadows were abandoned and former agricultural practices disappeared with the centralised approach to agricultural production. A large number of small village schools were closed and the rural population concentrated into centres of collective or state-owned farms. Land reforms and land restitution started in the early 1990s and fields, pastures and meadows were gradually because of a limited market for such products. The number of cattle and other domestic animals decreased causing under-grazing and further abandonment of pastures and meadows. Abandonment of agriculture and urbanisation went hand-in-hand, with people heading for bigger cities to find jobs (Table 3.3).

Table 3.3. Percentage of abandoned arable land (year in brackets)

<table>
<thead>
<tr>
<th>Country</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>30 (2002)</td>
</tr>
<tr>
<td>Estonia</td>
<td>23 (1999)</td>
</tr>
<tr>
<td>Latvia</td>
<td>50 (1998)</td>
</tr>
<tr>
<td>Lithuania</td>
<td>18 (1998)</td>
</tr>
<tr>
<td>Poland</td>
<td>18 (1998)</td>
</tr>
<tr>
<td>Romania</td>
<td>40 (2002)</td>
</tr>
<tr>
<td>Slovakia</td>
<td>10 (2002)</td>
</tr>
</tbody>
</table>

The main threat for biodiversity associated with abandonment of agriculture is the loss of habitats especially in mountainous pastures and valuable meadows where successional changes following the abandonment of traditional semi-natural meadows have caused the loss of a very high number of species inhabiting the various types of meadows, especially those with specific requirements, narrow ecological niches, or dependent on manure. Abandoned fields also facilitate the spread of invasive species, e.g., *Heracleum mantegazzianum*. Bio-invasion itself has been a remarkable phenomenon, especially in recent decades, influencing, and also being caused by, processes and changes in agricultural landscapes. Invasive species can originate from cultivated varieties, e.g., *Galega orientalis*, *Lupinus polyphyllus*, may have been old weeds (e.g., *Impatiens parviflora*) that have become invasive, or can be intentionally introduced species such as decorative species (e.g., *Solidago canadensis*) or species used in greeneries. It usually takes at least several decades before an introduced species becomes invasive, so the effects of species introduced in the 1970s and 1980s will only become visible in the coming decades.

Another possible cause of conflict is stubble burning. This practice is often used to clear old grass and bush cover in certain areas. Although this practice can be seen as a traditional way of management, stubble burning has sparked debate concerning its effects on biodiversity. In several countries it is prohibited, but it is still a problem in Bulgaria for example. Reasons for the conflict are linked to specific effects on biodiversity like soil surface damage, loss of bird and animal habitats, etc. However, it still protects grassland from afforestation, which could entail a positive, or at least less negative, effect on biodiversity. The driving forces behind this conflict, in addition to traditional management, include lack of funds, lack of ecological knowledge, lack of control and insufficient sanctions, as well as lack of protection: although the law regulates stubble burning, the implementation is lacking.
3.3.3. Changes in scale and organisation of agriculture

Although patchiness in the European landscape became less apparent from the start of the 20th century, abandonment is likely to increase patchiness and may create serious conflicts in small ACC farms in Poland, Romania and Lithuania. The 1990s changes have played both positive and negative roles for biodiversity in agricultural landscapes. An example of a positive role is the return to certain local traditional and extensive practices in land management. Negative examples include the large-scale changes in land use that usually decrease landscape heterogeneity or cause abandonment of certain communities’ long-term traditions. Collectivisation and, later, the breakdown of collective farms, land privatisation, and re-establishment of private farms have caused considerable structural changes in agricultural landscapes. The rapid changes are themselves harmful for biodiversity, because diversity levels rise very slowly to adapt to new local conditions. Any rapid change in these conditions turns the process back for a long period.

A paradoxical conflict concerns the support to sustainable farming. Due to the need to distinguish between sustainable and non-sustainable farming for the sake of distribution of financial support from EU sources, it has been necessary to define the characteristics of a sustainable farm. Thus, a farm, in order to be listed as a sustainable one, and accordingly to be allowed to mark its production as coming from an ecologically approved technology, has to meet a series of requirements. But, and here lies the source of the conflict, most small traditional farms that have used a very traditional and ecological way of farming, cannot meet these requirements. This is mostly due to the high investments needed for the microbial control of milk and meat production, which often exceed the possibilities of a small farm and hardly fit in with the traditional farm architecture and traditional technologies of food production. And, more directly, the administrative requirements for a sustainable farming themselves will mean a decrease in microbial biodiversity.

3.4. Conflict resolution

3.4.1. Resolution strategies

- Political and administrative framework
  The administrative tools in this area include finding and working with the people responsible for the control and the organisation of monitoring the national biodiversity resources.

- Legal regulations
  The laws that regulate the protection of species, communities, and territories, should include and specify the severity of fines for damaging nature. Also, the laws should restrict the introduction of alien species, as well as the introduction of genetically modified or manipulated organisms (GMOs) in both semi-natural and natural areas. Although the release of alien species and GMOs without special permission is prohibited in the Estonian legal system for example, the law is unable to prohibit the escape into the wild of alien plants found in fields where it is legal to plant them. The level of understanding of GMO release is still basic, and getting permission for GMOs is a simple procedure. A proper balance of EU and national regulations should be achieved at all levels in the ACC.

- Compensation and subsidies
  Compensation systems only exist in some ACC. In Estonia, for example, compensation is paid for losses due to migrating birds feeding on cereal fields. Livestock compensations for attacks of carnivores are very different from country to country, ranging from nothing (e.g. Lithuania) to ineffective systems (e.g. Poland). Compensation has been used in the case of legal restrictions to management due to nature protection regulations: A common practice in the ACC is a reduction of the land use tax for those landowners whose land includes areas of restricted use. In this way, biodiversity loss due to non-sustainable management can be reduced. Subsidies for the management of semi-natural communities have been introduced in some cases, such as Estonia in 2000 after a campaign from the Society of the Protection of Semi-Natural Communities. The subsidies are paid to landowners for the mowing of wooded meadows, coastal meadows, or other types of semi-natural
grasslands. Also, the restoration of temporally overgrown meadows is subsidised on a similar basis. In this way, traditional semi-natural grasslands can be kept in use, and their high biodiversity preserved.

- Marketing of environmentally friendly (labelled) goods
Marketing environmentally friendly goods is an indirect way of protection biodiversity in agricultural landscapes. The marketing process itself should include the advertising of green goods that will educate people on the biodiversity needs and the ways biodiversity can be protected. However, getting the label of organically produced food is costly and should be subsidised. The support to ecological agriculture could be very influential in promoting the right type of agricultural landscapes.

- Buying land
Buying land for the sake of protecting its biodiversity has not yet been a widespread practice in Eastern Europe. The three possible initiatives in this area include, (1) the state buying land from private owners (e.g., Ministry of Nature Protection or its equivalent), (2) NGO initiatives (e.g., the Estonian Fund for Nature) to buy land for protection, and (3) private initiatives.

- Awareness raising and training
This is the most fundamental way of resolving existing conflicts and avoiding future conflicts. Informing people about the values of biodiversity in agricultural landscapes should include the active use of all media. As the valuing biodiversity depends on knowledge of nature, it is necessary to raise awareness and knowledge of local biodiversity in all age groups. The sustainable management in agro-ecosystems also requires special knowledge and skills. These can be taught in special courses organised for both local people and interested volunteers. One such example could be special haymaking courses for those interested in preserving semi-natural meadows.

- Identification and use of social links
Different groups of people play a different role either in protecting or damaging local biodiversity. Linking people of different interests may help in acknowledging the needs of different species in the early stages of a possible threat.

- Communication among stakeholders
Communication among stakeholders on the biodiversity inhabiting their lands and the surrounding areas, as well as on the legislative documents and means of regulating the use, management, and protection of the appropriate biodiversity, will be an essential prerequisite for the resolution of many conflicts.

- Improve access to information
Data on the local biodiversity are often hard to find, and are often only published in specialised publications, often inaccessible to non-specialists. The publication of more wide-reaching and easily accessible writings on local biodiversity will be an important task.

- Research
In most cases, data on local biodiversity are insufficient due to the fact that it has not been adequately studied. Except of the lists of vascular plants and vertebrate animals that usually exist, lists of invertebrate animals as well as of all other taxa are usually scarce and require specialists' knowledge.

3.5. Indicators and monitoring

There is no doubt that semi-natural communities such as open meadows and pastures, wooded meadows and pastures, managed forests, as well as smaller elements and territories recovered from previous agricultural stress (e.g., road-sides, patches of trees or hedges made of local species, etc.) are a major biodiversity component within agricultural landscapes and their relative area should be a very important indicator in agricultural landscape evaluation.
Another possible indicator when comparing agricultural landscapes could be the number of alien species seeing as bio-invasion is an increasingly worrying phenomenon in agricultural landscapes and is homogenising communities at a large scale, thus becoming a threat to community diversity and biodiversity as a whole.

Although biodiversity monitoring in agricultural landscapes has been applied in most countries, it is important to highlight here that conflict monitoring is nearly absent and should be addressed.

3.6. Discussion and conclusions

What are the possible repercussions of new Eastern European countries joining the European market, from the point of view of biodiversity conflicts, particularly concerning agricultural aspects?

Expectedly, the abandonment process will continue and become more apparent in an increasing number of countries and regions. However, from the point of view of biodiversity, the inclusion of relatively large areas of species-rich and diverse semi-natural communities into the European network will be a very important and valuable asset in terms of biodiversity. The existence of large areas of semi-natural communities and living examples of traditional management of these areas will become a potentially important factor towards the development of sustainable agriculture in the whole region. These areas may also be attractive for eco-tourism, which in a limited quantity may be beneficial for the protection of local biodiversity.

3.7. Case studies

3.7.1. Energy-stands in abandoned fields and wastelands

In the late 1980s, using biomass as a large-scale energy source led to the establishment of the first willow stands in Estonia, initially using the clones of *Salix viminalis* and *Salix dasyclados* imported from plantations in Sweden (Koppel et al. 1996; Heinsoo et al. 2002). As a woody species, willow growing can be considered to be a version of forestry. Indeed, the stands are often called ‘short-rotation forest plantations’, with a four-year management cycle in the case of willows. Every four years the plantation is clear cut and renews itself vegetatively from stumps. Due to the regular use of fertilizers, and the initial application of pesticides, it still retains characteristics more reminiscent of agriculture than forestry. Also, in most cases the abandoned fields are used for willow plantations, because of their requirement of fertile soil.

In order to become economically feasible, and considering the massive requirement for energetic resources, there will be an increasing need for growing these stands on very large territories. Using biomass as an energy resource would certainly be favourable for biodiversity in a long-term and global context, due to the carbon cycle balancing and a whole sequence of climatic and ecosystem changes that may follow from this. However, in a local and short-term scale, the conflict with biodiversity conservation is evident.

The first Estonian experimental plantations showed some initial shortcomings including frost sensitivity of the clones with the highest growth rate and leaf fungi damage to certain clones. This led to important conclusions: in the long-term it would be more stable to use the clones with slightly lower growth rates instead of the fastest growing clones and clone mixtures rather than only one clone in a large area would minimise fungal damage. These two conclusions could be solved and applied, if the local native material of the same *Salix* species (both *S. dasyclados* and *S. viminalis* are native species in Estonia) was used for plantations: using native and genetically mixed material was economically as good and biodiversity-wise better than introducing selected clones from abroad.

The next problem with these plantations concerns the high fertilization levels applied, potentially threatening neighbouring ecosystems. Here, a partial solution can be the growing of these plantations on wastewater purification systems, thus using the stand as a natural water purification method.
(Kuusemets et al. 2001). In cases where the stands have to be grown on mineral land, instead of \textit{Salix}, the species of \textit{Alnus}, notably \textit{Alnus incana} can be used (Uri et al. 2002). The growth rate for \textit{Alnus}, in case of application of fertilizers, is lower than in \textit{Salix}. However, due to the nitrogen-fixing bacteria found in the roots of \textit{Alnus}, nitrogen fertilization may not be required in this species at all. \textit{Alnus incana} is a local native species in Estonia, which often grows on abandoned fields as a pioneer species in the process of overgrowing. Accordingly, the herbal community of these stands can be the local natural one.

As a final remark, the hay from ordinary productive grasslands, as well as from natural stands of high grasses (like \textit{Phragmites}, \textit{Phalaroides}, or also \textit{Typha}) can be used as a source of biomass for energy industry.

3.7.2. Land use and related problems in Lithuania

- Change of land use over time
  Until 1940, land in Lithuania was used for small-scale, relatively extensive agricultural production, with no abandoned land and a very low input from artificial fertilizers. Natural patchiness was maintained with crop rotation and small field size. Farms of 2.5 ha comprised 3.13% of the total agricultural area, 5-10 ha – 13.5%, 10-15 ha – 16.8%, and only 16.2% over 50 ha (Lietuvos, 1994). From 1945 to 1990, under the large scale Soviet kholkhoz system, natural patchiness was lost due to intensive land reclamation (ca. 80% of swampy land reclaimed and ca. 70% of small rivulets straightened), use of artificial fertilisers and pesticides, heavy machinery and monoculture. This was followed by the loss of other natural land properties such as small swamps, rivulets, hedgerows and refuges. Agricultural land accounted for 70% of the total territory. After 1990, the land ownership system changed heralding the return of small-scale agriculture, with the minimum private property area being set at just 3 ha. Private farms remain small today, with the majority covering 10-20 ha. The former land reclamation system was at least partially lost, regaining natural land properties such as swamps, rivulets and patchiness. As in most post-soviet countries there was also a drop in levels of pesticides, fertilizers and heavy machinery. The exact area of abandoned land is not reflected in official statistics, but a total share of agriculture land diminished from about 70% to 53.9% in 1994.

- Biodiversity situation in regards to the recent land use
  Lithuania is home to a number of species that are absent or threatened in western Europe but flowering in Lithuania and causing conflicts with landowners (wolf, beaver, large ungulates, including the European bison). All these animals have learned to adapt to land use changes. One example is a wolf pack that used to breed in a 200-hectare field, abandoned about 8-10 years ago and overgrown by wedges and \textit{Salix} species. Wolf damage in 2000-2001 reached a thousand heads of cattle and sheep (Balciauskas et al., 2002) causing conflicts as compensations for livestock loss are not paid to local farmers. The problem was exacerbated by the presence of wild boar that would move from the forests to the open overgrown fields during the day, thus causing damaging surrounding agricultural areas.

  However, many abandoned fields are used by species and causing no damage. These include many species of amphibians spawning in the former land reclamation system destroyed by beavers. The beaver itself is another species benefiting from abandoned areas, making use of the former reclamation ditches and restoring them to the previous state. Beaver and amphibian presence make it possible for the otter to survive in these conditions (Balciauskas et al., 2000).

- Some social effects
  In Soviet time, almost all the single farmsteads disappeared as a result of collectivisation. After 1990 and new wave of land abandonment, small villages in areas where soil was less fertile and remote areas started to be abandoned. In very recent years, the process has yet again been reversed and new farmsteads have started to appear. On the border with Latvia and Lithuania, near the Nemunelis River, huge areas are now only inhabited by a very low density of old people who no longer carry out agriculture. Abandoned agricultural areas have become meadows or wasteland and former meadows
have been afforested. This new landscape has however benefited certain threatened species like the corncrake (Balciauskas & Balciauskiene, 1999), golden eagle, some butterflies and amphibians.

Another biodiversity conflict caused by land re-privatisation occurred when unprotected small-scale territories became private land. Legislation does not cover these territories, and the new owners are often unfamiliar with regulations and restrictions, and believe they can use the land for whatever purpose they chose. Protected areas with restricted land use also caused a problem as without proper management, wet meadows can become overgrown by reeds and shrubs, thus becoming unsuitable to rare plants, amphibians, insects and breeding bird species.

Some of these problems may be solved by compensation systems, currently absent in the country, thereby balancing disagreement between the EU wish to protect large carnivores and the conflict they cause with livestock owners. Payments could also help in managing extensive use of land, which in other cases would be abandoned and lose their natural biodiversity value.

3.7.3. Soil erosion in Troyan, Bulgaria

The municipality of Troyan is located in the central part of the Balkan Mountains. Although it only occupies 86,326 ha, it combines the characteristics of plain, pre-mountainous and mountainous relief (approximately from 300 to 1,300 m of altitude), with climatic characteristics, soil differences and plant associations. Due to the specific particularities of the topographic (large slopes) and soil conditions (low resistant, stony, with high level of acidity), the area is potentially endangered and is prone to erosion.

Scientific research (Pencheva et al., 1998) completed before the 1990-2000 Bulgarian agrarian reform established that the surface water erosion in the Trojan municipality was widely spread and identified as the main soil degradation process. The main conclusion from the present scientific study is that the main direction for increase of economic and anti-erosion efficiency of land use in order to protect and to conserve the biologic diversity on the territory of municipality of Troyan must be the transformation of crops (i.e. change in the way of durable utilization), application of agro-technical and engineering activities.

After the agrarian reform in Bulgaria and ownership restitution, the owners and users of agricultural lands could use the land for cultivation of crops according to their needs or market demands. A common practice in the region is the application of “unsuitable” agricultural practices: stubble burning, incorrect crop-rotation, cultivation of monocultures, destruction of field boundaries, ploughing up meadows and pastures, incorrect soil cultivation, uncontrolled pasture, cultivation of untypical crops.

At this stage is still difficult to compel landowners or land users to protect their lands from erosion as there are no strict requirements for the land owners to protect the land from water erosion, no approved stimulus for land owners or users for implementation of soil-protection activities and a lack of funds for projects aiming at building up soil-protection facilities. Considering the existing fragmentation of lands, the implementation of the measures recommended in the Act for Agricultural Property and Land use (1991) and in the Agricultural Lands Protection Act (1996) has been impossible or too costly. The delay of putting measures in place for protection against water erosion will continue to disturb the ecological balance and biodiversity by threatening valuable and traditional regional crops, changing typical plant associations and changing the habitats of wild animals.

The process of conflict resolution in this case will have to incorporate a combination of various political tools and practical measures, including legal instruments and measures such as the adoption of a normative system in order to establish standards, ordinances, bans, permissions etc. for control of erosion; Economic instruments and measures such as the use of “money” as a driving force for change of farming practices (“money” as punitive measures like penalties, sanctions etc. and as encouragement through subsidies, direct payments, compensatory payments etc.);
Advisory/information instruments and measures such as public campaigns and advice to encourage farmers to change their methods of farming in order to decrease the risk of soil erosion; Instruments and measures based on pilot (demonstrational) projects. The development of pilot projects for application of best agricultural practices aiming at environmental protection will provide a solution to the problem of erosion, protection of the biodiversity and the education of farmers and local population. The existing experience shows that the best solution is for this model project to be performed by an NGO with scientific help (on the territory of the municipality this could be done by the Research Institute for Upland Stock- Breeding and Agriculture) and with the support of the local authority.

3.7.4. Local Breeds in Bulgaria

Animal breeding is an old activity in Bulgaria and after centuries of traditional farming practices the country is characterised by a great diversity of livestock species and breeds including cattle, sheep, goats, buffaloes, pigs, fowls, horses and other domestic animals. This genetic diversity is closely related to the geographical and cultural diversity of the countryside since different people in different places often had very different preferences for the species and breeds of animal they kept. The loss of traditional breeds is a particular problem in the disadvantaged mountain regions where traditional cattle and sheep breeds are very well adapted to the poor conditions and are important in maintaining grazing on mountain pastures.

The impact of the Soviet era on local breeds was devastating with specialisation and intensification of agricultural production leading to the abandonment and replacement of traditional breeds with modern breeds that were more productive and profitable. For example, prohibition of the traditional nomadic system of mountain sheep farming practiced by the Karakachani and the confiscation of their flocks impacted heavily upon the numbers of Karakachan sheep, horses and dogs - all of which are traditional breeds of the same name and are now endangered or rare. At the beginning of the 1900s there were about 330,000 to 500,000 Karakachan sheep. This number had decreased to 160,000 by 1957 and today there are only about 200 left.

Several indigenous Bulgarian breeds are identified as critically at risk on the FAO list of endangered animal breeds of the world (last updated in 1994). These include:
- Iskursko Govedo (Iskar Grey) cattle - In 1994, there were 42 herds remaining with 120 pure-bred females registered in the herd book – population trend was decreasing.
- Rodopska (Rhodopa Short Horned) cattle - In 1994, there was only one herd remaining with 14 registered pure bred females – population trend was decreasing.
- Carakachanska Ovsta (Karakachan) sheep - In 1994, there were 700 registered pure-bred females – population trend was decreasing.
- Karnobatoshumenska (Copper-Red Shumen) sheep - In 1994, there were 2 herds remaining with 350 registered pure-bred females – population trend was stable.
- Panagurishte sheep - In 1994, there were 800 registered pure-bred females – population trend was stable.
- Istochnobalkanska Svinia (East Balkan) pig - In 1994, there were 4 herds remaining with 408 registered pure-bred females – population trend was increasing.
- Carakachanski Kon (Karakachan) horse - In 1994, only one herd remained – population trend was stable.

The future of the indigenous local Buffalo breeds, notably the Bulgarian Mediterranean Buffalo (Bulgarian Mura) is also uncertain following an unexpected decrease in numbers after mass export of buffalo meat in recent years.

In addition to the FAO list of endangered breeds, a Red Register of Domestic Animals has been developed for Bulgaria that classifies local breeds according to the degree of threat. The current status of this Red Register is unclear, but it should provide more guidance on which breeds should be supported. The National Biodiversity Conservation Plan (NBCP) for Bulgaria recognises that the loss of genetic diversity of domestic animal breeds is one of many threats to the rich biodiversity of
Bulgaria and recommends that priority should be given to the conservation of endangered local indigenous breeds, including those with valuable qualities and genetic material that can be used for future selection.

In an effort to solve this conflict, the Bulgarian-Swiss foundation Bioselena has set up the “Rare indigenous breeds” project. The idea for this project came after a detailed analysis of the agrobiodiversity in Bulgaria, which showed that some of the indigenous breeds were extremely endangered. Special attention was directed to breeds important in terms of present Bulgarian animal husbandry such as the Bulgarian Grey Cattle - the Indigenous Grey branch and the Grey Iskar branch; the Rhodopy Shorthorn Cattle; the Karakachan sheep; the Copper - the Shoumen branch and the Karnobat branch. The importance of these breeds stems from the fact that they are adapted to the difficult climatic and feeding conditions of the regions where they are raised. Some of the breeds are unique in origin in that they are descendants of wild forms - the Karakachan sheep - or are one of the oldest representatives of pre-historical ages - the Shorthorn cattle. The loss of these breeds would cause the loss of important genes characterised with highest vitality.

The project aims to develop economically sustainable conditions for raising and breeding such animals. The major steps in achieving this aim are to describe the breeds seeing as no official descriptions and determination system exist yet; to identify existing animals and start herd books for the breeds; lobby and advocate awareness of the endangered status of the breeds before the state institutions; facilitate the state subsidy application process for farmers; support the institutions and farmers in the developing and implementation of the requirements for direct payments by agro-environmental measure 1.3 of the pre-accession SAPARD programme; create an autonomous network of indigenous breed owners to easy access to any supporting programs.

The project has gained its first successes by being implemented under an international Memorandum of Understanding between Bulgaria and Switzerland and increasing target group of farmers. Five private farmers from the group succeeded in receiving state subsidies for the first time since the democratic changes in Bulgaria started. The project and the state institutions worked in perfect unison and resulted in the production of “Instructions for Breeding Indigenous Animals and their identification”.
4. Grasslands


4.1. Introduction

Grasslands are among the most important habitats for biodiversity in agricultural landscapes. They are plagioclimax, semi-natural ecosystems that were developed in very different abiotic conditions (e.g. from wet to dry soils, on silicate or limestone etc.) and biogeographical contexts resulting in a broad range of ecological habitats covered by grassland ecosystems. There exist very close relations between grasslands and human activity, with diversity, coverage, and ecological conditions of meadow vegetation directly linked to economic activities and prevailing socio-economic systems. Beside economic importance, the grasslands have equally important role as shelter for plant, animal and microbiological biodiversity. Unique habitats exists in the lowlands, such as *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils; Mediterranean tall humid grasslands of the *Molinio-Holoschoenion*; Alluvial meadows of river valleys of the *Cnidion dubii*; Eastern sub-mediterranean dry grasslands of the *Scorzoneretalia villosae*; Sub-continental steppic grassland; Panonic steppes; Semi-natural dry grasslands and scrubland facies on calcareous substrates; Sub-continental steppic grasslands; Alpine and sub-alpine calcareous grasslands; Inland salt meadows; Humid dune slacks. Many of these habitats are listed in Annex I of the Habitat Directive.

The first half of the 20th century was characterised by private land ownership and extensive agriculture employing a very high number of people. Land reclamation had only a minor influence and owned grasslands were used for haymaking and grazing (handicraft haymaking even in tall sedge dominated communities). The grasslands were managed mainly in traditional ways with a very low level of mechanization. This mode of grassland utilisation usually corresponded well with biodiversity conservation needs. After World War II most private land was nationalised in nearly all countries. The borders between the private grassland patches were lost and collective farms were established. Wetlands were drained and turned into arable land. Intensively managed, species-poor areas replaced natural meadows and pastures. These were regularly ploughed, fertilized, sowed with new varieties and hybrids of grasses and clovers (mostly) and cut several times a year. Intensification and mechanization of agriculture led to the simplification of the agricultural landscape, decline of grassland biodiversity and significant loss of natural grassland ecosystem values. However, certain areas of natural grasslands were preserved. Farmers were allowed to keep some cattle for their own needs. In the case of grazing and haymaking, they could use less productive or more difficult to access areas such as woodland fringes, riverbanks, and steep slopes. Thus, albeit on a very small scale, the natural structure and biodiversity of some grassland communities were preserved.

The collapse of the communist system in the 1990s marked the start of the new process of land restitution. This change in land ownership caused different problems including division of land in
numerous small private farms, an increase in the proportion of abandoned land, a drastic decrease in the number of cattle, a loss of local animal breeds and plant varieties… Grassland management became less intensive and lower amounts of agrochemicals were applied. Natural meadows and pastures, as well as arable land were abandoned. Of course, the changes described above were not all similar across the ACC. Private land ownership prevailed for example, in countries such as Poland and Slovenia.

The next period of change started with the implementation of several nature conservation programs (e.g. Natura 2000) and a clear increase in public awareness of biodiversity values in at least some of the ACC. Further changes in these countries are expected when joining the European Union. Some mechanisms already operate in connection with the accession process (e.g. legislation harmonization, SAPARD programme, new agro-environmental schemes), but the main changes in grasslands are expected in connection with the implementation of the Common Agricultural Policy and quotas for agricultural products in the ACC.

Historical changes in agriculture described above and expected changes when joining the European Union significantly influence grassland management and biodiversity. Nowadays, the meadow communities should be considered as the most rapidly degrading (semi-) natural communities. This is alarming, because natural and semi-natural grasslands not only have high natural values (e.g. high biodiversity, many rare and endangered species), but also represent an important part of the European cultural heritage, having been created by generations of farmers in harmony with natural conditions and significantly contributing to the visual character of the European rural landscapes.

4.2. Identification of conflicts

Conflicts between human activities and biodiversity conservation occur when the land use management is incompatible with biodiversity conservation or when the conservation of biodiversity forces residents to change their habits, lifestyle and/or common practices. A clear distinction can be made between conflicts on two different levels. The first is to consider the actual practices in grasslands that lead to conflicts, and the other one is to consider how certain perceptions of grasslands can lead to conflicts. Another issue is related to the scale of conflicts. Most conflicts arise and can be resolved on a farm or patch level. Other conflicts (such as road infrastructure or spatial development) will have much wider repercussions and will involve actors on a wider scale. Thus, they can also be solved only with means applicable to the respective level (e.g. regional or national planning).

There exists a high variability in conflicts between human activities and biodiversity in grasslands. Based mostly on the intensity, impact on grassland dynamics, and impact on diversity of human activities we classified these conflicts into 19 different types that belong to 6 broader groups. Different types of conflicts do not operate equally in individual countries - there are differences between countries in occurrence, frequency, intensity, and spatial distribution of individual conflict types. These differences are given in table 4.1.

Table 4.1. List of conflicts in grasslands and their allocation to some Accession Countries*

<table>
<thead>
<tr>
<th>Conflict type</th>
<th>BG</th>
<th>EE</th>
<th>LT</th>
<th>PL</th>
<th>RO</th>
<th>SI</th>
<th>SK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Agriculture intensification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.1. Increasing fertilisation</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>N</td>
<td>N</td>
<td>L</td>
<td>N</td>
</tr>
<tr>
<td>A.2. Increasing stocking rate: overgrazing/soil disturbance</td>
<td>EL</td>
<td>L</td>
<td>N</td>
<td>O</td>
<td>N</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>A.3. Permanent grassland turned into temporary grasslands</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>O</td>
<td>N</td>
<td>O</td>
<td>L</td>
</tr>
<tr>
<td>A.4. Crop extension leading to grassland loss and fragmentation</td>
<td>N</td>
<td>EL</td>
<td>EL</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>EL</td>
</tr>
<tr>
<td>A.5. Drainage of wet grasslands</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>N</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>A.6. Simplification and/or homogenisation of grasslands</td>
<td>O</td>
<td>L</td>
<td>L</td>
<td>O</td>
<td>O</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>A.7. Genetic pollution and introduction of non-native taxa</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>B. Grassland abandonment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.1. Abandonment and natural succession</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Conflict type

B.2. Afforestation or plantations

C. Development

C.1. Infrastructure and road development leading to grassland loss and fragmentation

C.2. Urbanization

D. Spatial policy and Planning

D.1. Land use change

D.2. Different conservation priorities

E. Tourism/Access and Recreation

E.1. Leisure activities negatively affecting biodiversity

E.2. Leisure infrastructure leading to loss of grasslands

F. Management methods

F.1. Mowing (cutting) methods

F.2. Burning of grasslands

F.3. Not proper grassland conservation

* Only Bulgaria (BG), Estonia (EE), Lithuania (LT), Poland (PL), Romania (RO), Slovenia (SI) and Slovakia (SK)

O - occurrence of conflict; N – not occurring; L – locally occurring; EL – existing conflict, low intensity; Os – occurrence of conflict, but solution is established.

4.3. Conflicts description

4.3.1 Intensification

Intensification of grasslands is common in most ACC, mostly in easily accessible, high production areas and is linked with increased fertilisation, herbicide and insecticide application, early first cutting and frequent mowing, increasing stocking rates and overgrazing, land drainage in wetlands, ploughing and reseeding and the merging of small grasslands patches and creation of large homogeneous hayfields. The conflicts that emerge in association with intensification are between profit-maximisation and conservational priorities. Conflicts rarely emerge in situations when nature conservation can compensate for financial drawbacks of ecologically sound management or the extensive use of grasslands is otherwise reasoned.

- Increased fertilisation.
A well-known effect of chemical and organic fertilisation, beside higher production, is a change in floristic composition. Moderate fertilisation can lead typical hay meadows to be floristically diverse but with almost identical floristic structure in similar soil and climate condition. Excessive fertilisation including liquid manure can result in a drastic reduction in plant species number with only the most nitrophilous species persisting and resistant weeds dominating. The overall result of increased fertilisation is a severe loss of biodiversity at both the species and habitat level.

- Herbicide and insecticide application
The effect of pesticides on diversity is directly negative and several have effects extending to species and ecosystems beyond those targeted. Application of herbicides is usually limited to fertilised grasslands to suppress species with low nutritional value. In the past they were sometimes also used to eliminate shrubs in the first stage of afforestation. Both fertilisation and herbicide application have a strong impact on ground water and often cause pollution of the latter.

- Early first cutting and frequent mowing
Switching from hay to the economically more profitable silage production, can result in very early first cutting in different types of meadows, interrupting the propagation cycle of many plant species owing to the absence of mature seeds and decrease in species richness. Frequent mowing diminishes vitality of those species that are sensitive to cutting. Besides the effect on plants, early cutting also
strongly affects certain animal species like ground-nesting birds by interrupting nesting, reducing the chances of successful reproduction by destroying the nests and making it very difficult for juveniles in particular to hide from predators.

- Increasing stocking rates and overgrazing
  Different types of pasturing are known in the ACC, such as lowland and upland permanent pastures, combination of pasturing and cutting, etc. However, increasing stocking rates and/or overgrazing and associated trampling can lead to a decrease in species richness and have particularly strong effect on vulnerable species. This can also result in vegetation is dominated by a few grazing-resistant species in grazed areas, and soil erosion in mountainous grasslands.

- Land drainage in wetlands
  Drainage often results in the complete loss of wet grasslands and the creation of improved, floristically different and less diverse hay meadows. Drainage of wetlands is often accompanied by ploughing, reseeding, fertilization, merging of smaller patches and homogenisation of large areas. In some countries, where the most important wetlands have already been modified through intensive drainage processes, the decrease of biodiversity is very serious and has, in some cases, required restoration work in order to sustain necessary levels of biodiversity and water quality. Such work, however, is extremely costly.

- Ploughing, reseeding and homogenisation of grasslands
  Permanent grasslands or pastures are in some cases improved by ploughing and reseeding thereby increasing hay production and quality (especially for dairy production). Such practices could lead to genetic pollution in grasslands and ploughing (especially when coinciding with reseeding) through the use of seed mixtures potentially containing alien seeds or non-local varieties. Another possible effect is the homogenisation of grasslands, or unified intensive management due to the merging of smaller grassland patches or other amelioration works. In addition to ploughing, reseeding and draining, homogenisation can lead to the total destruction of natural habitats and the creation of new landscapes consisting of new, large, homogeneous and artificial habitats.

The dimension of intensification depends greatly on the economic situation of individual countries and varies between regions within countries. Generally the farmers themselves do not invest all their efforts in extensive intensification. In view of accession, the intensification of grassland is likely to continue in areas with easy access and suitable landscape features unless some restrictions are established. Grasslands with low production potentials, upland grasslands and other economically marginal grassland patches are more likely to be abandoned and left to the process of afforestation.

4.3.2 Abandonment

Grassland abandonment represents a widespread phenomenon in the ACC, with the area of abandoned grasslands significantly increasing in the last 15 years. Several reasons are responsible such as the long-term gradual changes in economy of agriculture linked with the market demand of agricultural products, the overproduction and the ability to produce the same amount of products on a smaller area with intensive management, focusing production in the most suitable natural conditions and the abandonment of sites with less favourable conditions. Factors like “mad cow” disease (BSE) or consumers’ preference changes connected with wholesome nutrition and vegetarianism have also contributed to a significant decline in livestock numbers and consequently to the decreased demand in hay and pastures. Demographic changes and population decline in the rural areas represent another reason for grassland abandonment.

Other reasons for grassland abandonment, specific to the ACC, occurred after the fall of Communism in the late 1980s and the transition from the communist system to democracy. Changes in economic and subsidy systems, and the new phenomenon of application of the market economy in agriculture resulted in an unstable economic situation and even the bankruptcy of some agricultural sectors, which had (and still have) a significant influence on land use and grassland management. Broad
ownership changes and changes in owner attitudes also led to abandonment. A specific feature is the loss of contact with farming practices in some ACC during the communist period. Collectivisation in agriculture led to the loss of land ownership, as well as the technical and economic basis for farming (machines, animals, buildings) and more importantly to the loss of traditional knowledge and interest for farming. After the restoration of land ownership in the 1990s, very little interest remained to establish private farms.

Grassland abandonment has a significant influence on grassland biodiversity leading to gradual changes in species composition whereby the process of secondary succession is induced, transforming grassland habitats into forest. The highly competitive species of grasses and herbs and later also of shrubs begin to dominate while species with lower competitive abilities are suppressed and gradually disappear. Species diversity of grassland declines and if such processes dominate in larger parts of the landscape, this can lead to a decline in biodiversity in the total landscape. Concurrent with abandonment is the fragmentation of grassland habitats, especially on large floodplains and coastal meadows. Decrease of suitable habitats due to fragmentation or afforestation reduces the survival probabilities of all species associated with grasslands.

The problem of grassland abandonment is often solved through afforestation, especially when former grasslands are in advanced phases of shrub succession or when owners find afforestation more economically beneficial than grasslands.

4.3.3. Management methods

The structure of plant communities as well as their suitability for other species (e.g. small mammals or nesting birds) depends on both the type and intensity of disturbances. Human-induced disturbances through management of grasslands have a direct impact on species diversity, especially so in the case of semi-natural grasslands whose conservation and development are entirely dependent on the way they are managed. Conflicts can occur in two cases: First, there is a transition from traditional management, which is usually extensive, to more intensive, profit-oriented management. This aspect has been dealt with in the preceding chapter. From a management point of view, a possible solution to overgrazing or multiple hay cutting could be mowing once a year at the middle of the growing season. Second, there is a lack of knowledge about the way in which diversity of grasslands can be conserved or why biodiversity in grasslands should be conserved in the first place.

This second aspect is more complicated. On one hand there is a lack of knowledge about grassland conservation and therefore people tend to use wrong conservation methods. For example, burning the litter is an effective way of creating fast early growth of the plants and removing the regrowth of trees and shrubs. However, when burning is used after the snow has melted, it can kill a large number of insects and cause a considerable decrease in plant diversity. Therefore, while controlled burning of litter can be an effective tool in meadow restoration, it should always be done on frozen soil and its frequency should be determined according to the community type. As the burning causes a decrease in soil nutrient levels and increases acidity of soil, it is better in most grasslands to use it only as one-time tool for restoration (i.e. removal of litter, shrubs and tree regrowth). Mowing must be done adequately to reduce the risk of unwanted negative effects on diversity. For example, mowing should never go from the edges of the grassland towards the centre as birds and small mammals will be prevented from protecting themselves in the field margins, and will be forced into the centre of the field, eventually killed by the mowers. Mowing should therefore always start from the centre of the grassland and proceed towards the edges or from edge to edge.

There are also differences between community types in the best use of biodiversity. Usually, alluvial meadows, coastal meadows, and many low-productivity meadows (e.g. alvar grasslands or heaths) are used as pastures. This is mainly linked to the difficulty of mowing in these areas. Other community types are used both for grazing and mowing. The optimal grazing pressure will differ between community types and will depend on productivity of the system. It is usually best to use combined grazing of cattle, horses, sheep, and goats as they all have different food preferences and when used in
combination create the best effect in terms of plant diversity. Combined grazing can also increase insect diversity as many insect communities specialise on the dung of different species.

Traditional management should be preserved since it has deep roots in the local culture and long traditions have created certain environmental conditions in these grasslands. There is reason to believe that these conditions have lasted long enough for local species to adapt to them and therefore the preservation of traditional management methods should also provide suitable conditions for these species. The fact that grasslands need low intensity management for their diversity to be preserved should also be taken into account when management plans are made.

4.3.4. Development

The scale of the conflicts between infrastructure development (including urban areas) and biodiversity conservation in the ACC is not as important as other processes such as abandonment for example, but this situation is changing in connection with economic and political development in individual countries. Although development usually manifests itself locally it can result in irreversible losses or fragmentation of grassland habitats. The following conflicts between development and biodiversity conservation can be highlighted:

- Urban development. This started to manifest itself after liberalisation with the expansion of suburbs. A new development however in the ACC is the creation of big shopping centres, occupying large areas in the city peripheries.

- Industry development. The influence of this factor on grassland biodiversity is mainly through foreign investments that often lead to the construction of new factories outside current industrial areas. Industrial development may potentially also lead to pollution of surrounding areas.

- Road infrastructure. This usually involves the reconstruction of already existing roads and enhancement of the roadside infrastructure. Highway construction has a significant influence, usually because new tracks of road have to be built.

- Development of rural territories. One example is the development of the tourism infrastructure in the most beautiful and valuable territories.

- Hydro-energy. This is one of the most acute conflicts in this area, with official institutions, private initiatives, and even some environmental protection organisations promoting the construction of dams on small rivers (“clean energy”). Alluvial meadows and valley fens are usually found in the affluence zone.

All these developmental efforts lead to the direct loss of grasslands if these are located areas used for construction. Indirect influence to biodiversity includes fragmentation, intensification of use, increased access, pollution (including increased garbage accumulation) and other effects. It is likely that the growing economy of Eastern and Western European countries will exacerbate these conflicts.

4.3.5. Spatial planning

Human activities in the landscape include the repair, development and construction of buildings, road networks, railways, telecommunication systems, water distribution and wastewater disposal, distribution of electricity and natural gas, changes in land use etc. Grasslands and meadows are appealing to constructors who will usually avoid cultivated landscapes such as agro-ecosystems, orchards and vineyards that are considered productive as well as wetlands that are considered unsuitable for constructions. However, development on grasslands might eventually lead to conflicts among those who want to preserve the biodiversity of grasslands and local communities and administration that will want the development of these infrastructures. The mission of spatial planning is to find adequate locations for all required activities and functions in the landscape.
Spatial planning has the potential to minimize impacts on natural habitats, including grasslands but requires good ecological data and adequate interpretation aiming to identify ecologically significant ecosystems and incorporate their conservation or appropriate management into spatial plans in order to minimise conflicts. Different approaches and methods are used in spatial planning processes in different countries and regions. In some ACC, spatial planning is delegated from the government to the regional or local levels. A number of decision makers, having no or little experience, different approaches and different priorities etc are involved in the spatial planning decision process thus creating potential for conflicts.

4.3.6 Tourism and recreation

Conflicts in this field can be related to leisure activities directly or to the infrastructure associated with recreation. Winter recreation activities seem to have a bigger impact than summer ones, with skiing being the most influential process causing direct damage of vegetation. This damage is due to low snow cover (especially in the spring) and artificial snowing resulting in deeper and longer lasting snow cover delaying and shortening the vegetation period: the development of plants is delayed, density of the sward is reduced and the biomass production is lower. The overall effect is a simplified plant community with a different species composition.

In the last few years, horse riding for recreation has grown. This can have positive impacts through the management of larger areas of grasslands for hay production, but can also cause the conversion of valuable meadow communities into horse pastures (leading to changes in plant species composition) or direct damage of vegetation cover through trampling. Golf is another sport growing in popularity with certain ACC experiencing pressure for construction of new golf courses, potentially threatening grassland habitats with relief alteration, transformation of wet grasslands into water pools, construction of new water pools and other objects that result in direct elimination or significant damage of grasslands. Intensive management of golf course (frequent sward cutting, irrigation, trampling) also changes grassland communities. An additional problem is the possibility of genetic pollution through lawns used in golf courses. The infrastructure associated with recreation activities usually has bigger impacts on grassland biodiversity than the leisure activities themselves. The most important effects are the direct loss of grasslands caused by construction of accommodation facilities (hotels, lodges) and accessory equipment, ski lifts, refreshment facilities, access routes etc. Building of linear facilities (access routes, ski lifts and railways) can also lead to grasslands fragmentation.

There are however positive relationships between grassland biodiversity and recreation with significant areas of grasslands being managed by owners of secondary homes. The popularity of agrotourism is also growing, usually leading to the continuation of traditional management of grasslands and the conservation of semi-natural grassland communities.

4.3.7. Different conservation priorities

Paradoxically, nature conservation itself can represent a source of conflicts relating to grassland biodiversity conservation. The establishment of protected sites (especially in the 1970s and 1980s) for example was usually followed by a time lapse in which either grassland management was completely aborted or saw significant changes in management regimes. This was due either to lack of sufficient financial and personal capabilities for the management of grasslands in protected sites or because the basic assumption of grassland maintenance, i.e. suitable management regime, was not always recognised by nature conservationists. The absence or paucity of ecological knowledge on management requirements of individual types of grasslands also led to unsuitable management (especially cutting time). All this resulted in changes in species composition, sometimes important enough for habitats to lose their character and conservation value.

Different conservation priorities also represent sources of conflict. Typical examples of such conflicts are associated with the protection of wooded meadows and pastures, Nordic alvar grasslands or
alluvial meadows which all need grazing or mowing to be preserved. In case of cessation of management these communities change to broad-leaved forests, Juniperus communis formations, or alluvial forests that also have very high value for nature conservation. In such cases a choice has to be made over which type of community will be preserved and maintained over the other.

Some conflicts within nature conservation are caused by mistakes in legislation. This relates mostly to cases when the law is established to insure strict protection of areas with high natural values. However, such laws can sometimes prohibit activities that are necessary for the maintenance of grasslands. The new nature protection law in Slovakia (543/2002) for example prioritises conservation of natural processes and prevents human-induced disturbance of vegetation in strictly protected areas., including mowing or grazing of protected grasslands. Nature conservation bodies like National Parks and Landscape Protected Areas need exceptional permission from Ministry of Environment for such management efforts, which can result in a grassland management cessation due to administrative bureaucratic barriers, or to the re-categorisation of grasslands into less strictly protected categories.

4.4. Conflicts resolution strategies

Legislative tools, such as policies, national strategies, laws etc. along with cultural background of the country largely determine the scale and frequency at which biodiversity conflicts in grasslands arise. The choice and applicability of resolution strategies depend on the dimension of a conflict with specific guidelines applied at specific levels of the conflict or to a specific stakeholder. There are certain steps, however, which apply to successful resolution in almost all cases:

- Identification of severity of threat to biodiversity and/or dimension of conflict
- Identification of stakeholders and their interests
- Involvement of all recognised parties in the solution finding process
- Identification of best (dependent on specific case) conflict resolution strategy and choice of guidelines
- Application of chosen strategy and guidelines
- Measuring the success – research and monitoring both diversity and level of social satisfaction

The most successful conflict resolution is one that results in a change in society’s attitude towards drivers of the conflict so that similar conflicts do not re-emerge.

4.4.1 Guidelines

The variety of conflicts identified in grasslands will call for a variety of resolution guidelines, outlined in table 4.2. The possible application of guidelines to resolution of individual types of conflicts is highlighted in table 4.3. Although certain guidelines can apply to a variety of conflicts, the high variability of conflicts and differences between individual sites and regions will require conflict-specific management strategies. We clarify below some points in our understanding of the guidelines:

- Promote best practices
  This includes a variety of measures relating to the management of grasslands and emphasises the need to disseminate knowledge of management practices that ensure maintenance of biodiversity or at least prevent a decrease of biodiversity. Knowledge of species composition and eventual presence of threatened plant species can help to specify the best time for cutting from a nature conservation point of view (based on life-cycle of relevant species). Other important aspects are cutting methods and side effects of burning litter. The promotion of best practices however can only be effectively implemented if the general awareness of biodiversity value increases through educational and training schemes.

- Assessment of the agronomic importance of grasslands at the farm level
  As specified earlier, grasslands were initially developed for economic gains through hay production, pastures and winter fodder. Nowadays this economic importance has changed with the development of more and better quality food from hayfields. The level of economical importance of semi-natural
grasslands compared to hayfields or cultivated pastures changes the severity at which diversity is threatened by changes in economic situation and in agronomical practices. Unless the importance of grasslands in agricultural economy is identified, no action can be taken to preserve or restore grasslands.

- Transaction or exchange with less sensitive grassland
In some cases it is possible to change the location of the activities that threaten grassland biodiversity. Whenever certain activities, e.g. conversion of grassland to field, can be transferred to areas less valuable in terms of biodiversity conservation, this should be promoted.

- Identification of ecological importance and prioritisation of grassland habitats
In order to know exactly where the most valuable grasslands are located and what is the overall distribution of areas with different ecological values, it is necessary to have access to recent grassland inventory results or carry these out if they have not yet been done. Without knowledge of the location and abundance of different types of grasslands and their biodiversity, their conservation cannot be based on scientific analysis.

- Ownership of abandoned grasslands
In countries where land ownership reforms occurred, it is often necessary to clarify who the owner is. When dealing with valuable grasslands which are included in nature- or landscape reserves it can be better to buy the land from the owner or leave the land to the state in order to avoid possible conflicts between economic needs of the private landowner and conservation of biodiversity.

- Water management on regional scale
The ecological condition of flooded (alluvial) grasslands depends on the regulation of river water levels. Similarly the ecological condition of paludified grasslands depends on the influence of drainage. Therefore, management of water levels can directly improve or deteriorate the biodiversity in these meadows and should be addressed according to conservation needs.

- Legal protection
All legal instruments that regulate biodiversity are included here, not only legal protection of species or habitats for nature conservation, but also policies, strategies and other legislative regulations (e.g. restrictions to applicants of agri-environmental support). It is important at this stage to note that some legal instruments might have an indirect influence on grassland diversity, e.g. protection zones of water sources.

- Creation or improvement of regional approach
Identification of valuable grasslands at the regional level and subsequent maintenance or protection represents a very useful approach and can help in maintaining a full spectrum of grassland types occurring at regional levels in the long-term.

- Restoration of grasslands at larger scale
Restoration of grasslands might be necessary to ensure that requirements for minimum habitat size of grassland species are met the regional scale. Only if the abundance of grasslands in the region exceeds a certain threshold level can the species pool of grasslands be maintained and allow for presence of stable metapopulations. At the local scale, especially with respect to certain threatened species, the restoration of patches of grasslands might be an effective tool for the conservation of grasslands. The “reconstruction of grassland” guideline addresses these cases when local patches of grasslands are reconstructed.

- Ecotourism and agrotourism
These strategies can contribute directly or indirectly to grassland conflict situations. Agrotourism represents a source of income for farmers, allowing them to manage their grasslands (or part of them) using traditional methods of management that are usually biodiversity-friendly. Moreover, both
natural tourism organisations and agrotourism farms are useful as education and awareness tools for the appreciation of biodiversity.

- Support for cattle and sheep breeding
Decline within the last decades of the number of animals kept on grasslands has been a major reason for grassland abandonment. Measures that result in a higher demand for animal products, especially so-called “ecological products”, should have positive effects on grassland utilisation and biodiversity.

### Table 4.2. List of guidelines for conflicts resolution

<table>
<thead>
<tr>
<th>No.</th>
<th>Guideline</th>
<th>Highest importance</th>
<th>Scale of applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Promotion of best practices</td>
<td>v</td>
<td>Local</td>
</tr>
<tr>
<td>2</td>
<td>Assessment of the agronomic importance of grasslands at the farm level.</td>
<td>v</td>
<td>Local</td>
</tr>
<tr>
<td>3</td>
<td>Transaction or exchange with less sensitive grassland.</td>
<td></td>
<td>Local</td>
</tr>
<tr>
<td>4</td>
<td>Improvement of communication with farmers and professional advisers to optimise biodiversity in grasslands.</td>
<td>v</td>
<td>Regional/Country</td>
</tr>
<tr>
<td>5</td>
<td>Financial incentives for grassland maintenance and restoration.</td>
<td>v</td>
<td>Country</td>
</tr>
<tr>
<td>6</td>
<td>Financial incentives for extensification of grassland management.</td>
<td>v</td>
<td>Country</td>
</tr>
<tr>
<td>7</td>
<td>Identification and prioritisation of ecological importance of grassland habitats.</td>
<td>v</td>
<td>Country</td>
</tr>
<tr>
<td>8</td>
<td>Ownership of abandoned grasslands.</td>
<td></td>
<td>Regional</td>
</tr>
<tr>
<td>9</td>
<td>Water management on regional scale.</td>
<td></td>
<td>Regional/Country</td>
</tr>
<tr>
<td>10</td>
<td>Legal protection (for habitats, species and sites with management regulations).</td>
<td></td>
<td>Country</td>
</tr>
<tr>
<td>11</td>
<td>Creation or improvement of regional approach (i.e. broader aspect).</td>
<td></td>
<td>Regional/Country</td>
</tr>
<tr>
<td>12</td>
<td>Change of legislation of land taxes (e.g. change grassland land use tax free).</td>
<td></td>
<td>Country</td>
</tr>
<tr>
<td>13</td>
<td>Promotion of awareness of grassland as habitat for biodiversity.</td>
<td>v</td>
<td>All</td>
</tr>
<tr>
<td>14</td>
<td>Broadening of Environmental Impact Assessment procedure to look at large scale impacts and large-scale compensation of grassland habitats.</td>
<td>v</td>
<td>Country</td>
</tr>
<tr>
<td>15</td>
<td>Restoration of grasslands at larger scale.</td>
<td></td>
<td>Regional/County</td>
</tr>
<tr>
<td>16</td>
<td>Reconstruction of grasslands (e.g. roadside verges).</td>
<td></td>
<td>Regional/County</td>
</tr>
<tr>
<td>17</td>
<td>Creation and standardisation of roadside verges management strategy.</td>
<td></td>
<td>Regional/County</td>
</tr>
<tr>
<td>18</td>
<td>Controlled burning.</td>
<td></td>
<td>Local</td>
</tr>
<tr>
<td>19</td>
<td>Ecotourism, agrotourism.</td>
<td></td>
<td>Local/Regional</td>
</tr>
<tr>
<td>20</td>
<td>Support for cattle and sheep breeding</td>
<td></td>
<td>Country</td>
</tr>
</tbody>
</table>
Table 4.3. Allocation of guidelines to individual conflict types

<table>
<thead>
<tr>
<th>Conflict type</th>
<th>Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1. Increasing fertilisation</td>
<td>✓</td>
</tr>
<tr>
<td>A.2. Increasing stocking rate</td>
<td>✓</td>
</tr>
<tr>
<td>A.3. Permanent grassland turned into temporary grasslands</td>
<td>✓</td>
</tr>
<tr>
<td>A.4. Crop extension</td>
<td>✓</td>
</tr>
<tr>
<td>A.5. Drainage of wet grasslands</td>
<td>✓</td>
</tr>
<tr>
<td>A.6. Simplification or homogenisation of grasslands</td>
<td>✓</td>
</tr>
<tr>
<td>A.7. Genetic pollution and introduction of non-native taxa</td>
<td>✓</td>
</tr>
<tr>
<td>B. Grassland abandonment</td>
<td>✓</td>
</tr>
<tr>
<td>B.1. Abandonment and natural succession</td>
<td>✓</td>
</tr>
<tr>
<td>B.2. Afforestation or plantations</td>
<td>✓</td>
</tr>
<tr>
<td>C. Development</td>
<td>✓</td>
</tr>
<tr>
<td>C.1. Infrastructure and road development</td>
<td>✓</td>
</tr>
<tr>
<td>C.2. Urbanisation</td>
<td>✓</td>
</tr>
<tr>
<td>D. Spatial policy and planning</td>
<td>✓</td>
</tr>
<tr>
<td>D.1. Land use change</td>
<td>✓</td>
</tr>
<tr>
<td>D.2. Different conservation priorities</td>
<td>✓</td>
</tr>
<tr>
<td>E. Tourism/access and recreation</td>
<td>✓</td>
</tr>
<tr>
<td>E.1. Leisure activities</td>
<td>✓</td>
</tr>
<tr>
<td>E.2. Leisure infrastructure leading to loss of grasslands (access, hotels, golf courses)</td>
<td>✓</td>
</tr>
<tr>
<td>F. Management methods</td>
<td>✓</td>
</tr>
<tr>
<td>F.1. Mowing (cutting) methods</td>
<td>✓</td>
</tr>
<tr>
<td>F.2. Burning of grasslands</td>
<td>✓</td>
</tr>
<tr>
<td>F.3. Inappropriate grassland conservation</td>
<td>✓</td>
</tr>
</tbody>
</table>
4.4.2. Monitoring and indicators

Many different approaches are available for assessing the impact of human activities on grasslands and for monitoring the quality and changes in grasslands environment. These approaches are considered from the point of view of disciplinary or multidisciplinary perspectives, for different users groups such as policy makers, scientists or farmers, on local, national, regional or global levels and for short- and long-term issues. The objectives of this chapter are to review alternative frameworks and indicator sets for monitoring biodiversity in grasslands.

One of the more frequently used frameworks is the pressure-state-response model (PSR), adopted by the World Bank, United Nations Commission on Sustainable Development and the Organization for Economic Cooperation and Development and that has become the dominant model (Murcott, 1997). PSR takes into consideration the actual state of biodiversity, trends of natural resources and factors or conditions related to such trends and their response to different kinds of intervention. For the implementation of the Convention on Biological Diversity (1999), the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) suggested a PSR model that included a comprehensive set of indicators of biological diversity, in order to design, initiate, and improve national monitoring programs.

The main problem in defining indicators is to choose those that reflect the real situation and sustainability precisely. General criteria for choosing and evaluating indicators are that they should:

- To represent an issue that is important to sustainable development, be understandable to a general audience, quantifiable, based on available data, national in scope or relevant to an issue of national concern and compatible at different levels.
- To reflect an issue that could have significant costs or benefits for current or future generations, could be addressed in a certain period of time, and involves thresholds beyond which small changes could potentially lead to irreversible effects.

Other possible advantages for indicators are (Convention on Biological Diversity, 1999):
- To quantify and simplify information in such a way that its importance is clear
- To be able to detect changes in time and space
- To have scientific credibility
- To be able to be represented in diverse ways to address different audiences
- To have the capacity to distinguish natural and man-made changes
- To be easy to understand
- To be universal or widely applicable
- To be operational, simple and inexpensive
- To be suitable for statistical analyses.

State indicators can be used to monitor losses or gains in ecosystem quantity or quality and the relative number of threatened and extinct species in time. These can include Ecosystem quantity indicators such as:
- Change in grassland areas
- Change in land use (area of land units that use has changed)
- Change in land property
- Area of abandoned and afforested grasslands

Methods: Remote sensing (satellite images, aerial photos) and field observations (local approach)

Ecosystem quality indicators at the ecosystem level include:
- Grassland fragmentation
- Wetland drainage
- Species richness and/or species density
- Amount of specific types of grasslands
- Structure of the community (presence or absence and spatial distribution of shrubs and trees etc.)
- Information about grassland use

Methods: Remote sensing (satellite images, aerial photos), field observations (local approach), questionnaires (local approach)

Ecosystem quality indicators at the species level include:
- Changes in abundance and distribution of a selected core set of species (common, threatened, endemic, rare species)
- Changes in abundance of species that contribute most to the quality of hay (food plants, inedible plants)
- Ratio between annual and perennial plants (higher abundance of annual plants indicating higher level of disturbance, e.g. erosion, trampling etc.)

Methods: Fieldwork inventory (local approach)

Finally, ecosystem quality indicators at the genetic level can include the replacement of native species with alien species using fieldwork inventories (local approach).

Pressure and response indicators reflect which factors are affecting biodiversity now and in the future. This can be determined by indicators on population density (response indicator) such as the population structure of certain core species (full population structure in key habitats - sex ratios, age distribution, birth rate, mortality rate, etc.), again through the use of local level fieldwork inventories. Pollution indicators can be linked to soil quality (total fertilizer used, pesticides and herbicides application per year) monitored through the use of questionnaires to farmers. Finally, alien/invasive species indicators can include the percentage of grasslands colonised by invasive species, using local level fieldwork inventories.

4.5 Discussion

This is a very important time for the ACC, with imminent accession connected to big changes in legislation, economy and consequently society as a whole. The possible repercussions on grasslands will obviously be highly country-specific, however a few parameters are likely to impact all ACC.

With agriculture representing the most important sector influencing grasslands, the Common Agricultural Policy (CAP) is likely to play a big role within the accession process. Quotas of agricultural products and subsidies represent important aspects of the CAP and will cause changes in grassland management. Because of the higher budget expected for CAP subsidies, farmers may have a tendency to manage larger areas of grasslands in order to obtain more subsidies thereby restoring (some) abandoned grasslands. Agri-environmental schemes represent another CAP tool for the support of management of environmentally important grasslands. However, farmers in individual ACC will come into direct competition with agricultural production in the enlarged EU, potentially resulting in more intensive utilization of easily accessible or more productive grasslands and abandonment of less favourable grasslands. Not all farmers will be successful in this competition and some could face bankruptcy resulting in the temporary or permanent abandonment of grasslands.

Accession to the EU is also going to have infrastructure development repercussions. As discussed previously, building of roads, highways, factories, urbanisation etc. create an important group of conflicts, resulting in potential grassland loss and fragmentation. Application of Environmental Impact Assessments (EIA) is one possibility to control and reduce impact of infrastructure development to grasslands.

The status of grasslands in individual countries is bound to change significantly due to accession to the EU and it is necessary to monitor impact of these changes to grasslands, especially to semi-natural, extensively used, species-rich and locally specific types.
4.6. Case studies

4.6.1 Abandonment in Slovenia

Besides the usual anthropogenic pressures on the natural environment, which are typical side-effects of economic development, a very prominent process in some ACC is abandonment of marginal farmland due to rural depopulation and the unsuitability of areas for grassland management, such as steep slopes or wet habitats, or due to economical reasons in ecologically less appropriate areas with low hay production. The natural process in abandoned grasslands is spontaneous afforestation, defined as land cover change from managed grasslands (and arable land with extensive use), to successional vegetation changing to shrub and then to forest. In the past, these semi-natural habitats enabled the existence of a great number of communities, very rich in biodiversity. At the same time, the cultural landscape consisting of a very fragmented pattern of small-scale hedges, forests, meadows, and fields represents a valuable asset in terms of specific set of communities, and in terms of aesthetic and cultural identity. This type of semi-natural habitats, in many cases predominating by grasslands, was established in the course of centuries of traditional, sustainable agricultural practice.

In Slovenia, abandonment is still in process. Compared to the data from the detailed military topographic map of the entire Austria-Hungary from 1773-1787 (Rajšp 1995), the surface area of the forests almost doubled over the last two centuries from 36% to over 60% especially on grasslands and pastures. From 1975 onwards, the forested area in Slovenia increased by almost 202,000 ha or 0.5% annually, ranking Slovenia among the top countries worldwide experiencing forest spread. At the same time, agricultural areas shrank from 42.7% to 31.2% (almost a third of the 1975 agricultural areas). The decrease of permanent meadows and pastures went from 32% of total area in 1960 to 28% in 1990. Abandonment is differentiated through the country, with high spontaneous afforestation in pastures and mountainous grasslands used for haymaking in the hilly and mountainous regions of western Slovenia, and in the alpine regions bordering Austria (Karavanke mountains and Savinjske Alps) or Italy (Julian Alps) and in karstic sub-Mediterranean regions. Moderate afforestation is detected in the basins of the central Slovenia and in the Pannonic hilly region of Goricko region in NE Slovenia. Several different succession phases have been observed, with variability of successional patterns being caused by differences in bedrock, climate, altitude, and phytogeographical position. During the successional changes, biodiversity in grasslands changes in two directions: One is a decrease in the number of plant species from more than 100 in Submediterranean-Illirian karst pastures to less than 50 plant species in shrubby woodland (Kaligaric, 1997; Kranjc, 1997). Another is a more or less complete change in terms of floristic composition.

4.6.2 Tourism & artificial snowing in Poland

The conflict between grassland management and skiing results from the fact that more than 1 million people ski and that good conditions for skiing are present only in the mountainous regions in the south of Poland, in the Carpathian mountain region. Skiing depends on the construction of ski lifts and ski routes and artificial snowing in some areas. Each year the number of ski routes in mountain regions increases with skiing taking up more and more grassland areas. Although skiing does not disturb the use of grassland sward for cutting or grazing, it does have a negative impact on grassland diversity, with simplified communities and reduced biomass production of grasslands, with longer period of snow cover delaying development of plants. On ski routes without artificial snow, the vegetation season is 1-2 weeks late, whereas on ski routes with artificial snow the vegetation begins 3-4 weeks later. Delay of the vegetation season of about 2 weeks lowers biomass production by almost 30%, while delay of vegetation season of about 4 weeks lowers biomass production by nearly 50%. Farmers, whose grasslands are located on ski routes, should take biomass loss into consideration, especially in terms of fodder balance. Another potential conflict in this area is the conflict between mountain grassland, tourism, recreation and forestry. Considerable areas of mountain grasslands are located in the highest parts of mountains, and very attractive to tourism and recreation in terms of splendid mountain landscape views, good healthy outdoor activities and collecting therapeutic plant
species. However, this can cause a major conflict with foresters who apply pressure to afforest mountain grasslands and use these areas for timber production.

4.6.3. Different conservation priorities in Vahenurme, Estonia

In Estonia, wooded meadows and wooded pastures cover a combined area of over 4,000 ha. Both habitats are considered to be extremely valuable and very threatened. Their area has decreased 200 fold over the 20th century. When abandoned, wooded meadows, but often also wooded pastures are overgrown by trees and shrubs. Very often succession results in broad-leaved forests that are also considered to be extremely valuable and very rare in Estonia.

There have been many instances when succession on abandoned valuable meadow area has promoted the appearance of other valuable community types, as for example when abandoned Nordic alvar grasslands develop into Juniperus communis formations, or when alluvial meadows change to alluvial forests. It becomes a conflict between different conservation goals when only one natural value can be preserved, and one has to decide which values are the most important ones. The conflicts often occur amongst botanically oriented nature conservationists, who by their subjective preferences would choose either a meadow or a forest, while ornithologists will prefer leaving the forest to develop, since broad-leaved forests serve as a good habitat for many birds. There is a specific case in Estonia where a once large, but then abandoned and now fragmented wooded meadow near Vahenurme village in Pärnu county was found to have a very high species density. When investigated in 1996, 10 1m² releveés were analysed and over 60 species of vascular plants were found in all of them. In 4 releveés, the number of vascular species exceeded 70, and 74 species were found twice (Kukk & Kull 1997). After this finding, restoration works were planned and started in 1998. However, in many parts, relatively natural broad-leaved forest had developed when hay production stopped between 1970 and 1998. The nest of a black stork (Ciconia nigra), a strictly protected species in Estonia, was found in one area of the forest. The presence of the nest changed the whole zonation of the planned Vahenurme Nature Reserve. The process of adapting protection regulations was halted and new regulations were prepared. The management plans that already existed needed to be changed considerably too as the black stork is very sensitive to the presence of humans and tends to leave the nest in case of disturbance. However, in Vahenurme it uses the area of wooded meadow as a feeding area, and lives in an area quite close to the area mown during the last years. Although it appears that mowing, i.e. management of the meadow area, does not disturb it too much, the planned restoration works probably cannot be fully executed. Eventually it was possible to solve this conflict with careful spatial planning during the design of protection regulations and management plan of the Vahenurme protected area. This conflict involving two different natural values delayed the process of adoption of protection regulations for about three years; the Vahenurme still isn’t an official nature reserve.

There are several other abandoned wooded meadows in Estonia where golden eagles (Aquila chrysaetos) or white-tailed eagles (Haliaetus albicilla) or several other rare birds are now nesting. In many cases the restoration of the wooded meadow has had to be cancelled despite the interest of local people in restoration works and despite the knowledge that historically many such species have lived in close contact with humans. However, one must keep in mind that these meadows serve as feeding habitats for many such species.
5. Forests

Urmas Tartes, Ion Barbu, Bogdan Jaroszewicz, Stanislav Lazarov, Jari Niemelä, Stanislav Niemtur, Julius Oszlanyi.

5.1. Foreword

The aim of this report is to address conflicts and conflict resolution strategies in the forests of the accessing and candidate countries (ACC). The conflicts and their resolution strategies presented in this report are often similar to those already presented in other BIOFORUM reports (Young et al., 2003). However, we also include other more specific conflicts relating to poverty, general forest use and conflicts between biodiversity itself (invasion of alien species), as well as issues relevant to all European countries such as the importance of nature education, loss of knowledge about biodiversity, the need to find a common knowledge between stakeholders, alternative uses of forest resources and historical aspects of sustainable forest management. As we will see in this chapter, conflicts in forestry can be linked with rapid changes in forestry practice over the last decade, and global trends like climate change and problems caused by alien species.

5.2. Introduction

Forests are among the most important repositories of terrestrial biological diversity, offering diverse sets of habitats for plants, animals, fungi and microorganism. Forests therefore are valuable not only in terms of significant economical potential, but also as a substantial landscape and ecological factor. Forest trees and shrubs play a vital role in the daily life of rural communities in many areas, as sources of timber, fuel, food, fodder, essential oils, gums, resins and latex, pharmaceuticals, shade, as contributors to soil and water conservation, and as repositories of aesthetic, ethical, cultural and religious values. Forest animals are a vital source of nutrition and income to many people, are used for medicinal purposes, have important cultural roles, and have vital roles in forest ecology, such as pollination, seed predation and dispersal, seed germination, herbivory, and predation on potential pest species. Forests perform several non-productive functions in the field of water management, erosion prevention, soil conservation, recreation, social and health care, aesthetics and others. We need forest biological diversity to allow species to continuously adapt to dynamically evolving environmental conditions, to maintain the potential for improvement to meet human needs and changing end-use requirements, and to support forest ecosystem functions including quality of human life.

5.3 Changes of forestry practice in ACC countries

5.3.1 Brief overview of forest cover history in Europe

After the ice age, forests began to move out of their southern refugia. Due to rapid climate improvement, the transition was complete by 8000 BP (for review see Williams, 2003). The mixed deciduous forest had moved from southern Europe (southern Spain and Southern France) northwards to dominate the land area of the British Isles, Spain, France, and central north Europe and southern Scandinavia. In extreme southern Europe, the deciduous forest gave way to the first substantial
manifestations of a typical Mediterranean evergreen oak and pine forest. The boreal (birch-conifer) forest was pushed northward to northern Scandinavia and Russia. During the next 4000 years the vegetation change slowed as temperature changed less. The only exception was the development of a well-marked western alpine zone of montane forest and the expansion of the Mediterranean vegetation mix over much of Italy and the coastal littoral of the Balkan Peninsula. Thus, by 4000 BP the distribution of the main biomes was similar to that of today but some tree species, like oak (Quercus), lime (Tilia), alder (Alnus glutinosa) and ash (Fraxinus excelsior) invaded and dominated locally. Hazel (Corylus avellana) and elm (Ulmus) spread even more rapidly. Other trees like spruce (Picea) did not expand their present distribution until a slight deterioration of climate, noticeable by 2000 BP.

Between 2000 BP and the present, there has, if anything, been slightly more cooling and the further expansion of boreal forest.

As forests changed, humans colonized newly vegetated land with remarkable speed. During the last 6000 years, many of the changes in vegetation have reflected adjustments to human disturbances brought about by the increasing density and spread of population, the use of fire, technological advances, the cultivation of exotic plant species and the introduction of grazing animals. In Europe the evidence of vegetation manipulation is patchy before 5000 BP. In the forests of what is now Poland, a phase disturbance with charcoal tissues of wood appears in lake sediments sometime between 6700 and 6109 BP. Nevertheless, forest cover was thick and human interference, although evident, was small compared to what happened when iron tools were invented and population density started to increase rapidly demanding larger areas for agriculture, pasture lands, firewood and timber for buildings, furniture and ships, iron melting, mining etc. However, the great clearing did not affect the whole of Europe. Mediterranean and temperate western and central European forests were most affected by the Middle Ages, with 70% of that land covered in forest in 900 but only 25% of forest remaining by 1900. Around the European core of innovation and transformation, in eastern and northern Europe, where most of today’s acceding and candidate countries are, clearing occurred for many reasons, but not with the same single-mindedness of purpose of overall impact. The progress of forest clearing and settlement was slower and the extent was limited and intermittent compared with the vigour and thoroughness of central Europe. When central Europe was at the core of the international economy, eastern Europe was at the periphery, with less well advanced transport means, and correspondingly not as affected by rapid development. Also, poor glacial, ill-drained soils with a limited growing season restricted the urge for clearing in northern parts of Europe during the Middle Ages.

Substantial increase of forest trade in Baltic countries occurred mostly in the 15th and 16th centuries. Unlike the exploitation of the remaining patches of dense forest in the high, inaccessible mountainous areas of the Mediterranean basin, the exploitation of extensive forests of the Baltic region was aided by local topographical and climatic conditions. Gradients were gentle, felling could be done in the winter months, when the sap was low and huge spars and trunks could be hauled out of the forest easily on horse- and ox-drawn sledges on the snow cover to the edge of the many substantial rivers that flowed across the northern European plain. Because Baltic forests provided highest quality material for masts and naval stores extensively needed for shipbuilding, Baltic timber became a worldwide matter for diplomats and traders. The late 18th and the bulk of 19th centuries were a period of maximum deforestation in the temperate lands of the Europe. The vast expansion of railroads, of manufactures, and the mechanical arts, of military armaments and especially of the commercial fleets and navies greatly augmented the demand for wood (Etverk, 2003). Other than largely agriculturally untouched coniferous wilderness of the Scandinavian countries, centuries of clearing had reduced the area of land covered by forests to often less than 30%, including in the ACC.

The diverse forces and cultural climates that drove and guided these biotic transformations in the temperate world varied enormously among individual countries. There was no common deforestation experience but rather a multiplicity of them. Some countries were already becoming aware of the value of forests and experienced mounting tension about their destruction. Ways of thinking in forestry came to this level when relatively rich timber resources thinned down and the market started to suffer from shortage of wood. Prior to this, timber harvest had not been subjected to any
regulations. As early as 1806, the Forestry Academy was founded in Slovakia and principles of sustainable use of forests started to develop. It was an important step on the European level many decades before Ernst Haeckel defined ecology in 1866 (Oszlányi et al, 1996). On the other hand countries under Russian jurisdiction, including Baltic countries, were still clearing in an unrestrained way and the wealth of these countries was largely hacked away and destroyed. In Romania for example, it is estimated that forests in the past covered over 75% of the country’s surface area. During the last centuries, more than 5 million hectares of forest have disappeared, with 3 million hectares cleared between 1829 and 1922. At present, only 27% of the actual surface area of Romania is forested. This forest cover loss has been especially significant in environmentally sensitive areas such as plains and foothill regions. Mountainous regions were affected at a lesser degree. Currently, forest cover is estimated at 7% of the total surface area in the plains and at 27% in the hills. Romania's forests are therefore distributed unequally between and within these different forms of relief. We can follow the same pattern elsewhere in Europe. In Poland for example, forests covered nearly the whole of the country but were cleared as agriculture expanded and the demand for raw timber increased massively. Thus Poland, bounded by its late 18th century borders, still had around 40% forest cover, whereas by post-war 1945 forests covered only 20.8%. Most Baltic countries forests today are secondary forest communities that have been formed after comprehensive anthropogenic disturbances.

5.3.2. Great changes in the last century

The 20th century has been a hectic period for forests full of swarming actions and diverse developments caused by political changes and wars. Revolutionary times in the beginning of 20th century did not benefit forests. Military conflicts such as World War I and the ensuing civil war caused destruction and the rapacious and reckless felling. During World War II wholesale logging and transport of lumber to Germany from Russia and the Baltic states led to severe destruction of forests in occupied territory. After World War II, the total forest area increased in all ACC countries. The forest area expanded mainly because of afforestation of farming lands and drainage of wetlands. In Estonia for example, forest doubled in the last century - from 0.8 million to over 2.2 million hectares in 2001 covering 51.5% of the mainland’s territory (Karoles, 2003). In Lithuania, forest cover has increased from 19.7% in 1948 to 31.1% today. Despite great human interference, most of the Estonian forests are classified as semi-natural forests at the current state. They are either naturally regenerated or cultivated, but moderately managed and therefore cannot be defined as plantations. In Bulgaria 1.5 million hectares has been afforested in the last 50 years and forest covers 34% of territory. In Poland forest cover has increased from 20.8% in 1945 to 28.4% today. According to state plans, forest cover in Poland should increase to about 30% by 2000 and 33% by 2050. Important areas for forest cover are the Sudeten and Carpathians Natural Regions, which are characterised by relief and structure unsuitable for agriculture, but where forests fulfil vitally important functions in soil and water protection.

However, all the figures pertaining the area of forest need to be considered with caution. When the cadastre register was introduced in Estonia early last century, the identification of a certain tract of land as forest was based on different criteria in different regions (mean tree height at certain age, volume increment etc). Later, the primary land use was also included among the criteria. For example so-called grassland forests, pastureland forests and shrub forests, where, unlike today, not considered forests due to their principal land use purpose (haymaking, pasturing). The categorisation of land (forests or farming land) was often dependent on the interests of the land user (Etverk, 2003). Therefore, setting the exact area of forest matching the modern criteria at any given point of time in the last century is difficult. It was only in the last decade of the 20th century that we could obtain more objective data on the forest area (Table 5.1).
<table>
<thead>
<tr>
<th>Country/Area</th>
<th>Land area (x1000 ha)</th>
<th>Total forest area</th>
<th>% of land area</th>
<th>Area per capita</th>
<th>Forest plantation</th>
<th>Annual change</th>
<th>Annual rate of change (%)</th>
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<tbody>
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<td>1039251</td>
<td>46</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>% of land area</td>
<td>Area per capita</td>
<td>Forest plantation</td>
<td>Annual change</td>
<td>Annual rate of change (%)</td>
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5.3.2.1 Changes in legal framework and ownership

Leaving aside the war years of 1941-1944, the territory of the Republic of Estonia within its present borders was subjected to the forest laws of Tsarist Russia until 1934. The Forest Act of Estonia from 1934 to 1940, the legislative acts of Russian Soviet Federative Socialist Republic from 1940 to 1979, The Forest Code of the Estonian Socialist Soviet Republic from 1979 to 1993 and the Forest Act of Estonia from 1993, followed by an edited version from 1999. The land ownership relationships have been equally diverse. For example earlier in the 20th century, before Estonia gained independence and adopted the Agrarian Reform in 1919, most of the forests were in private ownership. In 1918, the state owned 18% of forests, the peasants 12% and the landed gentry 74%. In 1920 landed gentry forests were nationalized and state-owned forests became prevalent. If we also count as forests the grassland forests, pastureland forests and shrub forests owned by farms, then the forest ownership was distributed almost equally between the farms (50%) and the state (49%).

After the occupation of Baltic countries by the Soviet Union in 1940, all land was nationalized. In Estonia state forest enterprises mostly managed forests but collective farms managed about 37-39% and the military managed minor areas. The land reform started in 1993. Due to restitution of ownership, amount of state forests decreased to 38% in 1999, but has increased slightly in recent years. Still, we only have 15% of registered private forests and some forests remain ownerless. We can follow the same pattern of ownership changes and Soviet influence on forest management in other East-European countries. For example in Romania the state confiscated all the forests in 1948 and forests were managed according to soviet concepts until the 1960s. Nevertheless, given their remoteness, many Carpathians areas avoided the negative effects of communist planning. For example, land collectivisation did not take place in some areas, thereby preserving many extensive, small-scale practices (e.g. farming) and avoiding the over-exploitation of forests. In Poland, public forests constitute about 83% of forest area today with an average of 1.03 hectares per owner, making it one of the lowest indices of Europe. Small areas in forest ownership have a negative influence on the degree of owner interest to the proper management of forest economy in their own forest.

5.3.2.2. Changes in forestry practice

Forest cutting practice has undergone deep changes. The forests in the beginning of 20th century looked more appealing from a biodiversity viewpoint than from an economic one. Systematic management throughout the century has however resulted in an increased stock of growing timber and higher wood productivity of forests. The regeneration of felling applied so far led to the creation of even-aged stands with uniform structure. The implementations of silvicultural regimes with a long regeneration period, which promote the formation of multi-aged stands, were not commonly used. Forest management planning practices often did not take the existing biological diversity into account and therefore no objectives were set in this area. Forest inventory and planning as well as current practice does not comply with nature-friendly, multifunctional and sustainable forest management. In many countries (Romania, Bulgaria and Poland for example) huge areas were cultivated through plantations and seeds and so balance in the age classes vanished. The species composition of stands in Polish forests significantly differs from that of primeval (natural) ones because of centuries of improper management such as monoculture plantations, lack of natural tree regeneration, and the type of cutting system. In the Polish part of the Carpathians the coniferous sites occupy only about 3% but the average percentage of coniferous stands reaches almost 64% of forest area. Deformation of species
composition of forests is much worse at higher altitudes, where slopes are steeper and where erosion processes are stronger. Only towards the end of the century were some forests allowed to take the developmental trends towards the condition they were in early that century and the amount of protected forests increased. For example, although most Estonian forests are natural in their origin, later forest management activities influenced them so that they do not resemble natural forest types. The mean stand age was high early in the 20th century, experienced a fall in the middle of the century and then started to rise again, climbing from 41 years in 1958 to 57 years in 1999. However, the National Forest inventory put the age as low as 50 years in 1999. There were more old forests in the beginning of the century. For example, 9% of coniferous stands were older that 100 years and 15% of deciduous stands were older than 50 years in state forests between 1925 and 1927 (Eтверk, 2003). Today naturally developed forests can be found in single small patches scattered all over Estonia and the area of so-called old-growth forests does not exceed 0.02% of total forest area. Together with forests with natural and recovering forests, relatively undisturbed forests are estimated to be 2-2.5% of total forest area, ca 45,000-55,000 ha (Karoles, 2003). The majority of natural forests are assembled in the existing and designed conservation areas.

In the first half of the century, lumbermen employed among the rural population in late autumn and winter when agricultural works had been completed were employed to do the tree felling. The felling and crosscutting of trees using hand or power saws permitted the thinning of stands in exactly the amount considered necessary for silvicultural purposes. The skidding of timber with horses left the undergrowth and soil practically intact. In the second half of the century, electrical and power saws found their way into forests and forest cutting turned into a year-round activity. Wheel tractors and powerful harvesters were increasingly used for timber skidding causing more extensive damage to the trees, undergrowth and soil particularly in summer.

Following the idea of nature transformation, the drainage of large marshlands was launched in the 1950s to reclaim them for forestation in Baltic countries. Because of the various environmental and economic benefits of large marshlands (fresh water supplies, habitats for rare plant and animal species, valuable wild berry patches, significance for recreation and tourism), the policy met with increasing opposition and was finally abandoned. In the 1970s the understanding was reached that undrained forests had their own significance and place in nature. In a good cranberry bog there is more to be gained from berry picking than from timber made available by expensive drainage works. Although floods caused by beaver dams result in increased biodiversity, they have provoked forest owners’ irritation.

In the Carpathian region changes of land use are better documented after World War I. Transforming hilly forests into pastures and arable land has had negative effects on the stability of slopes, erosion and flooding risks. It is estimated that in the last hundred years, the frequency of local flooding has increased 3-5 times, especially in the South and West Carpathians and more than 2 million ha of soil has been eroded or exposed to other kinds of degradations or slides, wind erosion, salinisation etc. Still, the Carpathians are home to Western and Central Europe’s last and largest populations of virgin forests and large carnivores.

In 1967, modelled on the Nordic countries, they launched forest fertilisation in Estonia. Twenty one years later the practice was abandoned for economic and environmental reasons. In the initial years fertilisers were dropped from aeroplanes, resulting in fertilisers often being carried away by air currents. Poisonous chemicals have been in relatively restricted use in Estonian forests. DDT has been prohibited since 1968. In the 1970s chemical control was increasingly supplanted by biological control favouring the natural enemies of pests and plant pathogens.

5.3.2.3. Alternative (non-wood) use of forests

The role of alternative (non-wood) use of forests was small in the beginning of the century in Baltic countries. People were more attracted by the sea than forests. However, towards to the end of 20th century the recreational importance of forests increased significantly. Many tourist farms, established
in the countryside in the 1990s, could not operate without surrounding forests. Other forest by-products in the 20th century were herding, haymaking, mushroom gathering, berry picking and resin extraction. Forest berries and mushrooms for example were exported from Estonia in large quantities amounting to 400 tons per year on average in 1929-1938 and much larger amounts (3,000 tons in 1997) after independence (Etverk, 2003). During the 1990s whortleberry and chanterelle picking for exportation was a significant if not the primary source of income for thousands of people living in well-wooded regions. Resin gathering disappeared from forests as chemical industry developed and natural resin was no longer needed. Other sources of forest by-products included gathering of herbs and decorative plants and beekeeping were not officially recorded, their importance, particularly to local communities, cannot be overestimated. In Bulgaria the use of many plants in folk medicine, the traditional use of wild herbs and the export of large quantities are typical. According to the data presented by the United Nations Statistic Division, Bulgaria exports about 15,500 tons of herbs and there is an evidence for an increasing trend, making Bulgaria the biggest exporting country within Central and Eastern Europe. Over the last 10 years recreational hunting has also increased significantly. Hunting for the materialistic purpose of procuring animal meat and skins are out of question today because the cost price is too high. However, hunting may serve as a good pretext for going out, enjoying the beauty of nature, relaxation and caring for one’s health. On the other hand, the excessive protection of game (deer, red deer, bear, lynx) has led to huge damages caused to the trees through peeling of the bark - which led to the decrease of forest quality (due to specific rotting) and to domestic animals.

5.3.2.4. Forests in environmental protection

In the beginning of the 20th century the role of forests in environmental protection was modest because of the small amount of anthropogenic pollution. Usually, like Bialowieza forest in Poland for example, forests were protected for game hunting for noblemen. Many first protection forests were intended to retain sand dunes and serve as navigation landmarks. Forestation of sand dunes in Estonia dates back to the 17th century when a pine plantation established on loose sand prevented a church from being buried under the dunes on the island of Saaremaa (Etverk, 2003). Initially the function of forests located by water bodies was to protect the banks and shores from erosion. Water purity became a concern in the 1970s. The protection of forests rose rapidly due to industrial development, motor transport and urbanisation. In fact, before the 1990s in Estonia, about a third of forests were protected because environmental, recreational and other considerations were more important than timber production. Sometimes maturity age was artificially increased in reports, prepared by Estonian foresters for Moscow and that reduced cutting volumes (Karoles, 2003). As a result of great economic pressure, 7.3% of forests are strictly protected in Estonia today, with a target of 10% by 2012. But if we include restricted management and special management zones, about 16.38% of the forest area is under some protection regime (Karoles, 2003), a number still well above Europe’s average. In other Baltic states the area of strictly protected forest is less that 2% (Baltic Forest Mapping, 2003), In Bulgaria 4.5% of forests are strictly protected, but protective forests and forests for recreation represent 26%. Few people know about the unique natural and cultural richness of the Carpathians mountain range half of which is covered by forest and home to Europe’s largest areas, excluding Russia, of pristine, virgin forest and natural mountain beech and beech/fir forests.

5.3.2.5. Effects of other activities

Many biotic and abiotic factors and their consequences including air pollution, climate changes with anomalous weather conditions and other anthropogenic factors have determined the present condition of forests. Effects of atmospheric pollution are important in Polish forests for example. However in recent years a slight decrease in the value of mean indicator SO2 and dust in mountainous areas have been recorded. Air pollution was a main reason of the ecological disaster in Sudeten that started at the end of the 1970s. An area of over 160 km² was deforested. Afforestation of this area was a great success for foresters. In the recent years the condition of trees, artificial and natural regenerations improved much, and it is undoubtedly due to limitation of pollution emission to the atmosphere. A recent, multi-dimensional problem that raises serious troubles and affects the biodiversity directly is
the progressively increased number and area of forest fires. These two parameters have increased progressively and reached critical dimensions during the last decade. For example until the end of the 1980s, the relative frequency of forest fires and the affected area in Bulgaria was comparable to North and Central European countries. However, data for the period 1991-2001 showed that for some basic parameters the country had reached or even surpassed the countries in the traditional fire hazard Mediterranean region. During the last 11 years the forest fires have affected more than 133,000 ha or 3.5% from the total forest area. Fires have damaged over 20,000 ha of forests during the 1999-2001 period. The forest fires have also affected protected nature territories with high conservative value. Despite the imperfect system for forest fire rendering and analysis, the statistics showed that the basic reasons behind forest fires were burning of stubble-fields, burning of returned land and forests and criminal arson. They are probably connected with the socio-economic conditions during the transition toward market economy. In Poland, 2001 brought a number of fires much below the long-term average for the 1995-2000 period. The number of fires in the season (3766 including 1925 in the State Forests) is the average for years with long lasting rainy periods. The total area of SF land burnt in 2001 was 655 ha, with the most frequent causes of fires being arson (46%), a lack of care by adults or young people (22%), or the spread of fire from non-forest land (7%).

5.3.2.6. Loss of knowledge of forest resources and biodiversity

Loss of knowledge of biodiversity has become a worldwide problem in recent decades. In most countries, including the ACC, nature research started with the inventory of natural resources. Serious studies in taxonomy and systematics were carried out in the last century. Nevertheless, much of the native biota remains very poorly known, and much of it is yet unknown. Today we lack the knowledge on at least half the species and many major animal groups remain virtually unknown. The general background for taxonomic studies and knowledge of our biodiversity is good. Much of the information available resides in collections in museums or herbaria, and there is still relatively good coverage of major taxa (vascular plants, mosses, some fungi, lichens, some worms, some insects and some other invertebrates). However, certain invertebrate specialists are absent in many countries and research institutions have seen reduced funding and personnel in recent years. Scientists trained to be able to understand biodiversity are almost as endangered as the species themselves. Few young people are starting a career in systematics. Systematics and taxonomy need long-term studies and not everybody is capable to work hard on the same subject for years. Most young people are attracted by new modern and promising technological sciences. When young people have to foresee their future, they tend to choose the area of research that promises quick returns. At the same time we all know that organizing biological knowledge according to phylogenetic relationships has become increasingly important for many segments of science and society including medicine, agriculture, nature protection and sustainable forestry practice. ACC provide an almost unique opportunity to obtain a novel data of their diverse biota. Different geographical locations support the most species-rich biota in the northern temperate zone.

5.4. Issues leading to conflicts

5.4.1. Different definitions of forests

The ability to communicate affects all conflicts in society. Forestry is not an exception. To identify and/or to resolve a conflict, we have to find common language. Surprisingly here lies one “hidden”, usually overseen conflict, involving different definitions of forest in different nations, with different stakeholders. The term “forest” comes from a Latin word “foris”, meaning “out of doors”. However, every nation has its own definition for forest reflecting often its cultural heritage: Gorite in Bulgarian, Mets in Estonian, Metsä in Finnish, Meņš in Latvian, Mišku in Lithuanian, Las in Polish etc. The European Commission (DGXIII) has defined forests as: “Ecosystems with a minimum of 10 per cent crown cover of trees and/or bamboos. They usually contain wild flora, fauna and natural soil conditions, and are not subject to agricultural practices. Forests can be divided into two categories: natural and plantation forests.” Worldwide we can find more than 470 definitions of forests (Lund, H. Gyde (coord.), 2000). Let us point out a few other definitions:
Forest as an ecosystem: A forest ecosystem can be defined at a range of scales. It is a dynamic complex of plant, animal and micro-organism communities and their abiotic environment interacting as a functional unit, where trees are a key component of the system. Humans, with their cultural, economic and environmental needs are an integral part of many forest ecosystems (See the Convention on Biological Diversity).

Forest as a declared, legal, or an administrative unit: An area of land proclaimed to be forest under a Forest Act or Ordinance.

Forest as a land cover type:
- Ecological definition: Forest is one of the major types of vegetation, which comprises an aggregate of woody, shrubs, herbaceous and other (mosses, lichens) plants, including fauna and microorganisms; all these components are biologically interacted during their development, and impact both each other and environment.
- Landscape definition: Forest is a natural and territorial complex of a different rank (from a facies to a geographical country) in which phytocoenoses are dominated by spontaneously developing tree vegetation (Kireev, 1984).
- Remote sensing: Land with tree crown cover of more than 20% of the area. Trees should be able to grow to a height of 7 m. Minimum area outside continuous forest: 0.5 ha. Minimum width outside continuous forest: 15 m. (minimum size stand; for instance 15 m x 333 m) (Köhl and Päivinen, 1996).

Forest as a land use type:
- Land under natural or planted stands of trees, whether productive or not and exceeding 0.5 ha in extent. It includes areas occupied by roads, small cleared tracts and other small open areas within the forest, which constitute an integral part of the forest (Päivinen et al. 1994).
- A natural land that has not been subjected to human activities regarding change of use. (Harrison, 1992).
- Land with the potential capacity to produce a mean annual increment of at least 1 m³/ha stemwood, over bark, given an optimum tree species mixture, growing stock volume and prescribed rotations. (European Communities 1997a - p. 186).

On the one hand, the fact that “forest” has been defined in many ways is a reflection of the diversity of forests and forest ecosystems in the world and of the diversity of human and different stakeholder approaches to it. On the other hand, diversity of definitions can often lead to conflict due to misunderstanding. Conserving forests can mean one thing to the environmentalist, another to the forester and third to the farmer... In fact, we cannot say that only one definition is absolutely correct, as forests have a multifunctional role.

5.4.2. Changes in ownership and legal framework

The land reform and ownership restitution have made much of the forests private. These are often small patches that are difficult to manage in terms of multifunctional use of forests. Today most of the private owned forest is clear cut or overexploited, and illegal cutting has become a great problem recently in Estonian forests for example. Small patches of private forests are difficult to protect and manage. Also forest owners often face a lack of confidence because rules and laws change often and compensatory mechanisms for environmental restrictions are poorly established. However, large forest or real estate companies, often international, have also purchased many forest areas. This means that a lot of owners do not benefit directly or do not depend on the multifunctional role of their forests. Such owners are often eager to find out the quickest ways to cut their forest down, get as fast a profit as possible and correspondingly do not care about biodiversity. On the other hand, often, because of poverty, forests and timber are the only incomes for local people in rural areas. The closeness of the forest to the everyday life of ordinary people, especially the landless peasant, means that the forest is not only a source of heat, materials and arboreal by-products like honey, wax, fowl, small animals, and brazing but also a source of land and therefore food. The forest has been and still is “the mantle of the
poor”, and in its exploitation and probable destruction lies the means for survival and even social and economic advancement. There are much less biodiversity conflicts on state-owned forests than in private forests, although forest industry pressure to increase cutting level over sustainable use is very strong.

5.4.3. Changes in forestry practice

In the last decade forestry practice has been heavily influenced by modern market economy principles. Intensification of forestry operations and changes in silvicultural practice are often in conflict with other uses of forest. Forestry has turned from being a seasonal (winter time) activity to a year-round activity leaving often no time for forest ecosystems to regenerate. In emerging legal frameworks, there are often gaps and weak supervisory systems allowing for the misuse or illegal use of forest resources. The phenomenon that practice falls behind the theory is quite common. In forestry, however, this gap achieves a huge dimension and deepens constantly. This is caused by the fact that the real life practice does not have appropriate conditions for application of theoretical knowledge on the desired qualitative level.

Some of the main reasons for this are:
- Management and handling of outputs are complicated by extremely long production period, (which are more than 100 years), large and hardly accessible forest areas, complicated accessibility in mountainous terrain and hard manipulation with the product (long and heavy trunks),
- The whole process of timber production is rather complicated. Timber is a product of at least four preceding generations of foresters, not only of the one that harvests.
- Complicated natural conditions (steep slopes, terrain constraints) and complicated manufacturing of small series of special machinery have not enabled domestic production of necessary equipment till now. Import of this equipment is expensive. Use of inappropriate equipment causes damage to soil cover such as compaction, acceleration of erosion, decrease of regeneration capabilities, damage to standing trees, contamination of forest sites by fumes and oil products. All of these shortcomings originate in insufficiency of financial resources.

As a result of limited number of bodies supervising the forest management as well as large areas of the management units for individual forest management groups the forest management plans are not thoroughly accomplished, quality of production suffers and the tasks in development and protection of forests are not being performed. The lack of appropriate equipment results in application of clear-cut techniques rather than techniques based on ecological management. This is the most serious shortcoming in the forestry and represents the most significant factor interfering with the ecological principles of forest management and thus also with the principles of nature conservation.

5.4.4. Alternative (non-wood) use of forests

The role of alternative (non-wood) use of forests is still very important among rural inhabitants. Alternative use of forest resources is not in conflict with profitable management and can, on the contrary, provide sustainable and long-lasting income for rural people. Although, like all forest management, non-wood resources need also proper management plans otherwise, they easily face the same problems of over-harvesting like we have seen in forest cutting practice. Heavy concentrations of large game (a deer, wild boar, and even bear), much appreciated by hunters, also constitute a threat to the fragility of forests and have already been observed in several parts of Europe.

5.4.5. Forests and environmental protection

A WWF-commissioned independent opinion survey across 12 European countries found that 93% of the population believe it is important that forests are well protected, and 80% believed that there should be more protected forest areas like National Parks in their country. The survey results underline that a vast majority of respondents want to visit protected forests for recreational purposes like hiking, and that they clearly reject activities such as road construction, infrastructure developments, hunting
and logging, which threaten the quality of protected areas (State of Europe's Forest Protection, 2003). Nevertheless, money talks too often and the forest and woodworking industry have developed into one of the most important branches of industry. This is because of the sufficient stock of forests, advantageous infrastructures (railways, roads, sea ports) and the well-established trade relations, both with the east and the west. As result, in recent years, starting from 1999, in Estonia, for example, forest cutting has exceeded its increment again like it had at the beginning of the 20th century (Karoles, 2003). Often cutting occurs even in protected areas like illegal cutting in Lahemaa National Park in 2002 (Estonia), or planned cunning in the heart of the Czech Republic’s Sumava National Park in 1994-2001 (State of Europe's Forest Protection, 2003).

5.4.6. Effects of other activities

In many cases forest biodiversity has been and is still affected by human activities in other areas:
- Droughts or floods in many countries in the last 20 years with especially significant impacts.
- Industrial pollution (SO2, heavy metals, NOx, Fluoride, Chloride, industrial soot and fine cement sediment, petroleum products...) has affected forests in industrial regions.
- Large infrastructure developments (building highways) may cut natural forest networks
- Wind and snow damages in mountainous regions have occurred especially in coniferous stands in mountainous regions
- The ancient tradition of grazing in the forest continues with all its negative consequences on the forest environment, plantations, natural regeneration and the wood production itself. It is estimated that these impacts will continue until the modernisation and the intensification of cattle raising.

5.4.7. Poor knowledge of forest resources and biodiversity

Besides different definitions, forests are diverse and dynamic systems. They change slowly, but continuously. Although the forest industry has been using and adapting many advanced methods for logging, monitoring of forest resources is in a much poorer state. Official statistics are often unreliable, especially in terms of biodiversity management. Forests have complex structural quality parameters and simplified statistics often do not give sufficient background data. Abandonment of arable land leads to increase of forest area, but such forests have completely different structural qualities than old-growth forests or primeval forests. This leads to difficulties in making proper forest management plans both on a small scale and large scale. Historically we have good biological background data of forest biodiversity, but nowadays, commonly, the data on the local forest biodiversity is insufficient because it has not been adequately studied. Apart from the lists of vascular plants and vetebrate animals that usually exist, the lists of invertebrate animals and the organisms of all other taxa are usually scarce and require special compiling work. There has been great loss on nature knowledge among society. A century ago local rural people knew nature and its biodiversity very well and knew how to use it in a sustainable manner. An average farmer could determine more than 200 different plant species alone. Today that knowledge has been mostly lost.

5.5. Conflict resolution

General conflict resolution strategies and means, published in the earlier BioForum Report (Young et al., 2003), are completely relevant to the ACC. We point these out in this section, as well as the priorities for the near future.

Acting on the technical or “substance” dimension can do a lot. Refined silvicultural guidelines, proper forest inventory and management plans are prerequisites of conflict solution. Conserving biological diversity in small separated forest patches is impossible. So, we need both local scale and country (continental) scale approaches simultaneously for forest planning. Often management of large areas of public-owned forests provides efficient measures to guarantee the multifunctional role of forests and sustainable use of its resources. We have good examples of publicly owned forest (state forest) management from Poland and Estonia. All management plans and silvicultural practices must be based on appropriate information provided both by experts and local people. Local people are usually much
more interested in sustainable forest management than urbanised forest owners, but often, good practice of forest ownership among private owners is missing. Data from long-term monitoring and regular inventory are necessary, since forest cycles last several decades, if not centuries. Certification practice like the Forest Stewardship Council should be widely promoted and implemented.

Political or “process” dimension is an equally important measure. With the accession to the EU, most local laws and regulations have been harmonised with the EU and international conventions have been largely acclaimed. To write laws and regulations is a relatively simple task. It will be a much bigger challenge to achieve their implementation in the ACC. Supervisory systems with financial compensatory systems of cost of protection will be crucial points if we want to be successful in forest biodiversity conflict resolutions. Marketing the green (environmentally friendly produced) forest products is an indirect way of protecting biodiversity, but its importance is immeasurably high. The marketing process itself that includes the advertising of green goods will educate people on the biodiversity needs and the ways biodiversity can be protected. If forest industry in the ACC want to compete in the same markets as industry from the EU countries, then the ACC industry must start to follow the same environmental guidelines as the “old” EU industry. In other words, the ACC forestry industry must become at least as environmentally friendly as the old EU industry in order to be successful in terms of competition. For example in Estonia, key environmental and industry groups together made a joint appeal to the Estonian Prime Minister to reform the new forest act: to clearly identify legally and illegally sourced timber on the market; to ensure a total inventory of forests and secure that the information will be included in the forest registry; to review taxation policy of forest management to promote sustainable forestry and to reduce the forest managers’ desire not to declare forest management activities; to ensure better supervision of forest and management activities as well as plan preventative measures for reducing illegal activities. Besides acting directly in the forestry sector, all other industry areas and infrastructure developments have to follow principles of sustainable development.

A relationship dimension, i.e. the ability to communicate with each other, should be the starting point for both substance and process applications. Natural resource management must base as much as possible in participatory planning. One of the crucial points in communication between different stakeholders is the ability to find a common language. As we already presented, forest itself may have very different definitions and correspondingly different stakeholders appreciate different aspects of forest use.

General education policies improving people’s attitude to respect other (different) opinions and values are often needed in post-soviet societies. At the same time specific courses not only to forest managers but also state officials, supervisors, security guards, lawyers etc. are needed. The most powerful tool in democratic society is public awareness. Informing people about the values of biodiversity in forests should include articles in newspapers and broadcasts in all sorts of media and school programmes. The knowledge of local fauna and flora should be raised in all age groups. All these actions must accompany the appropriate biodiversity research and education programs to provide society with highly skilled experts, as biodiversity valuing is highly dependent on knowledge of nature. Most of the major advances in understanding of ecology and ecosystem function have taken place in areas where the ecology is relatively secure. Accordingly, it is necessary to study and teach people the local species of plants, animals and other taxa of the living world. One key issue in the nearest future is to find solutions to provide increased attention to taxonomic studies in science. Organizing biological knowledge according to phylogenetic relationships has become increasingly important for many segments of science and society including medicine, agriculture, nature protection and sustainable forestry practice.

5.6. Monitoring strategies

Monitoring the outcome of the conflict resolution process is an integral component of conflict management. Relations, communications, legal procedures etc. should lead back to biodiversity itself. How the state of biodiversity changed after conflict resolution has been carried out is of primary
importance. Biodiversity indicators should provide proper feedback about status on biodiversity. Key biotypes, such as the area of primeval forest and protected forests are some general indicators. In the meantime each conflict resolution should be monitored from the process and relationship point of view to provide better conflict resolution strategies for the future. In terms of monitoring, there will be no differences between present EU countries and the ACC.

5.7. Discussion and conclusions

The forests of the ACC are usually more diverse and the biodiversity is well conserved because of the climatic and the bio-geographic conditions, less intensive use of forest in the Middle Ages (low density of population, low demand for wood, lack of transport, low industry) and the impact of human activity having been determined mostly by grazing and deforestation for agriculture rather than industrial needs. Also, in many cases, large areas of forest exploitation were developed until the end of the 19th century and were followed by forest management plans and forest codes. Today with new countries coming to the European market, and from the point of view of biodiversity conflicts, the ACC forests are likely to continue facing high economical pressure. At the same time EU regulations should provide many new ways of reaching appropriate solutions to maintain forest biodiversity. Hopefully opened borders will facilitate more innovation-based industry and forestry instead of selling large amounts of raw material. On the other hand the inclusion of large forest areas into the European network will be a very important and valuable event. Forests in the ACC include species-rich and diverse communities for the whole Europe, as well as large areas of forests with very few alien species. This means that, from the point of view of bio-invasion, these areas are still relatively less affected than most of west European forests. Besides, acceding and candidate countries also bring with them valuable experience and also expertise in forest management. To protect, study and use these values creates unique opportunities and challenges for the whole of Europe.

5.8. Case studies of biodiversity conflicts and their resolution in forests

5.8.1. Historic experience on sustainable development of forestry in Slovakia - a measure to avoid conflicts.

- Historic development of the basic principles of forestry practices

More than two hundred years of rationally based forestry development brought a wide range of solutions to conflicts of interests. Forestry itself developed as a reaction to the alarming condition of forests devastated by uncontrolled exploitation with the aim to protect forests (and in the broader sense nature itself). As a response to the absolute lack of timber (in the 16th and 17th century) a philosophy of sustainability of forest productivity as a principal precondition of timber production came into practice. The idea behind this approach is not far from present ideas of carrying capacity and sustainable development. The period of uncontrolled forest exploitation was followed by a period focused on forest development (Kavuljak, 1942). The first task in the forest development-afforestation- of course led to the development of the notion of an ideal forest. As a result, a model of forest oriented to maximal possible production was developed. The principle of maximal production has emerged, understood both from quantitative and qualitative points of view. This principle was applied as decisive and became a principal forestry tool of these times. Of course, this approach brought a need for a complex economic evaluation of the whole production process. Forestry philosophy thoroughly applied the principle of economical efficiency (originally profitability and productivity). Forestry trapped in the system of economic directives oriented exclusively to high production and requirements of the wood processors at the beginning of the 19th century led to the selection of the most efficient timber, planting spruce and in some regions also pine.

Forest management planning and forest management as a whole had to focus on improvement of forest resistance, mainly against abiotic damaging factors, especially wind. Thus, a principle of production safety emerged, later termed the principle of minimized risk. In environmental practice today, this principle is being identified with the principle of ecological stability. At the turn of the 20th century, forestry started to apply biological principles in forest management. The first step was
abandonment of the schematic classification of forests and implementation of forest stand management, i.e. division of forests into forest stands differing from each other by age and composition. The author of this principle was Johann Judeich. This remarkable contribution was a new concept of forest management, so called close-to-nature forest management.

The most decisive step forward to notion of biodiversity (unknown at these times) was implementation of the site, later typological survey, into the adaptation of forest management after World War II. This approach involved utilization of knowledge about distribution of phytocoenoses for biological evaluation of a forest state and creation of a new forest imagination based on this evaluation and typology. This approach together with the study of forest ecology contributed to the implementation of the principle of biodiversity as a keystone factor in ecosystem functioning.

- Development of the principle of sustainable development in Slovak forestry

The principle of sustainability has played an important role in the philosophy of forest management. Actually, this is the basic principle of forestry in the past and today in Slovakia. This way of thinking in forestry came to this level when relatively rich timber resources thinned down and the market started to suffer from shortage of wood. Prior to this, timber harvest had not been subjected to any regulations.

The concept of sustainable development became well-known thanks to the Norwegian Prime Minister G.H. Brundtland and the report “Our Common Future”. However, the very beginnings of this concept were founded in the countries with well-developed pastoral and forestry principles. The philosophy of sustainable harvest was coined and supported by the legislation in the Theresian Forest Order of 1769 which implements the efforts for co-ordination of requirements for timber supply with productivity of forests. This order meant the end of the period of uncontrolled exploitation of forests and initiated the effort to create and take care of forests. Also, higher education at the Forestry Academy in the town of Banská Štiavnica from 1806 was based on principles of sustainable development of forests, which was an important step at the European level. This is an evidence that the principle of sustainability came into practice 200 years ago in order to maintain continuity of forest production.

The need for restoration of natural resource of wood is thus supported by the principle of sustainable harvest and production. Naturally, all these actions led to the knowledge that only the volume produced can also be harvested. This knowledge, however, is only applicable to the whole production period not on the yearly (season) basis. Experience that Slovak forestry gained during these years could be a contribution to a better understanding of application of sustainable development conception and its practical importance in other branches of national economy, since a number of currently used methods of natural resources utilization are improper from the environmental point of view and also unethical in respect to next generations.

5.8.2. Alien species in Bialowieza forest

Bialowieza forest lies in a very fortunate place in terms of nature conservation, being at the border of states (Poland/Belarus), climates (continental/Atlantic), cultures (West and East Slavic), different geo-botanical regions of Europe (Baltic, Eastern and Western) and watersheds of the Baltic and Black Seas. However, all of these aspects did not make this place invulnerable to natural or human-caused colonization by alien species of organisms. Most of the known colonisations took place through rivers, roads and prevailing wind directions. In the case of Bialowieza forest most of earlier mentioned factors worked against colonisation. Our knowledge about this place is comparatively good from the point of view of flora and fauna; there are 1070 species of vascular plants (Sokołowski, 1995), 254 species of mosses (Faliński & Muńenko, 1997), 4000 species of fungi and over 12,000 recorded species of animals (Gutowski & Jaroszewicz, 2001). As a whole this biodiversity is becoming a more and more important source of income for local people (developing tourism and scientific interest) and for scientists themselves. Besides conflicts between biodiversity itself and biodiversity conservation there is obvious conflict between biodiversity, nature oriented tourism and researchers themselves as well.
Bialowieza Forest is very well preserved and therefore brings a lot of attention. There are thousands of scientists interested in studying the different aspects of natural habitats. The general public, politicians and businessmen are also deeply involved in matters pertaining to this area. The biodiversity of this area (or to be more precise, the big hunting game such as European bison, aurox, bears and others) was initially of great interest to the Polish Royal House. After Poland was parted in 1795, Russian Tsars showed interest towards it as a hunting ground. This resulted in the first anthropogenic introduction of alien species (fallow deer) (Kartsov, 1903). At the end of the 19th century, Tsar Alexander II ordered the construction of a big hunting palace in Bialowieza and at once developed a park around it. The park was designed in the English style. As well as local species, a big number of North American and Mediterranean species of trees and bushes were planted. There were about 200 woody species planted in this park, while Bialowieza forest has only 26 species of trees and 54 species of bushes native to it (Kawecka, 1960).

The Palace Park caused three problems:
1. It became a source of alien species in Bialowieza forest;
2. Some trees easily cross-pollinate with local species thus creating new hybrids;
3. Some genetic mutations of native species used in the gardens as decorative forms of trees, mix with local population of the same species and may cause some changes in biodiversity on genetic level.

Of course local inhabitants also brought hundreds of alien species of trees and bushes to Białowieza Forest and the number of wild growing woody alien taxaons (species, subspecies, cultivars, and so on) has now reached 278 (Adamowski, 2002).

Białowieża National Park was founded in 1921 with the aim to protect all the elements of natural forest (the concept of biodiversity did not exist at that time). It was decided by the founders that the best method of protection in this case was the protection of natural forest processes. That means a strict regime of protection. In 1996 Białowieża National Park was expanded and the “old territory” protected under strict regime became the core area, while the rest of it plays a role of buffer zone for this most precious part. Nowadays however we face serious obstacles: alien species encroaching the Białowieża Forest area, Białowieża National Park and its core area. The general tendency of invasion is that the more disturbed and changed (anthropogenic transformations) an area is, the more vulnerable for invasion it becomes. That is why the highest intensity of colonization is observed on abandoned agricultural land, roadsides, gravel pits, stands disturbed by human encroachment and commercial exploitation. The most common woody taxa on Polish side of Białowieża Forest are: Sambucus racemosa, Sarothamnus scoparius, Acer pseudoplatanus, Prunus serotina, Robinia pseudoacacia, Acer negundo, Malus domestica, Prunus cerasus, Prunus domestica, Quercus rubra. In further divagations I will however concentrate only on the species present and problematic inside the national park’s limits.

Ashleave maple (A. negundo) spreads with the stream of water down the rivers (core area of Białowieża National Park is down the river from Białowieża village). There are already some examples that are at the border of the core area and in other places inside Białowieża National Park. However this species is very difficult to eradicate and the presence of trees does not always mean further colonization: the tree is dioecious, so there is a difference between male and female tree presence. Further, there have to be a minimum of two trees of different sex to produce seeds. Nevertheless, the tree is already in the territory and its eradication would need at least 2 types of actions: cutting down all of the trees inside of the Park and using chemicals to kill root system of the cut trees. Both actions are forbidden as the area is protected under strict regime and using chemicals is forbidden inside of the national parks’ limits.

Red oak (Q. rubra) spreads mostly because of animals (jays and squirrels) gathering its acorns in winter storages. It is able to develop even in the deep shadow of other trees. We already know that jays transport acorns very often for a distance of over 2.3 kilometres, and the Palace Park is only 800 metres from the core area of BNP. Fortunately it has not yet been found inside the core area. In the
case of this species the policy is to cut down each exemplar found in the buffer zone in order to avoid colonisation of the core area. But what do we do if some specimen occurs inside the core area? Do we allow breaking the law and cutting it down in the area declared as strict nature reserve? Is such an action justified by its aim (eradication of alien species), and will the area still remain “strictly protected”?

Red elder (*S. racemosa*) is the only alien species that proved to be able to colonise even the undisturbed forest ecosystem protected in the core area of Białowieża National Park. It is already there owing to its dispersal strategy: birds eat its berries and they spread it across of the whole forest. It is not possible to control this process or to eradicate the species. The only thing to do in such cases is to monitor how the situation develops.

There are also some other examples of alien species colonising Białowieża Forest: Smallflower touchmenot (*Impatiens parviflora*) – the Asiatic species, which started colonization of Europe from the botanical gardens. It spreads very quickly along of roads, railroads and other linear disturbances of natural habitats. It is already present, and common, in whole Białowieża Forest. The first and so far only site inside of the core area where *I. parviflora* occurred was found in 1991. There were 508 plants present at the site. In this case the experiment was set with the aim to study the possibility of stopping further colonisation by careful elimination of plants year by year. This was in opposition to strict rules of protection, but we undertake this challenge to check if any activities made any sense. The process was successful and colonization was stopped (Adamowski & Keczyński, 1998). This population never recovered but observing development of colonisation in the rest of Białowieża Forest we are far from optimist: monitoring of the borders and stopping of the species in the buffer zone most probably will not stop the process, but only delay encroachment of *I. parviflora* to the core area of BNP.

Another aspect of biodiversity protection is case of “economically important species” of trees. The first official acts were aimed at protection of local genotypes of forest trees (local genetic biodiversity). As early as the mid 1970s, the State Forest Company declared Białowieża Forest a closed genetic region. It was forbidden to bring any seeds or seedlings from outside, while the Forest served as source of them for adjacent forest regions. Of course the rule applied only to native material. Also seed production wood stands and large numbers of “best trees” for each native species have been designated across of the whole Forest (also in core area of BNP). Of course in this case the process aims to protect only small parts of genetic variability, the one carrying the best raw material attributes such as height, stem straightness and so on.

The protection of biodiversity itself started to be discussed in the early 1990 and it never became a priority outside of the core area of BNP. That is why it is very difficult to keep this place free of alien species, especially when we try to observe the rule of no interference.

The strategy set for now is:
1. To give up fighting with the species which are spreading very quickly on large scale (*S. racemosa, Phyllonorycter issik*);
2. To try to stop slowly colonizing species at the edge of BNP (in buffer zone);
3. In special cases, approved by scientific council of BNP, it is possible also to undertake actions similar to the case of *I. parviflora*.

5.8.3. Use of non-wood forest resources in Bulgaria

In spite of the traditions and indisputable successes in multifunctional forest management, it is usually recognized that the most important management objective is still timber. In the case of Bulgarian forest management we can provide the example that alternative use of forests is not in conflict with profitable management and on the contrary, can provide sustainable and long-lasting income for rural people. But, like all forest management, non-wood resources need also proper management plans.
Bulgaria has significant resources in terms of medical plants. According to the Law on Medical Plants more than 750 plant species are used in one form or another as a source of medication; 200 of which are economically valuable and regularly harvested and processed (Lange & Mladenova, 1997). About 20 plant species are used for forest fruits and 10 mushroom species have industrial or commercial importance (Savev, 2003). In Bulgaria many plants are traditionally used in folk medicine, in pharmaceutical industry and as food. Also, during the last decades, the use of non-woody forest products as export goods has become more and more important. According to the data presented by the United Nations Statistic Division, Bulgaria exports about 15.5 thousand tons of herbs and there is an increasing trend in this quantity. This means that Bulgaria is the biggest exporting country within Central and Eastern Europe and figures in 8th position in the list of the biggest exporting countries of MAPs (Medical and Aromatic Plants) worldwide (Kathe et al, 2002). Compared with the export of medical plants those of mushrooms have a modest share. For the last 5 years the average annual export is 3000 tons (mostly Boletus boletus sp. and chanterelle Cantharellus cibarius) (Savev, 2003). In Bulgaria, like in most countries of the Balkans, the wild-harvesting of MAPs accounts for 75-80% of plants traded at the domestic and international market. Only 20-25% result from cultivation (Lange & Mladenova, 1997). During the former state-controlled economy, medicinal plant collecting was organized and controlled by the state. It was normal practice for this activity to be fulfilled mostly by schools. Recently, the Gross National Product of the country is still relatively low and this reflects on the living standard of large parts of the society. High unemployment rates also lead to an increased available work force for collecting. Harvesting of medicinal plants and mushrooms from the wild has become an important economic factor in rural areas. The non-timber products are collected mostly by certain underprivileged groups of society including unemployed people, people aged over 50, ethnic minorities, etc. To some collectors the wild harvesting of mushrooms and plants provides much needed additional income, to others it is the only source of income. The total number of people involved in commercial wild-collection in Bulgaria is estimated at about 400,000 (Kathe et al, 2002).

It is a normal practice for herb and mushroom collecting companies to drive collectors to an area where specific non-woody products are known to grow (Ploetz, 2000). The companies pay the gatherers by the weight of the herbs they bring in. On the other hand they use the economical dependency of the people and maintain low purchasing prices. This encourages the gatherers to pick the entire plant, including the root, and to pick all plants in the given area in order to sell bigger quantities. Large numbers of workers are usually not from the area where they are collecting, so they don’t feel responsible. In the areas largely populated by underprivileged social groups, populations of mushrooms and plant species used as medicines tend to be even more exploited than elsewhere. As a result sustainable collecting methods are not practiced (Ploetz, 2000).

The recent threats to the non-woody forest resources in Bulgaria include over-exploitation, destructive harvesting techniques, habitat loss and decrease in genetic diversity. According to the National Plan for Biodiversity Conservation, about 200 species are potentially threatened. In order to promote the sustainable management of the non-timber forest resources and to enforce the conservation activities, several laws and regulations have been introduced concerning the wild collection of botanical drugs and mushrooms. In 1991 a regional annual quota system for the collection and trade in certain MAP species that had become less abundant or were in danger of threatened was applied (Lange & Mladenova, 1997; Hardalova, 1998). The comprehensive description of the situation and tools used for control of the wild-harvesting is presented in the article "Bulgarian model for regulating the trade in plant material for medical and other purposes" by Lange & Mladenova, part of which is presented below:

“Legal framework… The trade in, to and from Bulgaria in botanical drugs is governed by legislation at national and international levels. Those species protected internationally are covered in the Convention on International Trade with Endangered Species of Wild Flora and Fauna (CITES). Those protected nationally are listed (i) in the Bulgarian Ordinance on the Conservation of Species, and/or (ii) are subject to legal restrictions and ordinances concerning control of utilization and trade of the botanical drug species. In addition, botanical drug species can be protected through habitat protection.
The Bulgarian Species Conservation Legislation came into force on 21.7.1989 (Ordinance No. 718, dated 20.6.1989). This ordinance updated the first list of protected plant species published in 1961, and covers 330 plant species. Criteria for inclusion in this listing are varied, including over-exploitation, limited natural distribution, habitat destruction and difficulties with dissemination (Hardalova, 1997). For all the 330 plant species, cutting, collecting, picking, uprooting, trading, exporting them, either as fresh or as dried material is strictly forbidden. Additionally, it is prohibited to harvest their seeds, bulbs, or other reproductive organs. Amongst the 330 plant species, thirty-seven species are used for medicinal or related purposes. According to Hardalova (1997) a total of 820 ha of conservation sites exist in Bulgaria for the protection of botanical drug species around 50 protected areas. They have been established to protect the habitat of summer snowflake \((\text{Leucojum aestivum})\), peony \((\text{Paeonia peregrina})\), liquorice \((\text{Glycyrrhiza glabra})\), snowdrop \((\text{Galanthus nivalis})\), elecampane \((\text{Inula helenium})\), and cowslip \((\text{Primula veris})\), inter alia. The collection of these species is forbidden. In addition to this in-situ conservation, about 150 botanical drug species are preserved in collections of living plants and seeds of the Academy of Sciences. Trade in botanical drugs in Bulgaria is subject to different laws and regulations established in 1991 under the Law for the Protection of the Environment (Mladenova, 1996). In addition to taxes and duties, import/export turnover taxes, any customs duties, possible countervailing duties, regulations concerning required documents for imports/exports, or registration and transaction charges, there are some interesting legal requirements, which are described below:

(A) Where botanical drug species occur in the forests, they come under the jurisdiction of the National Forestry Board, and their use is subject to forestry laws, which the Forestry Administration is responsible for applying (Hardalova, 1997). In the forests, wild collecting is seen as a business and thus fees have to be paid for using the so-called forestry by-products. The rates are species-specific, but charges are only applied when forestry resources are exploited commercially.

(B) Several fees are collected by the Ministry of Environment for the National Fund for Protection of the Environment. Those are related to the granting of import/export certificates and the rates are differentiated dependent on whether the exported plant species is covered or not by any species conservation regulations.

(C) Since 1991, wild harvesting of, and trade in, threatened botanical drug species are subject to restrictions and prohibitions, issued by the Ministry of the Environment. Several ordinances regulate the gathering, trade and export of selected wild botanical drug species, with the aim of protecting them and their natural habitats, to re-establish wild populations, and to encourage cultivation of some species. These ordinances establish restrictions and prohibitions on collecting, trading and exporting botanical drug species:

(i) At least 14 plant species are totally prohibited from being collected from the wild, traded and processed for commercial purposes.

(ii) The collecting of 23 other plant species from the wild, their processing, and trade are subject to restrictions. A quota-system was established for these species. The volumes of each species (according to plant parts used) which can be collected from their natural habitats in the different Bulgarian districts, and which are allowed to be exported have been published in the Official Gazette every spring since 1992, drawn up by Advisory Expert Commission including specialists of the Ministry of Environment and Water, Ministry of Agriculture and Forests, Bulgarian Academy of Science, NGOs, trade associations, scientific organizations etc. The list of plant species affected by this order has been modified slightly, but the volumes, which are allowed to be gathered, vary considerably from year to year according to the species and the region.

(iii) The export of six additional botanical drugs collected from the wild is strictly prohibited.
Those obtained from cultivation, are not subject to prohibitions and restrictions. For controlling the legal requirements of the ordinances mentioned, the purchasers of the botanical drugs involved are obliged (i) to register with the regional Environmental Inspectorates, (ii) to ensure complete access to the controlling authorities, and (iii) to keep the necessary documentation for all transactions concerning these botanical drugs. The laws and regulations concerning wild-collection of some of the highly-sought-after botanical drug species, will enforce an increase in their cultivation. Further, according to Mladenova, the share of the cultivated plant material to be exported will increase in the future.

The Bulgarian model for controlling and protecting botanical drug species includes not only species and habitat conservation measurements, but also legislation on the collection and trade of some selected species. In this respect, it is unique. Additional administrative, technological and educational measures to the purchasers, growers or collectors will need to be established (Hardalova, 1997). An unintended, however, negative consequence of the legislation concerning control of utilization and trade of the botanical drug species could be that botanical drug traders and producers of herbal teas, phytopharmaceuticals or cosmetics will get around Bulgaria's law by purchasing raw materials abroad. As stated above, this has been observed for some species during recent years. As a result, these species could become scarce in other countries. Consequently, it will be necessary to ensure that imports of those particular botanical drugs are also subject to control, or even to restrictions, in cooperation with the source countries. Thus, there is a need to develop guidelines for the sustainable exploitation of wild plant resources, including requirements for the qualifications of those involved in the trade. Further scientific research is warranted on cultivation, development of population status due to habitat change and exploitation, type of harvesting, and the demands of the plant species in the market. All of these measures should be taken into account with regard to the expected increased demand for botanical drug species within the coming years."

A Monitoring System, part of the National System for Environmental Monitoring developed in 1994, was organized and applied aiming for long-term monitoring of the wild-growing MAP populations and their usage in order for negative processes to be identified in time. The data are approximate and include the species-specific quantities collected in the regions where the subdivisions of the Ministry of Environment and Water are located. The monitoring system is reported to be reliable in most cases (Kathe et all, 2002).

It is clear that the administrative and legislative measures alone are insufficient to ensure a sustainable use of these resources. Complete state politics are imperative in order to decrease the level of unemployment and to provide alternative income, especially in the regions with concentration of unprivileged social groups. A step in this direction would be the development of conditions for alternative agriculture that include cultivation of medical plants. This will complement another important measure for decreasing the pressure on the wild-growing populations, i.e. providing suitable conditions for increasing the proportion of cultivated medical plants.

Education of the people involved in the processes of non-timber forest resources gathering, trading and processing is essential and should be implemented. It should be consistent with the target groups and include basic principles of biodiversity conservation, appropriate gathering techniques, etc. Last but not least in importance is the mapping of medical plant and mushroom distribution; investigating the basic characteristics of the populations such as horizontal vertical, structure and age structure, current state and abundance.

5.8.4. Conflict prevention and management in Estonian state forests

An example of conflict prevention and management is the complex forest management practice of the Estonian State Forest Management Centre (SFMC). Forests cover over a half of the mainland of Estonia. Contrary to other parts of Europe, total area covered by forests has increased from 0.9 million hectares in 1920 to 2.3 million hectares in 2001. The state forest also played an important indirect role in recent economic reforms. For successful currency reform the Estonian Supreme Council resolved
on January 23rd 1992 to commit into the balance of the Bank of Estonia, reserve areas from the state forest with an estimated value of USD 150 million as an additional guarantee for the foreign currency reserves. The Bank of Estonia received a total of 4 million cubic meters of forest ready for felling and which could be sold to supplement the gold and foreign currency reserves of the Estonian kroon in the event of crisis. Luckily that did not happen and today forestry forms an important part of the economy, particularly in rural areas, and lays out 13% of Estonian export. Therefore, forests face strong economical pressure.

Forest reserves occupy 7.2% of total forest area. Although this is one of the highest numbers in Europe, we have not yet protected all forest types in Estonia. During SU occupation all forests belonged to the state. When Estonia became independent again, most lands, including forest were privatised. Nevertheless, a large amount of forest remains state owned forests. According to the Forest Act, in order to ensure the stable state of the environment and multiple uses of forest, the area of state owned forest should be at least 20% of the area of mainland Estonia. Today state forests cover over 1 million hectares, forming nearly 40% of the total forest area. State forests are managed by SFMC who are responsible for forest management, seed and plant production, nature management and recreation in a way that guarantees preserving the biological diversity and ability to renew, and the improvement of the health condition of the forest. SFMC produces forest-related budget revenue and provides for the preservation and progeny of forests. SFMC receives income from sales of timber, standing crop, transplants, forest seeds and recreational services. Besides earning income, SFMC ensures that state forests are accessible to all people. SFMS has built several public recreational areas and made forests accessible for people. SFMC pays special attention to nature protection and other uses of forest. Today forest reserves occupy 14% of state forests. In addition, 17% of state forests are protection forests with restricted management. While being the only for-profit state agency, SFMC has established itself as a strong organisation and a steadily profitable undertaking. Successful business activities have not prejudiced sustainable management, but SFMC has become an example in terms of good forestry practices. In 2001, SFMC won international acclaim by being granted the FSC certificate on sustainable forestry, and the ISO 14001 certificate on environmental management. SFMC is the first state forest management organisation in Eastern Europe, recognised by FSC certificate. Interestingly, while Estonia is one of the smallest countries in the world, SFMC manages the largest single forest holding in the world certified by FSC.

At the moment there are no serious conflicts in state forests in Estonia. In the long term, some conflict sources are possible because of political decisions: 1) in case of requirements to increase profitability (more money from state forests to the state budget) instead of the present practice of optimal profitability; 2) in case of decisions to privatise state forest or to sell some profitable SFMC units (e.g. recreational unit), thereby destroying complexity of forest management; 3) SFMC establishing itself as a well defined organisation could be overloaded with additional duties not directly related to forest management and therefore shading/loosing its objective and operating efficiency. Only one private forest has been certified by FSC in Estonia, with a total area of 517 ha. Biodiversity in remaining private forests often face over-harvesting. In many recently resold forests, where the owner lives away from his property, principles of sustainable forestry are largely ignored and clear-cutting exceeds replanting or natural regeneration. Starting from 1999, felling trees has substantially exceeding increment in private forests (Etverk, 2003).

Although Estonian forests have multiply uses, owners often see forests only as direct source of wood to cut and gain economic income. Therefore, only complex forest management by owners is a key to prevent biodiversity conflicts. In complex forest management the owner takes into account all aspects of forest use: 1) maintenance of protected natural objects (nature conservation); 2) protection of a landscape or landscape variety, soil or water (environmental protection); 3) protection of people against pollution spreading from industrial production sites and transport facilities, and against the harmful effects of weather (sanitary protection); 4) creation of opportunities for people for resting, health improvement and sports activities (recreation); 5) gathering of tree seeds, forest berries, mushrooms, herbs and ornamental plants and parts thereof, moss, lichen, nuts, hay, branches, ornamental trees, bark and tree roots, resin and birch sap, the location of beehives and grazing of
animals (use of by-products); 6) research and education; 7) obtaining timber; 8) hunting; 9) national defence.
6. Inland aquatic habitats

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6.1. Introduction

Biodiversity protection in the Acceding and Candidate countries (ACC) has experienced many challenges during the transition period and the accession to the European Union. The basic features of this process were the incorporation of the *acquis communitaire* into national legislation, capacity building of the relevant structures of both the government and the civil society, and cooperative valuable support of the EU and single member countries.

The process of setting up new biodiversity protection and conservation policies has run in parallel with important reconstruction of many other sectors of the national economies such as industry, agriculture, forestry, transport, spatial planning, civil works etc. The basic trend of these changes is the diversification of property by means of privatisation (mainly in industry and transportation) and restitution (mainly in agriculture and forestry). As a result, the emerging changes in land-use strongly pressured the biodiversity protection policies thereby creating both direct and indirect conflicts. In addition, many ACC suffered from economic recession. The decreasing quality of life in many regions generated conflicts between biodiversity protection and the sustainable use of biological resources; between current practices in inland water habitats and their conservation.

The current changes in land ownership, land use practices and production technologies in the agriculture, forestry, construction, transport and tourism sectors are major driving forces causing conflicts with the conservation of biodiversity in inland aquatic systems (Bulgarian National Strategy for the Environment and Action Plan 2000-2006, 2001). Other conflicts can relate to the overuse and/or illegal use of biological resources, invasion of alien/exotic species together, lack of knowledge and poor implementation of legislation, inefficient management and administration of protected areas and the lack of registration and effective monitoring of biological resources (see Table 6.1).
Table 6.1. Main sources of conflicts and effects on inland aquatic habitats

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Sources of impact</th>
<th>Sectors/Driving forces</th>
<th>Wetlands Affected</th>
<th>Basic type of conflicts</th>
<th>Basic effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>Point sources of pollution</td>
<td>Industry, Energy production, Cattle-breeding, Urban systems</td>
<td>Rivers, Lakes &amp; Reservoirs, Estuaries, Coastal wetlands</td>
<td>Changes in water quality</td>
<td>Pollution, Eutrophication</td>
</tr>
<tr>
<td>Non-point sources</td>
<td>Agriculture, Forestry, Transport</td>
<td>Rivers, Lakes &amp; Reservoirs.</td>
<td>Changes in water quality</td>
<td>Use of pesticides &amp; fertilizers, Increasing stocking density, Crop extension</td>
<td></td>
</tr>
<tr>
<td>Indirect</td>
<td>Transboundary sources</td>
<td>Industry, Energy production</td>
<td>Watersheds as a whole</td>
<td>Changes in water quality</td>
<td>Acidification, Eutrophication</td>
</tr>
<tr>
<td>Local sources</td>
<td>Agriculture, Forestry, Urban Planning, Tourism, Infrastructure</td>
<td>Rivers, Lakes &amp; Reservoirs, Estuaries, Coastal wetlands</td>
<td>Changes in land-use</td>
<td>Land abandonment, Deforestation &amp; Erosion, Introduction of exotic species, Loss of traditional species, Habitat exchanges and losses, Habitat fragmentation</td>
<td></td>
</tr>
</tbody>
</table>

The present report will outline some of the common sources of conflicts, specific for the ACC, and the extent to which these conflicts may impact on the conservation of biodiversity. Most of the examples provided hereafter reflect a range of general issues, which have been selected to represent a selection of different types and scales of inland aquatic habitats as well as different social contexts.

6.2. Value of inland aquatic habitats

Inland aquatic habitats and wetlands (rivers, lakes, swamps/marshes, ponds, reservoirs, etc) are a substantial part of each landscape and important sources of many goods and services for countries and regions. In Lithuania, for example, there are about 3,200 lakes that cover about 1.5% of the whole territory. Swampy areas cover some 6.4% of the country, about 50% of which are smaller than 1 ha. Among artificial reservoirs, 400 are bigger than 5 ha, while about 10,000 are smaller than 5 ha. The river network covers about 63,700 km of riverbeds (Svazas et al., 1999). The Slovak recorded river network is 49,755 km long and represents an average river network density of 1,015 km per km². The number of water reservoirs under waterworks authorities’ management is 291, of which 54 have a water capacity exceeding 1 million cubic metres. In Slovakia, wetlands cover a total area of 198,790 hectares, with more than 2,000 wetlands registered, of which 1,606 are categorized: 17 are of international importance, 72 are of national importance, 467 are of provincial importance and 1,050 are wetlands of local importance. The Slovak river network is 44,943 km long and represents an average river network density of 0.92 km/km². In Bulgaria, the total surface of the natural wetlands is about 11,000 ha, mainly along the Black Sea coast and the Danube bank. Artificial lakes (reservoirs, accumulations) are in the range of 6,000, 51 of which are of national importance. There are 88 natural and artificial lakes, which are officially recognised as wetlands of national importance. In Estonia, there are 1,200 lakes larger than 1 ha, two of which are very large lakes (the 3555 km² Peipsi Lake, fifth largest lake in Europe, and Võrtsjärv that covers 270 km²), inland water bodies cover 4.8% and wetlands 4.3% of the Estonian territory. Average river network density is 0.72
km/km². In Slovenia, the network of watercourses is 28,000 km long or 1.4 km/km². Some 1300 lakes cover 68.93 km². Half of this area belongs to artificial accumulations, while the largest natural lake, Cerknica Lake, is an intermittent lake in the karst area, which covers up to 26 km². 81% of the territory drains into the Black Sea and 19% to the Adriatic Sea. Additionally, some 44% of the territory is carbonate bedrock and some 7000 caves have been registered in the karst areas. The karst surface and underground hydrological complexes are particularly sensitive to human impacts. Due to the geological and climatic diversity of the territory, the inland surface waters and wetlands of Slovenia are rich in plant and animal species. There are about 7,081 lakes larger than 1 ha in Poland, occupying about 281,377 ha, equivalent to about 0.9% of the country area. Wetlands with peat deposits cover about 1,200,000 ha, equivalent to about 4% of the country area.

Rich biodiversity is one of the main values of wetland ecosystems. In Slovenia, for example, around 1,700 algae species and subspecies and almost 100 species of water and marsh flowering plants have been recorded in the identified wetlands. In addition, around 2000 aquatic species, including fish and amphibians but not insects, have been identified so far. It has been estimated that there are approximately 1,000 species of insects, which spend part or half their life in water. Plant and animal species, which are new to Slovenia’s identified flora and fauna, are still being found in wetlands today. In reference to subterranean fauna, some 700 endemic taxa are estimated, some of them highly specialised endemics. For example, in Bulgaria there are more than 2400 invertebrate aquatic species recorded for the inland water bodies of the Aegean and Black Sea river basins (Uzunov et al. 1998), another 1610 taxa are recorded for the Bulgarian tributaries of the Danube River (Russev et al., 1998).

There was a common understanding in the past that aquatic habitats and wetlands only played the role of basic suppliers of water and biological resources for human life. To this end the wetlands were the object of various large-scale human interventions leading to drastic changes in hydrological regime and to loss of wetlands. The drainage of wetlands for agriculture was the main driving force for wetland loss. Other human impacts on the inland riverine habitats included various civil engineering works like embankments (flood prevention), barraging and the revetment of banks and channel beds in many rivers. This resulted in only 17,000 km of 63,700 km of riverbeds being left unchanged in Lithuania and some 80% of swampy areas reclaimed since the beginning of intensive draining works in the 1950s. Bulgaria has lost more than 190,000 ha of its natural wetlands in the last century (National Action Plan for the Conservation of the Most Important Wetlands in Bulgaria, 1995) and currently it seems there is no river flow unregulated in some way or another in that country. In the Romanian Danube Delta, 20% of the total area of 2,413 km² of natural wetlands have been maintained under natural and semi-natural conditions as a follow-up to a large program for transformation of the natural wetlands into agricultural lands carried out during 1960s and 1970s. In Estonia on the other hand, construction of new and restoration of existing dams in the last decade has significantly increased the number and total surface of wetlands. The main reason was the wish of authorities to produce more energy from water sources, despite the fact that water provides some 1% of the total energy supply. In many cases the result was degradation of fish fauna in rivers and coastal areas (Järvekülg, 2003). In Slovenia, the written data shows that since the 18th century more than 100,000 hectares of land have been drained. Between 1973 and 1991, 70,000 ha of land were drained in order to obtain new arable land, mostly in the northeast part of the country. According to statistical data, approximately 40% of wetlands were lost between 1952 and 1990. In the last 50 years the number of large lakes in Poland has decreased from 9,296 (in 1954) to 7,081 (in 1992). The total loss of the wetland is over 35,000 ha, or about 11%. The decrease of the total area follows the decrease of index of lakes in Poland form 1.0 to 0.9 (Choiński, 1995). Currently, 85% of Polish mires are supposed to be disturbed in different degrees. According to 1950 data, many small mires have completely disappeared from the landscape due to land reclamation and stimulation of mineralization processes.

Only in the last few decades has there been a growing understanding of the wetlands’ critical role as multifunctional resources. Besides their ecological importance as the main mediator of the atmosphere, lithosphere and hydrosphere, finally accepting and accumulating all kind of land-based influences, inland aquatic habitats are valuable for biodiversity, provide various goods and services to society and perform a number of important ecosystem functions. In some instances changed use of
wetlands affects the ‘value’ of the land and may need to be re-appraised in the light of better understanding of the functional role they may need to play.

A methodological gap in the estimation of total economic value limits the ability of society to recognize the multifunctional importance of inland aquatic habitats and to gain a better understanding and social acceptance of the ecological scale on aquatic biodiversity in parallel with provision of goods and services supplied by wetlands. It is of utmost importance for science to identify knowledge gaps, to develop methodological tools for evaluation, to predict possible conflicts, to delineate response options and, finally, to translate scientific knowledge to a language understandable both by policy-makers and the wider public.

6.3. Identification of conflicts

6.3.1. Ecosystem related conflicts (degradation of inland aquatic habitats)

During the transition towards a civil society and market-based economy, the ACC experienced deep and, sometimes painful, changes in all sectors of economic and social life, many of them strongly affecting the status of freshwater ecosystems, aquatic habitats and related biodiversity. These processes caused both positive and negative effects on aquatic biodiversity. The impacts may differ according to the sector acting as a driving force on the one hand, and on the type of inland aquatic habitats on the other (Table 6.2).

Table 6.2. Relative vulnerability of inland wetlands to human impacts (+/- intensity of effects on biodiversity)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Sectors/Driving forces</th>
<th>Streams</th>
<th>Rivers</th>
<th>Lakes &amp; Reservoirs</th>
<th>Coastal Wetlands</th>
<th>Estuary</th>
<th>Mires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>Agriculture &amp; Forestry</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++++</td>
</tr>
<tr>
<td></td>
<td>Civil works</td>
<td>++++</td>
<td>++</td>
<td>+</td>
<td>+++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Extraction industries</td>
<td>++++</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++++</td>
</tr>
<tr>
<td></td>
<td>Manufacturing industries</td>
<td>+++</td>
<td>++++</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Urbanization</td>
<td>++++</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Indirect</td>
<td>Dams &amp; Barrages</td>
<td>+</td>
<td>++++</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Land drainage</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>++++</td>
</tr>
<tr>
<td></td>
<td>Industrial &amp; Urban land use</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Recreation &amp; Tourism</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
</tbody>
</table>

Due to the economic recession, the level of direct industrial contamination of watercourses and lakes decreased in many regions and countries. In Bulgaria, a World Bank report (Bulgaria: Environmental Strategy Update and Follow-Up, 1994) recognized that there was statistically proved improvement of water quality in 13 of the 17 main water basins at least for three basic parameters (BOD<sub>5</sub>, N-NO<sub>3</sub> and suspended solids). The recent data showed that almost half of the watercourses in the country were of very high quality, and in the remaining ones the water was of relatively good or poor quality. Improving water quality has had a positive effect on riverine biota in many watercourses. The list of invertebrate species found in the bottom fauna of the Mesta River (South-West Bulgaria) contained a total of 448 taxa as recorded since 1978. Of them, 245 taxa were established with 81 taxa recorded for the first time in the bottom communities during the recent investigations (1999-2000). The species content changed significantly after 1990 when severe organic pollution of industrial origin had been eliminated. The faunistic similarity was estimated to be 53.2% for the periods before and after 1990. In the macrozoobenthos, some 163 taxa were still common for both periods of comparison. Some 124
taxa were not registered any longer, but 163 new taxa appeared in the bottom invertebrate fauna after elimination of the pollution (Uzunov et al., in print).

In Estonia, the status of inland water bodies improved considerably after the collapse of the Soviet political and economic system. One of the reasons for water quality improvement was the very wet period in the early 1990s, when dilution of substances took place (Ott & Köiv, 1999). However, in the large Lake Peipsi, the ecological status has deteriorated and biodiversity has decreased in recent years due to the changes in the N:P ratio. The total nutrient load was decreasing but the nitrogen level dropped faster than the phosphorus. Because of this, heavy water blooms caused by cyanobacteria occurred in combination with loss of biodiversity and mass fish deaths.

In spite of lower current intensity, agriculture is still commonly recognized as one of the main sectors creating conflicts and affecting biodiversity: the use of fertilizers and pesticides, drainage of wetlands for arable lands, channelization of rivers, pollution etc., have all resulted in changes of water quality and quantity and deterioration of water habitats. The eutrophication of freshwater ecosystems is recognized as a pan-European problem of major concern and occurs in all parts of Europe where intensive agriculture has taken place. A trend of increasing eutrophication of wetlands in ACC is commonly recognized. In many regions where agriculture occurs it covers fewer areas but is more intensive and machine and chemical driven thus changing the traditional agricultural land use. On the other hand there are less favourable areas for intensive agricultural production (pastures, water meadows etc.) that have been either drained or abandoned.

The nutrient enrichment by phosphorus and nitrogen (from both agricultural and urban sources) may have both local and transboundary effects. The inventory of pollution sources conducted during the preparatory work for the Black Sea Strategic Action Plan and the studies dealing with nutrient balance in the Danube River basin have provided data on the inputs of total nitrogen (TN) and total phosphorus (TP) to the Black Sea in 1989 (473 Kt of TN and 35 Kt of TP) and some years later in 1997 when the economies of the former Soviet block countries had declined (~315 Kt of TN and 18 Kt of TP). Analysis suggested that about half of the nutrient inputs to the Danube River originated from the agricultural sector, 25% were supplied by industry and 25% by households (Vadineanu et al., 1998). The estimates suggest that Romania contributes 27% of nitrogen and 23% of phosphorus and non-coastal countries (Austria, Belarus, Bosnia, Croatia, Czech Republic, Germany, former Yugoslavia, Hungary, Slovakia, Slovenia and Republic of Moldavia) contributed 30% and 26% to the total N and total P discharges in the Black Sea. Romania and non-coastal countries, of which most are Danubian countries, contribute more than 50% of the total waterborne load of nitrogen and phosphorous.

The agricultural sector is also responsible for loosing large territories of valuable aquatic habitats through draining. To this end wetlands have lost much of their capacity for nutrient retention. In the Romanian Danube Delta for instance, by losing about 4,000 km$^2$ of wetlands, the surface actively involved in nutrient retention dropped by 30% in the LDWS compared to the reference state of 1950. Although the efficiency in nutrient retention differs over a wide range according to the wetland type, hydrology, community structure and other factors, an average of 14-15% for TN and 8-9% for TP was estimated in the LDWS by applying the method of nutrient accounting (Vadineanu et al., 1998). The corresponding amounts of nutrient retention per hectare per year are therefore: 140-160 kg for nitrogen and 7.6-10 kg for phosphorus. Thus, since the current configuration of the LDWS has been established, an additional 42-48 Kt of nitrogen and 2.3-3 Kt of phosphorus have been discharged annually in the North-Western Black Sea.

During the last two centuries, a large proportion of European wetlands became victims of “land reclamation” projects, which involved drainage not only of inland water habitats sensu stricto, but also of those wetland areas that were waterlogged, very often only temporarily. The result of the land drainage is increased amplitude of groundwater table fluctuations, with the upper soil layers being often unsaturated with water, and aerated. The enhanced groundwater table fluctuations are therefore associated with an enhanced mineralization of the soil organic matter (humus) and thus with a loss of
organic C, N and P forms and of the cation-holding capacity of the soil. Whenever the groundwater table is sinking in the soil and water discharge from the drained areas increases, large amounts of mineral nutrients (NO$_3^-$, soluble phosphates and, above all, cations such as K$^+$, Ca$^{2+}$, Mg$^{2+}$) are leached from the soil profile and transported into both running and standing water bodies. This increased nutrient input to surface water bodies as well as that from both point and non-point sources of nutrients and pollutants, causes eutrophication of waters and wetlands, i.e., proliferation of such life forms and species of algae and vascular plants that are able to make rapid use of available nutrients for their growth and propagation. Species that are adapted to nutrient-poorer habitats are thereby suppressed or eliminated. The resulting changes in the plant communities are also reflected in changes in the communities of zooplankton, zoobenthos, fish and amphibians, birds and mammals, all in favour of species that can make rapid use of an increased food supply composed of a restricted set of food (prey) species. Also, the communities of decomposers change, involving bacteria, fungi, and detritivorous animals belonging to other (and often fewer) species than are those present in less nutrient-loaded (oligo- to mesotrophic) habitats. Due to mineralization of the peat deposits, significant changes occurred in mire and fen meadows ecosystems. Most of the changes are related to spontaneous succession leading to a replacement of low sedge communities (Caricion fuscae, Caricion davalianae) by herbal vegetation (Filipendulion), reedbed (Phragmition) and scrubs. Moreover significant drainage could cause large and long lasting fires that may disturb and even destroy wetland ecosystems.

In the past, draining activities in Lithuania for example far exceeded the demands of agriculture, especially after the post-soviet land reform period. Intensive draining works started in 1951, reached a peak in 1971–1975, and resulted in some 80% of swampy areas being reclaimed/drained for other uses. Later the land draining activity decreased, with an especially sharp decline between 1991 and 1995, and a near stop in draining activity after 1996. As a result, the majority of small peripheral streams became monotonous canals draining agricultural fields, peat lands, or forests. The hydrological regime of many larger wetlands has changed towards drying, and many valuable natural habitats have been lost. Moreover, a significant part of the reclaimed land has never been used for intensive agriculture because of unsuitable soil or infrastructure conditions (Kvaraciejus 2001).

Land drainage affects the biodiversity and species variety in wetlands and surface water bodies in the following aspects:
- A net loss of wetland areas, which is, of course, associated with a loss of habitats suitable for wetland biota resulting in a decrease of their abundance on the local, regional and European scales.
- An impoverishment of the soil by mineralization of organic soil matter (with the associated effect of enhanced CO$_2$ release in the atmosphere) and by net loss of mineral nutrients. The final result is a simplified structure of biotic communities on the drained sites. Acid rains are less accountable than land drainage, as only a small fraction of the proton equivalent of the leached metallic cations arrives with acid rain.
- A shift in the heat balance from the energy dissipation of incoming net solar radiation in the process of evapo-transpiration to an increased sensible heat flux and overheating of the drained sites. The cooling effect of wetlands and other wet sites is thus lost. This is reflected in changes of biotic communities to more xeric ones. Changes in the heat balance over large drained areas result in a greater instability of climatic conditions.
- A simplified structure of aquatic and wetland biotic communities affected by eutrophication, comprising a narrower selection of species adapted to a high nutrient input.

In Poland, the vast majority of non-forested mires, as well as wet meadows on drained fens, have been shaped by centuries of yearly mowing and low-impact grazing by cattle. The agricultural activities have decreased since the 1950s, first on non-drained fens and then on reclaimed fen meadows. The abandonment increased recently due to a general decline of the economical profitability of agriculture in Poland and emigration of rural communities (Kotowski, 2002). A cessation of extensive mowing and grazing stimulated natural succession, which was until then suppressed by the type of management: sedge-moss communities were replaced by tussock-forming tall sedge communities, reedbeds, and later by scrubs and trees (Piórkowski & Rycharski, 1999, Kotowski, 2002). The scale of
the problem illustrates change in the area covered by scrubs and forests in 1990s. In the early 1990s nearly 12% of peat lands were covered by forest vegetation while at the beginning of 21st century forests covered almost 17% (Ilnicki 2002). The scrub encroachment on open wetlands causes fast disappearance of animal species from agricultural mire landscapes. The cessation of mowing in the Biebrza Mires for example led to the complete disappearance of ruff populations nesting in sedge moss fens within 20-30 years and is also a serious threat to the populations of aquatic warbler and corncrake. Other bird species that suffer particularly from spontaneous succession on abandoned wet meadows are the lapwing, common curlew, redshank, black tailed godwit and common snipe (Ilnicki, 2002). Several studies have shown that abandonment of meadows also result in a reduction of plant species diversity: e.g. data from Muller et al. (1992) show serious decrease of species in wet meadows on peat land after 30 years of abandonment (after Ilnicki, 2002). Raised bog and fen peat are also widely used for production of potting soil and for gardening and is a profitable export product. In Poland, peat extraction seems to be a serious threat for many raised bogs and fens. Extraction causes destruction of vegetation cover and has to be preceded by drainage, which may affect surrounding areas. In 1999 there were 41 peat deposits and 48 lacustrine chalk deposits with ongoing extraction, amounting to about 580,000 tonnes of extracted peat (Kotowski 2002). Conflicts between peat extraction and nature conservation seems to be prevented by legislation at a large scale, while on a small scale, illegal activities still cause serious problems for the protection of mires’ biodiversity.

Intensive fish farming can also influence the water quality and this could create conflicts between the biodiversity conservation and economic interests of the stakeholders. The present technologies of fishpond management have drastically impacted not only the ponds themselves but also the downstream stretches of the watercourses. There are many activities associated with intensive fish farming that generate conflicts mainly by accelerating the eutrophication processes and worsening the water quality: fish feeding and joint duck farming, application of fertilizers, liming, manuring, application of toxic substances (as medicine in case of fish diseases), removal of fringing vegetation, etc. When developing a large program for intensification of salmonids farming in 1970s-1980s for example, the water quality and biodiversity of many mountain watercourses in Bulgaria deteriorated significantly.

Developing new agricultural sector structures in many ACC, especially in cattle farming, have also created conflicts. The former large cooperative farms (pigs, cows, sheep, chickens) were replaced by thousands of small private (family) farms. In Bulgaria for example, not only has the total number of cattle decreased drastically in the last decade, but at present 85% of all dairy cows are in small family farms (1-5 cows, about 2 cows per farm on average), less than 9% are in farms with more than 20 cows, and only 2.6% are in larger farms with more than 100 cows. The lack of any facilities for wastewater treatment in such farms has created numerous small sources of direct pollution of inland brooks and streams thus affecting the water quality locally and respective biodiversity in watercourses and adjacent water bodies.

The ongoing or completed reforms in land ownership in the agrarian sector have also created conflicts between current practices and biodiversity protection in the ACC. Because of gaps in ownership, many small artificial ponds risk being lost as wetlands of local and regional importance. In the past, Bulgaria constructed nearly 5,350 artificial reservoirs and ponds, mainly to support local irrigation, cattle breeding and fire protection although many were also used for extensive fish farming. Most of them provided rich local biodiversity and served as suppliers of many goods for local population (water, fish, game birds, reed, etc.). Only 1,084 are still owned by the state today and are used mainly for fish farming. Almost 30% of all former cooperative owned small ponds are without a legal owner and are going to be abandoned due to the soil erosion, siltation, mass plant development and lack of any maintenance.

In Slovenia, karst ponds are the result of human interference with nature and therefore important features of a country’s natural and cultural heritage. Using the natural characteristics of an area, they were built in naturally occurring depressions on karst, where water accumulated at least temporarily, and, in the flysch landscape, at permanent springs. Karst ponds were mainly used for watering cattle.
Due to loss of traditional life-style and land use karst ponds are becoming threatened and need to be managed in order to secure their survival. As the only stagnant water in the landscape, karst ponds are home to many plant and animal species, whose lives depend on water. Their survival does not depend on some selected localities, but rather on the whole network of karst ponds formed in the southwest part of Slovenia. Without maintenance karst ponds soon become encroached by vegetation and water is lost as the bottom becomes permeable. Filling them up thoughtlessly only contributes to their disappearance. By decreasing density within the network the distances between individual sites increase and many species fail to cover it. As a result, some parts of the plant and animal populations become isolated and consequently can become locally extinct.

Table 6.3. Some specific characteristics of the transition and accession of ACC affecting biodiversity in wetlands

<table>
<thead>
<tr>
<th>Type of changes</th>
<th>Process</th>
<th>Driving forces</th>
<th>Weaknesses</th>
<th>Identified conflicts generating loss of biodiversity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political</td>
<td>Developing new legislation</td>
<td>Integration of EU-standards and MEA</td>
<td>Weak enforcement of legislation, standards and protocols on grass-root/on sites</td>
<td>Inconsistent agreements for sharing responsibilities</td>
</tr>
<tr>
<td>Restructuring administration</td>
<td>Setting-up better management models</td>
<td>Ineffective management on site Lack of sufficient methodological, financial and human resources</td>
<td>Insufficient actions and control Insufficient monitoring</td>
<td></td>
</tr>
<tr>
<td>Developing civil society</td>
<td>Involvement of the wide public</td>
<td>Lack of dialogue between stakeholders</td>
<td>Prevailing of top-down measures Weak bottom-up measures</td>
<td></td>
</tr>
<tr>
<td>Economic</td>
<td>Restructuring economic sectors</td>
<td>Recession</td>
<td>Lowering the production intensity</td>
<td>Secondary pollution/ Eutrophication</td>
</tr>
<tr>
<td>Restructuring economic sectors</td>
<td>Privatisation &amp; Restitution</td>
<td>Changing land-use practices</td>
<td>Lands/Ponds Abandonment Overuse of bioresources</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Restructuring economic sectors</td>
<td>Unemployment</td>
<td>Lack of social alternatives/jobs</td>
<td>Illegal use of bioresources, poaching</td>
</tr>
<tr>
<td>Restructuring economic sectors</td>
<td>Impoverishment</td>
<td>Restricted access to resources</td>
<td>Illegal use of bioresources, poaching</td>
<td></td>
</tr>
<tr>
<td>Restructuring economic sectors</td>
<td>Immigration</td>
<td>Lack of social alternatives/jobs</td>
<td>Lack of human resources for maintenance and traditional use of bioresources</td>
<td></td>
</tr>
</tbody>
</table>

6.3.2. Species related conflicts

Deterioration of habitats and decline in water quality as a result of changing water and land-use practices leads to many conflicts related to the species content of inland water bodies. A simple illustration is to look at the effects of eutrophication processes on phyto- and zooplankton communities and the consequent negative changes in both zoobenthos and nekton, especially fish
fauna and larger hydrobionts. There are classic examples of extinction of many common but sensitive European species like brook crayfish (*Astacus astacus*), water turtle (*Emys orbicularis*), freshwater pearl mussel (*Margaritana margaritifera*), etc. The most sensitive issue for stakeholder interests is the narrowing of species distribution or even extinction of salmonids in many brooks, streams and rivers. In Bulgaria, for example, due to the radical changes of hydrological cycles (due to the regulation of water discharges), water quality problems and severe poaching it is almost impossible to maintain stable populations of the brown trout (*Salmo trutta fario*) without special actions for regular introduction of young fish in mountain brooks and streams.

Alien species can also be a major problem. When addressing the issue of alien species, one has to take into account both the distribution of alien species and the genetic pollution of natural populations. The natural enlargement of alien species distribution has increased due to the canalisation of rivers networks, connecting distant basins, intensive navigation traffic, changes in water quality, etc. For instance, the most remarkable alien species, the zebra mussel *Dreissena polymorpha*, reached Estonian freshwaters in the 1930s, starting in Lake Peipsi. It is now very abundant, mostly in the sub-littoral, probably improving the lake condition by filtrating water and creating additional ecological niches on the river bottom (Timm 1990). In the 1950s it reached Lake Võrtsjärv (Timm 1977) but decreased again, after an initial explosive distribution, due to shallowness and high water turbidity. Its distribution in smaller lakes and rivers, particularly by fishing gear, is currently in progress. No important nuisance effects have been recorded in Estonia so far. However there is evidence of the negative impact of zebra mussel on technical facilities of the pipeline systems for water abstraction. Another example is the small Far-Eastern fish *Pseudorasbora parva* that appeared occasionally in some fish farms along the Danube in the early 1980s due to intensive but uncontrolled import of adults for breeding from Soviet fish farms. At present, this alien species is a common component of ichthyofauna of the Bulgarian Danube stretch and now occupies an important niche and competes successfully for trophic resources with young valuable fish species. In most cases, the economic interest of stakeholders is the main driving force for the introduction of exotic and alien species in inland water bodies. Introduction of alien fish and trophic organisms was a widely used practice in the former USSR and its satellites from the 1950s onwards. Aiming to improve the trophic conditions for local fish, many invertebrate exotic species were introduced in water bodies quite far from their original area of species distribution. One example is the introduction of the American crayfish *Pacificaostacus leniusculus* for farming purposes in several ACC. Despite failure of most introduction efforts, the pressure from economic sectors is still strong. Introduction of exotic fish species for farming and stocking has taken place in many ACC countries in the last decades. It is disputable whether it has had positive effects on native inland fish fauna. On the one hand, it could be considered positive to diversify fish assemblages thus fully utilising the trophic resources of wetlands, mainly plankton and vascular plants. On the other hand however alien species can compete with local ones for trophic resources and can change the structure and functioning of the whole aquatic ecosystem as they significantly influence the mass and energy flows within the ecosystem.

There is also the possible concern of alien species causing genetic pollution of local populations. A good example is the marble trout *Salmo truta marmoratus* in the Soca River and its tributaries (Slovenia) threatened by interbreeding with an introduced American salmonid species (*Salmo gairdneri*). Another example is the attempt to introduce genetically modified species like triploid brook char (*Salvelinus fontinalis*) for intensive fish farming and stocking in Bulgarian mountain streams. For the last 50 years, many alien fish species have been introduced in Bulgarian fish farms and water bodies (both watercourses and reservoirs): cyprinids like bigheads (*Aristichthys nobilis, Ichthyophthalmichthys molitrix*), grass-carp (*Ctenopharyngodon idella*), black amur (*Mylopharyngodon piceus*); salmonids like rainbow trout (*Onchorhynchus mykiss*), brook char (*Salvelinus fontinalis*), lipan (*Thymalus thymalus*), coregonids like withfish peled (*Coregonus peled*) and European cisco (*Coregonus albula*), several species of buffalos (*Ictobius spp.*), etc. At present, some of them, such as the silver carp, are now common in many reservoirs and ponds in the Danube River after intensive fish stocking or escaping from farm-ponds. In Estonia, the gibel carp (*Carassius auratus gibelio*) inhabits many lakes, having some value for sport angling. Many other fish species
have either been intentionally introduced or escaped (from ponds), without initiating new viable populations.

Some species re-inhabiting wetlands have considerable influence on these habitats by creating new conditions for plant and animal communities. The beaver (*Castor fiber*) is the most well-known keystone species in inland water ecosystems. The conflict relating to beavers comes from the ability of this species to initiate changes in the environment that are opposite to practical human needs, causing humans to want to remove them from intensively managed areas. From a biodiversity point of view, beaver activity is mostly positive by restoring the natural shape of the wetland habitats and thus working for their re-naturalization. Also, beavers are one of the most important factors of wetland re-naturalization. In Lithuania, as in many other European countries, beavers were exterminated most probably through uncontrolled hunting. They returned to inland water ecosystems through reintroduction and immigration in the 1940s. By the 1980s they already inhabited the entire country at comparatively high population density. At present, beaver numbers exceed 30,000 individuals and this figure could reach 70,000 according to the latest expert evaluations. This is considered to be a very high number for beaver populations considering mean territorial density is about one beaver per km². Regarding habitat distribution, about 30% of beaver sites are located in drainage canals of reclaimed areas (Ulevicius, 1999). It is namely in this type of inland water ecosystem that beavers appear to be the main cause of conflict by destroying the local drainage system and raising the water level. Humans often try to remove beavers by breaking up processes of re-naturalization, usually when these have already started. These efforts are usually ineffective and the former agricultural (forest) value of an area is rarely achieved. Finally, this conflict stipulates a very negative public attitude to an undoubtedly ecologically valuable species.

6.4. Conflict resolution strategies

By default, the accession process required integration of EU Directives and Regulations relating to biodiversity protection and water management within national legislation. This top-down approach to avoid and/or solve conflicts was generally accepted and implemented by all ACC (in spite of some country specific issues). The legally regulated public relationships, setting up legal frameworks for human activities, allocation of responsibilities and duties of competent governmental authorities and public bodies creates a general framework for sustainable use of resources and protection of biodiversity in aquatic habitats. Most of the ACC have either already successfully implemented or are in the process of implementing the provisions of the EC Habitat Directive, Bird Directive and recent Framework Water Directive as well as many of international agreements such as the Ramsar Convention, Bern Convention, Bonn Convention, Washington Convention (CITES) and Convention on Biological Diversity. The institution of Environmental Impact Assessments (EIA) and integration of Integrated Pollution Prevention and Control (IPPC) practices are considered to be important instruments for preventing and avoiding conflicts between biodiversity conservation and changing industrial technologies, land-use changes and practices. Public inquiries with the participation of a wide range of the public (local people, interested groups, scientists, NGOs etc) are a common legal requirement with the procedures of an EIA in all the ACC.

However, in many cases, integration of the EU legislation and Multilateral Environmental Agreements (MEAs) are not enough to make national legislation operational without proper public capacity such as proper structure of governmental and local (municipal) authorities and those of the civil society (NGO, interest groups – professional, scientific, scholar, etc.). There are some examples of controversial legal requirements or standards to a wetland according to different objectives of human intentions (for example peat extraction or land reclamation). While looking for conflict resolution strategies it is important to recognize the importance of involving stakeholders in a public dialogue and the scope for decision-making provided to them by the current legislation. To this end, the top-down approach should be complemented by a bottom-up approach and participatory schemes should be the most effective way of predicting and solving the potential and real conflicts in biodiversity protection and conservation of inland aquatic habitats. In Bulgaria, for example, there are several mechanisms for implementing such a proactive approach. Following the Biodiversity Act, a Consultative Council to
the Minister of Environment and Water was created with participation of official representatives of governmental agencies, relevant to biodiversity protection and use of bio-resources, academic circles, NGOs and nature-protection groups in order to serve as an advisory body in all aspects of biodiversity conservation, protection and sustainable use of bioresources. The Bulgarian Academy of Sciences also established the National Scientific Coordination Council on Biodiversity and thus provided a countrywide forum for dialogue and coordination of research and monitoring activities of all parties interested in biodiversity protection. Following the provisions of the Water Act and integrated basin-management approach, several Basin Councils were established with participation of all interested stakeholders, including representatives of state and local administration, water users, NGOs and research institutes.

It is important to highlight that conflict resolution is a process that should integrate all stakeholders taking part into the decision making rather than a single act of agreement between them. It is necessary to create a kind of “institutional infrastructure” providing a forum for negotiations and dialogue. Any kind of “infrastructure” (more or less official) is welcome if its main goal is consensus building and setting up a system of actions in order to integrate the different stakeholder expectations. To this end, it is a common recognition that dialogue and mutual understanding is the first step towards conflict resolution. The best case is to initiate bottom-up incentives when a conflict has been identified and the final agreement is thereafter based on a decision taken by stakeholders rather than a decision imposed by outside and/or higher levels of administration. Participants in a dialogue or negotiation should be well aware of the hierarchical organization of the other members within the conflict resolution process as well as the international/multilateral agreements, regional conventions, national legislation and local decisions.

It is also important to emphasize the responsibility of scientists in these dialogues and/or negotiations to speak the “same language” as policy makers, administrators and local people. This means providing them not only with a conceptual frame but also with understandable messages, correct data and information and alternative scenarios for future actions. This can be a difficult process because in many cases local people are not always very accepting of the new role their land could take and changing land-use practices to come (for example to reduce the use of pesticides and fertilizers in order to control diffusive pollution and wetlands eutrophication).

Resolving the conflicts and final output of the dialogue is much more sustainable if the time/space scale is well framed. Some “simple, practical and thus best solutions” could be unsustainable in the mid- and long-term due to the different speed of ecological (ecosystem) and socio-economic processes. On the other hand, adaptive management appears to be an important requirement to the resolution strategies in order to “use” the changing environment in a flexible way in terms of both natural and socio-economic processes that could take place in different temporal and spatial scales.

6.5. Monitoring the conflict resolution process

In general, monitoring activities are considered to be an integral part of the management process by providing feedback information on the effectiveness of the actions undertaken. Apart from a thorough understanding of what the monitoring should be in terms of assessment of physico-chemical and biological properties of wetlands, it is rather difficult to formulate requirements to this process in terms of conflict resolution. Of course, being a long-time process, the conflicts between biodiversity conservation and human practices should be placed correctly on temporal and spatial scales as some of the actions to be undertaken could have different effects on inland aquatic habitats. Because of the complexity of the observed issues of concern it is obvious that both phase approaches and step-by-step approaches should be jointly implemented in a monitoring procedure taking into consideration the time/space scaling.

There is a common recognition that there is no universal measure/dimension for monitoring the resolution of a conflict seeing as the conflict itself has got substance, process and relation dimensions. Monitoring of the substance dimension could be provided by the changing physical, chemical and
biological parameters of the water bodies in achieving target goals and/or selected thresholds. Biological diversity itself is a crucial dimension in assessing the interim and final results of a conflict resolution process. There are many well-known and described approaches and methods for monitoring the biodiversity components, depending on the conservation objectives and/or target species or habitats. The process related dimensions of a monitoring should assess the correctness of implementation of the agreed actions and the progress in achieving the goals. In other words, regular observation of the organization charts and timetables of the plans and programs should be the subject of this kind of monitoring. Independent and external supervision could ensure successful conflict management. Economic parameters of the resolution achieved might be substantial part in allocation of efforts of stakeholders in implementing their responsibilities. The monitoring of the conflict resolution should also include relational dimensions or good maintenance of the communication between stakeholders involved in conflict resolution process. Networking of stakeholders was strongly recommended as a way to exchange information, data and knowledge. It is also important to monitor the social dimensions of a conflict resolution: changing perception of the local people on visible changes as a result of a resolved conflict, state of their awareness as a result of education, training and involvement within the resolution process.

6.6. Case studies

6.6.1. Inner Danube Delta

The substitution of natural wetlands into agricultural land in the Inner Danube Delta has resulted in the decrease of natural goods and services for the local population and associated socio-economic systems as well as changes in both local and larger scale ecological systems i.e. eutrophication of the Black Sea etc (Cristofor et al., 1993, Vadineanu & Cristofor, 1994, Vadineanu & Postolache, 1997, Vadineanu et al. 1998). The subsequent changes in the food web structure under hypertrophic conditions and the loss or deterioration of habitats led to changes in the quality, amount and availability of food resources for the fish associations. The changes that occurred in the Lower Danube Wetland System (LDWS) affected mainly those functions dealing with the production of renewable biological resources and nutrient retention. With only very little input from auxiliary commercial energy, the former wetland floodplain ecosystems were able to provide an average of 6,000 t of fish per year, up to 144,000 t of cereals per year (average of 70,000 t per year) and food for over 100,000 animals (Antipa, 1910). The above biological resources, which fed the local economies in the past, were harvested from about 100,000 hectares of natural aquatic ecosystems or were produced by practicing traditional non-intensive agriculture on 20,000-35,000 hectares of arable land, and about 20,000 hectares of natural grasslands. That indicates an average fish yield of 60 kg per hectare and an average crop production of 2.5 t per hectare. However, the total amount of fish catches and crop or meat production depended on the flood frequency, level and duration. The aim of the human-made transformation in the LDWS was to produce higher amounts of crops (mainly corn) on very large state farms, based on the most intensive production technologies (e.g. 5 t per hectare of wheat, 7 t of corn per hectare); to insure a total fish production from intensive fish farming (~20,000 hectares, most of which established in coastal delta) of at least 10kt per year (an average fish yield of 500 kilograms per year); and to produce large amount of meat by cattle breeding (zootechnical) complex farms based on food supplied by the intensive agricultural farms. The cost of establishing such production infrastructure in the LDWS reached a total amount of 3 billion USD and would require at least another similar amount for rehabilitation of the infrastructure, if the former goal for the management of this region was to be maintained.

However it has to be emphasised that high amounts of commercial energy inputs are required for achieving the operational objectives of the established intensive crop and fish farms. Despite of huge costs in terms of concentrated energy equivalent to about three tons of crude oil per hectare, the crop production per hectare has increased by a factor of just 1.5-2 compared with non-intensive or traditional farming system. The established fish farms have proved to be inefficient in the long run and for most of them the production is similar or even below that usually obtained from the natural water bodies (e.g. less than 40 kg per hectare in the large enclosures from coastal delta, like Popina,
Dunavat, Holbina). In order to compare the overall efficiency in terms of renewable resources provided by a hectare of wetland and an equivalent surface of agricultural land established by conversion an estimate is given of the total economic value of one hectare of wetland. The average value of 1,706 USD per hectare per year calculated for the LDWS should be taken as a first approximation, due to limited data on productivity and of the full range of resources and services provided, level of education and quality of information available to the public. However, it can be considered as a useful reference for any attempt to argue the need for conservation and rehabilitation of LDWS and to properly identify the basis for a sustainable management plan. It is also expected that the total economic value per hectare per year is higher than that calculated to date since most of the data used for calculation have been underestimated. Two levels of intensity have been assumed for the management of agroecosystems according to the amount of auxiliary energy input as diesel fuel, one equivalent to 1 tonne and the other 3 tonnes of fuel per hectare per year.

Assuming an average crop production per hectare of 2-3 t and 5-6 t of wheat, corresponding to the two levels of intensity and applying the current prices for diesel (460 USD per t) and wheat (130 USD per t) it is estimated that the cost of production is 1.5 – 2 times higher than the economic value of the crop. The estimated net economic value of some major resources provided by a hectare of wetland per year is 350 USD without any commercial energy input. The difference could be clearer if one considers that some of the most important driving forces for eutrophication have their origin in intensively managed agroecosystems while the wetlands provide benefits by buffering that impact (Table 6.4).

Table 6.4. Average economic values of the Lower Danube Wetland System (USD ha\(^{-1}\) y\(^{-1}\))

<table>
<thead>
<tr>
<th>Goods &amp; Services</th>
<th>Valuation method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct (Tradable goods)</td>
</tr>
<tr>
<td>Fish biomass</td>
<td>100</td>
</tr>
<tr>
<td>Animal products</td>
<td>50</td>
</tr>
<tr>
<td>Vegetables &amp; Cereals</td>
<td>150</td>
</tr>
<tr>
<td>Timber &amp; Reed</td>
<td>50</td>
</tr>
<tr>
<td>Honey &amp; Medical plants</td>
<td>20</td>
</tr>
<tr>
<td>Recreation</td>
<td>150</td>
</tr>
<tr>
<td>Nutrient retention</td>
<td>876</td>
</tr>
<tr>
<td>Flood control</td>
<td>200</td>
</tr>
<tr>
<td>Biodiversity maintenance</td>
<td>110</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>370</strong></td>
</tr>
</tbody>
</table>

6.6.2. Biebrza wetlands area (Poland)

The conflict is related to the ecosystems of different semi-natural fen meadows were traditionally managed extensively in the past and which are nowadays being abandoned due to economic inefficiency. The case study comprises a vast wetland area of about 126,000 ha located in the north-eastern part of Poland, in the Biebrza river valley. The Biebrza wetlands originated in the ice marginal valley depression where intensive peat accumulation processes occurred during Holocene period. Human activities in this region started as early as the Palaeolithic (10,650 BC) but serious impacts started in the 18th century when parts of the wetlands were drained and a large canal linked Vistula and Niemen catchment was built. Vast areas of wetlands were then changed into extensively used fen meadows and pastures with free grazing cattle. By accommodating activities to the natural conditions, human activities in the area did not overly disturb the crucial natural processes. Specific semi-natural wet meadows ecosystems with set of plant and animal species increased with time and climate changes resulting in the presence of a number of rare or even endangered species limited to extensively managed wet minerotrophic meadows. While by the end of the 1950s the Biebrza wetlands area was extensively used, by the 1960s, farmers had started to abandon the land due to
economic and demographic changes, resulting in scrub and forest invasion. The rate and course of succession has increased significantly in the last 20 years. In 1993 the Biebrza National Park (BNP) was established in order to protect mire ecosystems, rare or threatened plant and animal species, plant communities, landscape values and biotopes especially important for avifauna. One of the main tasks of the BPN authority is to maintain vast area of the open wetlands based on application of active protection approach.

There are three important factors identified for ecological changes in the Biebrza Wetlands: current changes in land-use practices in agriculture, land reclamation (still small ditches draining the area) in the past and climate changes.

The following stakeholders involved are:
- Local farms who are only slightly interested in the maintenance of the former practices due to low economic income, but are interested in finding additional income to raise life standards;
- Local authorities that are interested in the regional development mostly based on agriculture, but also tourism to a certain extent;
- BNP authority interested in the effective nature protection of Biebrza Wetlands through proper management,
- NGOs interested in maintenance of natural values of Biebrza Marshes, in particular providing suitable habitats for certain bird species (restoration projects), save specific wet meadow ecosystem types; also interested in activities relating to the local population, such as help to organize infrastructure for specialized and qualified tourist;
- Tourists who are interested in maintaining natural values of Biebrza Marshes.

The most important key issue to solve the problem regarding the disappearance of fen meadows disappearance is how to convince local people to stay in the region and continue extensive management of open wetlands by making it economically feasible.

Several top-down activities on different administration levels, considering legislation, planning and management issues aiming at maintenance of open wetlands and semi-natural ecosystems have been undertaken in Poland. All of them are important and valid for Biebrza Wetlands. The first one is related to the regulation on Nature Conservation Act: Fens as well as fen meadows are included into the national list of high priority habitats. The second initiative is related to agro-environmental schemes: extensively managed lowland meadows are included into the proposal. Thus if the whole system is applied in the nearest future, farmers could have additional profits from proper wet meadows management. The last one is related to the establishment of the BNP as an area where specific semi-natural ecosystems are protected. This is partly top-down (approved by parliament and the government) and partly bottom-up initiative (WWF and other NGOs activities). Thanks to BNP efforts almost 1,000 ha of wet meadows and sedge-moss communities are now mowed. More than 500 ha of scrubs have been removed. In order to enlarge the total area of mown wetlands a special harvester was tested in the field recently.

The most important bottom-up initiatives are related to different and wide-range local NGOs activities. Some projects focus on raising ecological awareness among local societies (training courses for local guides, local newspaper addressed to students). Other projects consider providing local societies with alternative financial sources: agro-tourism, regional handicrafts and local products. Another projects involve local communities directly in active conservation through mowing, tree and scrub cutting. The most significant bottom-up initiative undertaken so far is the complex program focused on the management of open wetlands that provide local societies with an extra benefit e.g. bio-fuel power stations. The project was prepared by local NGO and funded by GEF and EcoFund.

The north-eastern part of Poland in general and Biebrza Wetlands in particular, is a region with high unemployment rate, very low income per capita, relatively low life standards, inconvenient landownership pattern (a large numbers of small, less than 5 ha, farms), high rate of older people in the population and difficult natural condition for agriculture (short growing season, low fertile often
wet soils etc). Traditional activity in the region is mostly based around extensive agriculture. Due to all those difficulties, the emigration of young people followed by the disappearance of traditional practices became a serious problem of the Biebrza Wetlands, and in particular for open wetlands (fens and fen meadows). Therefore, activities undertaken by administration, BNP and local NGOs aim at finding an alternative schemes for development, offer an opportunity for local people to stay in the region and continue sustainable wetlands’ management.

Within the activities promoting sustainable management of the area, the cross-sectoral approach is applied as the most promising alternative instead of agriculture exclusively. In order to gain the most important goal, i.e. maintaining extensive management, the following multi-sectoral activities are proposed or implemented:
- Agriculture – benefits for proper wetlands’ management (agro-environmental schemes),
- Enhance local infrastructure – heating system based on bio-fuel (biomass from wetlands), waste collection system,
- Stimulation for local companies (supply heating system with biomass),
- Education and information action,

Participation in agro-environmental schemes is done on a volunteer basis. There are no legal tools to force farmers to take part in the program. Some restrictions and severe monitoring system within the agro-environmental schemes provide proper management. So far all activities related to management on the state owned areas in the BNP are controlled by the parks’ services. As nearly 60% of the park’s area is private the control and management is less effective and depends heavily on co-operation between BNP and local people. There are however specific regulations that could prevent negative effects of conflict such as the Act on Nature Conservation, Act on Environmental Protection and Development, Act on the Protection of Agricultural and Forest Land. Within the framework of the Act on Nature Conservation there are specific regulations and restriction related to national parks and other protected areas.

For quite a while there has been some tensions between BNP Authority, farmers, local administration and NGOs due to the different groups having different approaches and attitudes towards the river valley. At the beginning BNP was perceived as the institution that was going to stop any local initiative. After a long process of education initiatives, meetings and common initiatives the perception of park’s administration by local society has changed. Nowadays there are many common initiatives also considering the problem of wetlands’ management e.g. National Championship of Wet Meadow Scything, annual local products trade fairs, event related to Ramsar Day or Earths Day etc.

A step by step approach is characteristic of the Biebrza Wetlands case study: from the problem identification (land abandonment and spontaneous succession) through to key stakeholder identification (farmers, local administration, BNP, NGOs, tourist), problems of communication and/or possible misunderstanding, defining thresholds (economy, some regulations, lack of information), brainstorming phase (different optional proposals), until the choice of the most promising and effective (considering multi-sectoral and ecosystem approaches) solution. All programmes for the information, training and education of stakeholders addressed to local administration, farmers but also tourists by different parties including the NGOs, BNP authorities, as well as specialized state agencies within the agro-environmental schemes are now implemented. The last step is still ahead as the agro-environmental schemes will start next year and the first real investments from one NGO project will be done in 2004.

There are a few possibilities and measures that could provide monitoring of the conflict resolution. The first one is based on the demographic and economic parameters and should include migration tendencies, income per capita, land use changes as well as general attitude towards the whole activities. The second measure should convey figures regarding the amount of annually mown or restored fen meadows. The third measure could contain information about the number of contracts within agro-environmental schemes from the region. Another measure could feed back information about efficiency of biomass utilization in the newly established heating systems. The next set of
measures should provide information on ecological effects, in particular considering avifauna, floristic composition and biotic conditions (chosen physical and chemical soil and hydrological parameters).

6.6.3. The beaver as a factor for the re-naturalization of Lithuanian inland habitats

Inland wetlands of Lithuania consist of lakes, rivers, swamps, and artificial reservoirs. There are about 3,200 lakes in the country. The majority of lakes are small, with only 14 lakes having a surface bigger than 1,000 ha. Swampy areas currently cover about 6.4% of the whole territory; 50% of them smaller than 1 ha. Some 80% of swampy areas have been meliorated since the beginning of intensive draining works in the 1950s. Approximately the same proportion is characteristic to the hydrographical network: only 17,000 km of the entire 63,700 km network of river beds have been left unchanged. Intensive draining works started in 1951, and reached their peak between 1971 and 1975. As a result, the majority of small peripheral streams became monotonous canals draining agricultural fields, peat lands, or forests. The hydrological regime of many larger wetlands has changed towards drying, and many valuable natural habitats have been lost. Moreover, a significant part of the meliorated land was never used for intensive agriculture because of unsuitable soil or infrastructure conditions. The draining activity far exceeded the demands of agriculture, especially after the land-reform in the post-soviet period.

Beavers are very important in restoring biodiversity in the changed landscapes of Lithuania. Restoration of the canalised riverbeds is one of the current basic impacts on the environment of inland wetlands. Considerable parts of the drainage canals of land reclamation are self-destructing because of their abandonment, or are affected by outside agents, like beavers. In the case of self-destruction, the process of re-naturalization is considerably longer than in case of beaver intervention. Moreover, beavers change not only the hydrological but also the hydrographical characteristics of an occupied canal, i.e. making the shoreline more complicated. Beaver activity is very effective in the peripheral (i.e. mostly canalised) part of the hydrographical network, because beavers are able to impound only small streams, mostly < 0.5 m$^3$/sec. Beaver impoundment accumulates the surface water thus reducing water flow from watersheds. By expert evaluation, beaver ponds located only in canals of land reclamation contain around 10,000,000 m$^3$ of the surface water of the country (Lamsodis, 2000). This is nearly equivalent to the amount of water used for public household needs per year ($2^{nd}$ Baltic State of the Environment Report, 2000). Beaver impoundment acts like a small sedimentator hence its importance in surface water treatment.

According to official data, beaver numbers exceeds 30,000 individuals. According to expert evaluations this figure varies between 50,000 and 70,000. Although the mean territorial density is about one beaver per km$^2$ beaver density can be significantly higher in certain areas (see the figure), reaching 4 and more individuals per km$^2$. Regarding habitat distribution, about 30% of beaver sites are located in canals of land reclamation, and this share tends to increase. Beavers usually inhabit canals inside or near a forest because they need woody vegetation. However, many abandoned canals in open areas overgrown by bushes thus becoming more suitable for beavers.
Figure 6.1. An example of high density of beaver population in Lithuania (the Žemaitija National Park). Dots designate the beaver sites – territories of separate beaver families. Not all beaver sites are active at the same time, however, most of them are recolonized with the period of 2–4 years. At the same time are active about 70% of sites. The territory locates on watershed, thus, beavers usually occupy small water bodies (small swamps, rivulets, ditches, drainage canals).

The beaver is currently a game species in Lithuania. No licenses are needed to hunt this animal and hunters can hunt beavers without limitations from the 1st of August to the 1st of April. Hunting clubs are responsible financially for the damage made by beavers to landowners and other local stakeholders. The hunting bag comprises about 6,000 beavers per year, i.e. nearly 10% of population. This level of exploitation ensures stable growth rates of population. Principles of the beaver exploitation are the same among different countries, i.e. optimal population number with stable and high growth rate, and economically acceptable damage costs at the same time. Many indicators show that the current beaver population in Lithuania exceeds the level of optimal population number, so, the exploitation rate should be increased.

The beaver is included into the Annex II and IV of the EC Habitat Directive. In the process of the accession negotiations with the EC the Lithuanian (as well as other Baltic countries) position is to make an exemption from Annex II and IV and an addition to Annex V regarding the beaver.
Creating attractive wetlands for wildlife (including pond turtle, crayfish, waterfowl, otter, etc.) is the other very important aspect of beaver activity in man-modified wetlands in Lithuania. Investigations showed that otters (Lutra lutra) benefited from the beaver ponds as feeding habitats in small peripheral water bodies and canals. Fossorial activity of beavers provides excellent hiding conditions. Large beaver sites existing quite a long time ago are attractive habitats for many game animals.

The beaver is very abundant in Lithuania, and being such a powerful factor of re-naturalization it can cause many conflicts with humans: beaver vs. agricultural producers; beaver vs. forest managers; beaver vs. road engineering, and beaver vs. environmental protectionists, etc. As a consequences of the conflicts there are negative perceptions towards beavers translating into intensive persecution of beavers, especially in the small private lands, deterioration of public opinion towards ecologically valuable species (making them a pest), and deteriorating conditions for the biodiversity recovery by excluding an important re-naturalization factor. Another conflict originates from beaver activity in destroying canals of reclaimed lands by damming and raising the water level, as well as by burrowing the banks. As a consequence land becomes unsuitable for agriculture, and flooded timber usually dies and should be immediately removed. The main stakeholders identified in this specific conflict are landowners, especially farmers, foresters, and hunters. Driving forces of the beaver-related conflicts are the increased privatisation of land, lack of landscape planning, weak legislation on use of resources, lack of a real compensation system, lack of effective management plan of beaver resources, etc.

The government does not compensate damage done by beavers. Hunting clubs must do that if a landowner applies to a local authority and if a commission from local authority confirms these losses. However hunting clubs usually have no money to pay, thus, this mechanism is only formal. Part of the canal network is on balance of the Ministry of Agriculture, and it (the Budget) allows certain subsidies for maintenance of this network. Private landowners have to maintain canals through their own budget. No sociological or economical evaluation of beaver presence in Lithuania has been done even though it is absolutely necessary for the reconciliation or at least reduction of the conflict. Public awareness and education about positive beaver impacts on environment are still very poor.

Possible solutions of the beaver-related conflicts could be wide public dialogue to increase public awareness and education, discussion among groups of different interests, development of an effective system of compensations, high quality planning environment and integration of biodiversity conservation concerns and establishment of effective independent further supervision of the follow-up.
7. Uplands

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7.1. Introduction

Uplands are considered to include, usually, land above an altitude of 200m. An important trait of uplands is the great diversity of habitats and human activities that determine their complexity and significance in terms of biodiversity and livelihood. The agricultural potential of uplands of some of the Acceding and Candidate Countries is shown in Table 7.1.

Table 7.1. The distribution of Utilized Agricultural Area in selected Uplands (in thousands of hectares)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Uplands</th>
<th>Utilized agriculture area</th>
<th>Permanent grassland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount. Reg.</td>
<td></td>
<td>Area</td>
<td>Area</td>
</tr>
<tr>
<td>Bulgaria</td>
<td></td>
<td>2,598.6</td>
<td>477.6</td>
</tr>
<tr>
<td>Czech Republic</td>
<td></td>
<td>6,360.0</td>
<td>3,282.7</td>
</tr>
<tr>
<td>Polish-Slovakian Carpathians</td>
<td></td>
<td>5,063.8</td>
<td>2,060.7</td>
</tr>
<tr>
<td>Slovakia</td>
<td></td>
<td>3,103.8</td>
<td>1,061.1</td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td>1,960.0</td>
<td>999.6</td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td>7,362.5</td>
<td>2,945.0</td>
</tr>
<tr>
<td>Total upland area</td>
<td></td>
<td>21,384.9</td>
<td>8,766.0</td>
</tr>
</tbody>
</table>

Sources: Krajcovic et al., 2001; Main Statistical Office of Poland, 2002; Romanian National Institute of Statistics, 2003.

Uplands in central and south-eastern Europe are represented by the extensive Carpathian range, Caucasus and the mountains of the Balkan Peninsula. The Carpathian range covers border areas of the Czech Republic, Hungary, Poland and Ukraine, together with a significant part of Romania and the Slovak Republic. The contribution of uplands in terms of biodiversity and cultural heritage is high compared to lowland regions. This is mainly due to climate, topography, geology and land use in these areas that result in major changes in plant growth conditions and in a diversity of habitats. The conservation value of the uplands is determined by the great number of rare, threatened and endemic species of plants and animals, glacial and tertiary relicts and high diversity of habitats occurring, which are protected by establishment of several National Parks and natural reserves. Uplands in central and south-eastern Europe represent various types of habitats: grasslands, scrub – Pinus mugo,
Juniperus sibirica, J. oxycedrus (only in the South), peat bogs, woodlands (coniferous, deciduous and mixed), caves, screes, lakes, carst, riparian communities, springs. The role of mountains in the Balkan Peninsula is also recognized in terms of their importance for speciation and the maintenance of a rich gene pool after the post-glacial re-colonisation of Central and Northern Europe. It should be underlined that alpine and sub-alpine zones represent vulnerable, fragile ecosystems with slow recovery after disturbances due to both natural causes and human activities.

7.2. Identifying sources of conflicts

The different activities and pressures in uplands that may lead to conflicts with biodiversity can be categorised as follows:
- Land use change (due to agriculture, forestry or game management)
- Direct use of resources (like wind farms, hydroelectric power or extraction of minerals)
- Access and recreation (tourism and infrastructure)
- Indirect pressures (like atmospheric deposition or climate change)

7.2.1 Agriculture

In many parts of Eastern European upland areas, agriculture has developed through the fragmentation of land in smaller plots. This applied to meadows and pastures as well as forests. Although the process of degradation in uplands is not new, the problem was exacerbated after World War II when economical considerations particularly in agriculture and forestry were more important than environmental or ecological considerations. It was therefore assumed that for both internal consumption and export, a large volume of plant and animal production represented the guarantee of a stable national economy.

Excessive emphasis on plough land exploitation led to the creation, and consolidation of inappropriate spatial structures. Structural problems included badly planned agriculture land, scattered settlements, and a linear infrastructure. Added problems included a large concentration of overpopulated farms, low technical level of many farmhouses and buildings, and a low standard of equipment for collecting the organic matter originating from domestic sewage and from animal production. Added to this, ineffective supply of water in rural areas, badly managed sewage plants, and very high unemployment rates have all indirectly contributed to the deterioration of the natural environment (Twardy et al., 1994; 2001).

The agricultural economy in the Carpathians is mostly based on private ownership of land. In Poland for example, 93% of the land is owned privately (Main Statistical Office of Poland, 2002). In the Communist era, Polish agriculture was not collectivised like its neighbours but remained a country of small farms. There is a strong bond to the land, with many farmers regarding it as a legacy, leading to the partitioning of farms and increase in small plots of land with very different management practices (see table 7.2).

Table 7.2. The area of agricultural land in the Carpathian farms (PL-Poland and RO-Romania)

<table>
<thead>
<tr>
<th>Specification</th>
<th>The area of agricultural land in the holdings in ha</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 2</td>
<td>2-5</td>
</tr>
<tr>
<td>Number of farms</td>
<td>PL</td>
<td>186,132</td>
</tr>
<tr>
<td></td>
<td>RO</td>
<td>988,012</td>
</tr>
<tr>
<td>Total area of farms</td>
<td>PL</td>
<td>260,585</td>
</tr>
<tr>
<td></td>
<td>RO</td>
<td>1,142,660</td>
</tr>
<tr>
<td>Percentage of farm areas</td>
<td>PL</td>
<td>24.6</td>
</tr>
<tr>
<td></td>
<td>RO</td>
<td>75.7</td>
</tr>
</tbody>
</table>

The small plot holdings also explain the high population density in Carpathian agricultural areas. For example in Romania there are nearly a thousand farms below 2 hectares, which cover an area of about 1.1 million hectares. The great number of permanent inhabitants results from numerous and large families living in these areas, and the industrial restructuring resulting in an immigration of unemployed people from the cities back to family villages where living costs are lower. In Poland for example, a total of 54 people make a living from agriculture on only 100 ha of land—nearly twice as many as on agricultural land in lowland areas. Upland farmers are forced to develop low-input systems of plant and animal production for their own consumption and the local market. However, the general nature of upland environments limits the potential for communities and individuals to introduce alternative economic forms of exploitation.

However, while abandonment of land is becoming an increasingly common occurrence in Central Europe, intensive livestock production and overgrazing is still a serious environmental issue and can result in a direct loss of habitats. Intensity of land use in the Carpathians is a result of natural, social and economic conditions. In lower slope areas, the land is mostly used for agricultural purposes. In certain areas however, this can have a damaging impact on biodiversity when ploughed land is located on steep slopes and shallow stone soils, chemical fertilisation (N, P, K in the range 150-250 kg/ha) is unbalanced, or when the application of manure is too concentrated (Krajcovic et al. 2001). Land abandonment due to economic migration from mountain and remote places nowadays in Bulgaria is an important issue and leads to loss of traditional knowledge of cattle breeding and agricultural practices and loss of indigenous local breeds and varieties of plants. The contamination with pesticides, fertilisers and manure is not a problem caused by extensive agricultural practice. Decreasing grazing pressure in high mountain pasture causes the replacement of important grass communities by juniper.

With the increase in altitude, the pattern of agricultural land use changes. Grasslands increase and the arable land decreases. Generally this is a favourable phenomenon, resulting in less soil erosion and a better protection of the soil-water environment (Kopec 1999, Kurek 1979).

It is anticipated that free market and liberalization of food imports as well as capital and human resource flows will transform Central European countries. Apart from socio-economic conditions, there will be the impact of non-productive aspects connected with recreation. In the Carpathians, the significance of production of agriculture land will be gradually limited and adjusted to the requirements of sustainable and multifunctional development of these areas. Non-productive roles particularly in reference to erosion control, as well as aesthetic and landscape function will be given higher priority. The quality of products will be better controlled, resulting in less quantities being produced but emphasis put on varieties of vegetables, fruits and berries valuable in terms of taste and health requirements. Hopefully there will be a more gradual move towards environmentally friendly low-input agricultural production.

Based only on organic fertilising, rational organisation of hay making, pasture conservation for winter and proper grazing, the move to organic farming is expected to help in the conservation of biodiversity through the maintenance of biodiversity rich feature such as permanent grasslands. This more labour intensive form of agriculture should also benefit local population by creating more employment.

7.2.2. Forestry

Effects of trans-boundary atmospheric pollution have heavy consequences for mountain forests in general. The situation in the Polish Carpathians is more favourable than that in the Sudeten, due to the lower pollution levels and more fertile forest sites. The process of degradation of upper mountain spruce stands is stronger in the artificial stands, which are not genetically adjusted to the conditions of the upper mountain zone. In recent years, a slight decrease in the value of mean indicator SO2 and dust in mountainous areas has been recorded. Air pollution was a main reason of the ecological disaster in Sudeten that started at the end of the 1970s, when an area of more then 160 sq. km was deforested. Afforestation of this area was a great success for foresters. In recent years the artificial and
natural regeneration of trees improved, and it is undoubtedly due to limitation of pollution emission to the atmosphere.

Long-term studies on climatic data have shown a recent deviation from the average long-term temperature values. The predicted climate changes are expected to have negative repercussions on existing mountain spruce stands, as well as cause severe floods, soil erosion, landslides and the increased occurrence of pests. The improvement of quality of forest ecosystems is necessary for better natural water retention and in order to limit floods and erosion processes in mountain forest watersheds. This can be achieved by limiting air pollution and by elaborating long time climatic forecasts that can facilitate acceleration of naturalization species composition of stands adapted to mountain forest sites and changing climatic condition.

Sustainable development of mountain regions depends primarily on technical infrastructure as well as on the economic and social situation of particular provinces and villages. In mountainous villages, particularly in those situated relatively high, technical infrastructure is very poor, considerably poorer than in the rest of the country. The further development of mountain regions is greatly conditioned by changes in the infrastructure.

One of the most important priorities of the mountain forest watersheds management should be the inclusion of private forests into more ecologically friendly management schemes and afforestation of the post agriculture areas programmes, as stated in the National Program of Forest Cover Increase.

A serious conflict in Bulgarian forests is the incidence of forest fires. In Central Balkan National Park for example 18 fires were registered in 2000 alone (44% caused by man and 50% of unidentified origin). The forest fires have importance especially for coniferous, juniper and mountain pine communities caused by the high content of resins, lack of natural barriers and difficult access. High mountain fires are responsible for superficial erosion and increasing avalanche incidences.

7.2.3. Game hunting

The principal game species used for hunting in the Carpathians are deer (*Cervus elaphus* and *Capreolus capreolus*) and wild boar (*Sus scrofa*) (Warszynska, 1995). The smaller game species are foxes (*Vulpes vulpes*) and hares (*Lepus europaeus*). There are seasonal periods of hunting for partridges (*Coturnix coturnix*) and pheasants (*Phasianus colchicus*). In the past, capercaillie, black grouse, hazel grouse and woodcock were hunted. Nowadays they are under strict protection. In Poland for example, according to the Main Statistical Office (2002), the number of culled game animals (in the hunting season 2001/2002), were as follows: 149,000 deer, 105,000 wild boars, 107,000 foxes, 91,000 hares, 96,000 pheasants, and 22,000 partridges. Simultaneously 2,000 hares and 67,000 pheasants were caught and transferred to another locations.

The present distribution and population size of the above species is strongly influenced by the impact of man through hunting (including poaching), forest management, pasturage, and tourism thus causing an imbalance between different species populations. The heavy exploitation of forests as well as mining operations have also had a significant bearing on this problem. On the one hand, the numerous cleared areas that soon became overgrown with grass and shrubs provided favourable conditions for the development of game. On the other hand, the large scale grazing of cattle and sheep had a detrimental effect on the feeding grounds of game species and opened up the areas to increased hunting pressure.

7.2.4. Tourism

Although tourism can be dated back to the 16th century, the intensive development of tourism only began in the second half of the 19th century (Szafer, 1962). The socio-economic changes at the end of the 1980s made the existing tourist base accessible for all. The uplands in the ACC are used for a wide range of outdoor recreation including skiing, rock climbing, walking, paragliding, hang-gliding, and
bird watching. In water environments, canoeing and rafting are popular. The biggest recreation areas are observed in the Western Carpathians, e.g. Tatra Mountains famous for resorts in Zakopane (Poland) and Ščrbské Pleso (Slovakia). There is frequent overlap of tourist arrivals at different times causing excessive concentrations and overloading of the infrastructure during the weekends, in an area primarily designed for long-term visitors. The weekend movement is spreading on relatively pristine mountain regions causing their devastation, soil trampling, compaction and eutrophication. In addition the excessive concentration of buildings and the lack of harmony between the architectural style of the tourist complexes and the surroundings landscape create significant problems as well. New infrastructure creation in the ACC, transport corridors, road building, supporting other activities together with uncontrolled and illegal building contribute substantially to the conflicts. Overbuilding in mountain areas with big hotels cause high anthropogenic pressure, waste accumulation, sewage pollution, commercialisation, and thus provoke loss in local identity and local traditions.

7.3. Identifying resolution strategies

7.3.1. Guidelines

The relationship between mountain agriculture and nature conservation can be complex, delicate and sensitive to local conditions. Sometimes, minor changes in management can be significant for particular species. Stoll-Kleemann (2001) differentiates two approaches to biodiversity management, the “people-included” approach versus the protection or “ecology-first” approach. It is believed that protecting habitats and species should be the priority of biodiversity management (Matouch 2003).

Analysis of the main type and sources of conflicts in uplands showed their complexity and needs of holistic approach in proposing the resolution strategies (see table 7.3). Often conflict resolution requires implementation of more than one strategy. Although there are some differences between countries, all of them have historical, economical and cultural reasons. Therefore, general resolution strategies could be applied through: i) legislation and control measures, ii) subsidies/incentives; iii) training, education and dissemination of information; iv) technology measures; v) specific measures.

7.3.2. Agro-environmental measures and afforestation

Financial instruments may not be used in a systemic way to encourage farmers to maximise environmental benefits resulting from the implementation of good agricultural practices and activities protecting the nature and landscape. Agri-environmental pilot projects have recently been set up in selected regions of high natural value or in regions liable to environmental threats. These schemes aim to promote, on a pilot scale, practices and agricultural production methods related to landscape conservation thus limiting environmental threats resulting from marginalisation or intensification of agricultural production. Similarly, afforestation pilot projects can be set up in regions with a high percentage of poor and marginal soils in order to promote activities aiming at afforestation enlargement on private agricultural land taking into consideration optimisation of landscape structure, reduction of erosion processes and greenhouse gases. Under these schemes, farmers can earn an extra income while complying with the requirements provided for in the stipulated contract. The PHARE and SAPARD programmes provide several opportunities in this direction.

7.3.3. Legislation & Legislative Instruments

In the last few years, many important documents and acts connected with forest and water management have been developed in Central European states, mostly in the frame of the accession process. In Poland for example these include the Programme of Conservation of Forest Gene Resources and Selection Breeding of Forest Trees (1993), Guidelines on the improvement of forest management based on sustainability principles (1995), the National Programme for Expansion of Forest Cover (1995), National Policy on Forest (1997), Water Act (2001) and the Polish Mountain Bill. For Bulgaria: National Strategy for Biodiversity Conservation (1993); Act on Forests (1997); Act
on Restoration of Ownership of the Forests and Lands in the State Forest Area (1997); Act on Protected Area (1998); Act on Hunting and Game Conservation (2000); Water Act (2000).

Table 7.3. Types of priority conflicts between human activities and the conservation of biodiversity and guidelines to resolve these in the Central and South-Eastern European Uplands

<table>
<thead>
<tr>
<th>Type of priority conflict between upland biodiversity and other activities</th>
<th>Guidelines for resolving conflicts (refer to number in conflict column)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Land use change</td>
<td>1. Regulation strategy and control</td>
</tr>
<tr>
<td>A.1. Agriculture/Livestock</td>
<td>2. Legislation measures and/or legal protection</td>
</tr>
<tr>
<td>A.1.2. Improving of grasslands (10,14)</td>
<td>4. Prohibition on wood exports</td>
</tr>
<tr>
<td>A.1.3. Heavy Stocking (overgrazing, increased tracks, burning) (6,12,14)</td>
<td>5. Effective control measures</td>
</tr>
<tr>
<td>A.1.4. Improving of animal production (11,12,14)</td>
<td>6. Controlled burning</td>
</tr>
<tr>
<td>A.1.5. Change in the type of grazing (2,8,9,14)</td>
<td>7. Maintenance of existing infrastructure e</td>
</tr>
<tr>
<td>A.1.6. Specialisation (over dominance of sheep and goats) (2,5,14,15)</td>
<td>8. Subsidies/incentives- CAP-Paying farmers for caring for the countryside</td>
</tr>
<tr>
<td>A.1.7. Afforestation (4,6,15)</td>
<td>9. “Decoupling” subsidies and production</td>
</tr>
<tr>
<td>A.2. Forestry</td>
<td>10. Financial incentives for grassland maintenance and restoration in disadvantaged areas</td>
</tr>
<tr>
<td>A.2.1. Deforestation including logging and forest fires (2,4,5)</td>
<td>11. Financial incentives for extensification</td>
</tr>
<tr>
<td>A.2.2. Forest management activities (4,5)</td>
<td>12. Training and Education</td>
</tr>
<tr>
<td>A.3. Infrastructure</td>
<td>13. Education of the custom officers</td>
</tr>
<tr>
<td>A.3.1. Construction (3,7, 21)</td>
<td>14. Improve communication with farmers and professional advisers to optimise biodiversity</td>
</tr>
<tr>
<td>A.3.2. Road building (3,21)</td>
<td>15. Promote awareness of uplands as habitat for biodiversity</td>
</tr>
<tr>
<td>A.3.3. Waste management (1,5,12,20)</td>
<td>16. Game farms</td>
</tr>
<tr>
<td>A.3.4. Soil erosion and land sliding (1,18,20)</td>
<td>17. Ownership of abandoned lands</td>
</tr>
<tr>
<td>B. Direct use of resources</td>
<td>18. Re-cultivation</td>
</tr>
<tr>
<td>B.1. Extraction (minerals etc.) (1,3,18,20) and hydroelectric power (3,19)</td>
<td>19. Water management on regional scale</td>
</tr>
<tr>
<td>B.2. Game management</td>
<td>20. New technology applications</td>
</tr>
<tr>
<td>B.2.1. Illegal persecution of raptors (5,13,16)</td>
<td>21. Assess the ecological importance of uplands in respect to lowlands</td>
</tr>
<tr>
<td>B.2.2. Introduction of birds (16)</td>
<td></td>
</tr>
<tr>
<td>B.2.3. Poaching and culling (2,5)</td>
<td></td>
</tr>
<tr>
<td>C. Access and Recreation</td>
<td></td>
</tr>
<tr>
<td>C.1. Access (2,3,7,15)</td>
<td></td>
</tr>
<tr>
<td>C.1.2. Sports (1,2,12)</td>
<td></td>
</tr>
<tr>
<td>C.1.3. Recreation (3,15)</td>
<td></td>
</tr>
<tr>
<td>C.1.4. Hunting (2,12)</td>
<td></td>
</tr>
<tr>
<td>D. Indirect pressures</td>
<td></td>
</tr>
<tr>
<td>D.1. Atmospheric pollution deposition (2,21)</td>
<td></td>
</tr>
</tbody>
</table>
7.4. Case studies

7.4.1 The Sola river, (Upper Vistula, Poland): Conflict between river control and draining and conservation of biodiversity

The Regional Water Authority is in favour of engineering works consisting of lining the riverbed with concrete and logging of the floodplain forests. They argue that dense floodplain forests create particular threats during unusually high rates of discharges, because the river flow is impeded, which can lead to scouring and breaking of the embankments. The extensive system of tree roots may also weaken the flood embankment bedding by building up the seepage paths. The large and uniform trees and shrubs complex reduces cross-sectional area between flood embankments, which decrease the flow capacity and leads to additional water levels. Hydrologists from the Water Authority are against crediting a great importance to flood plain forest. They frequently mention a particular flood when in a four day period, 220 million cubic meters of rainfall water fell in the catchments of Tresna dam (The Sola River) and the forest was unable to avoid the flood. They also argue that small dams (local retention) are not applicable to the mountain conditions, where the dam reservoirs should be constructed based on detailed hydrological analyses.

The Green Federation is now in conflict with the Water Authority over the proposed engineering solutions. From a biodiversity point of view, floodplain forests are the richest of the continent, equivalent in terms of species number to some tropical rain forests. Conducting river engineering would mean a total degradation of the river environment by increasing flood threats as well as limiting the natural self cleaning capacity and lowering the ground water table. They argue for a management of the Sola valley that will maintain its nature values and keep the ecological equilibrium. They also highlight the important role of trees and shrubs in absorbing the huge amounts of Nitrogen and Phosphorus (biogenic) from the soil and water systems. The Green Federation suggest that the new flood embankments should be permitted only at the large distance from the river, that beavers should be re-introduced to the Sola river catchment and that a nature-landscape complex should be created in order to develop a so called “life corridor” for migration of valuable plants and animals species.

7.4.2 Bieszczady National Park (Poland), East Carpathians Biosphere Reserve

The 29,200-hectare park was established in 1973 as part of the trilateral Polish-Slovak-Ukrainian cooperation for nature conservation and sustainable development that also encompasses Poloniny National Park in Slovakia and Uzhansky National Nature Park in Ukraine. This is the second largest European mountain biosphere reserve accounting for 213,211 hectares. This protected area, which is located in the south-eastern part of Poland, was designated UNESCO Man and Biosphere Programme. The vegetation zones in the Park have a specific character resulting from climatic and anthropogenic factors. The upper zone of forests run at the elevation 1150 m. a.s.l, whereas the main part of the park is located in the lower sub alpine zone (500-1150 m a.s.l.). The area is almost 90% forested and contains the largest European natural beech forest complex. It constitutes one of the most important refuges for large predators such as the brown bear (Ursus arctos), wolf (Canis lupus), lynx (Lynx lynx) and big native mammals like roe deer (Capreolus capreolus), red deer (Cervus elaphus), European beaver (Castor fiber), bison (Bison bonasus), and reintroduced Hutzel Horse. One can find the last viable Aesculapian snake (Elaphe longissima) population in Poland.

Conflicts in the park have emerged due to land ownerships and demands for restitution of property that had previously been confiscated by the government. Other conflicts include poaching, gathering ground cover and the fact that farmers find compensations for livestock or crop damage too low.

There is also a conflict between the growing wolf population and peasant farmers in the Bieszczady area. Whereas only 30 wolves live in the protected area, the total number of wolves in the south-eastern region of Poland reaches 400. This causes a serious problem for local farmers, whose property
is damaged by wild animals. The municipal offices responsible for paying compensations demand complicated proofs of losses from farmers, which prove impossible to provide when wolves don’t leave any traces of preying on domestic animals. Similarly, the Hunting Association are accused of delaying the procedures and of complicating administrative processes. Other wild animals, such as wild boar and deer, are causing losses in grain and root crops. Evaluation of the losses by responsible officers usually comes too late and is often underestimated. The losses caused by animals lying over growing cereals are quite considerable but compensation paid is very modest. Therefore, the subsistence farmers feel bitterness because they are forced to purchase food products for the winter period. It seems that government and local government units do not solve all conflicts between the National Park and the farmers.

This region is known to have extremely high unemployment because numerous state farms were dissolved due to an economic transformation. Illegal forest exploitation such as poaching, gathering ground cover, logging etc. is in permanent conflict with protection policy in the Park.

7.4.3. The Blatov grassland (Czech Republic)

- General framework of the problem

“The countries of Central and Eastern Europe which liberated themselves from Communist rule … have inherited a weak economy and a severely deteriorated environment” (Kvet 1993). Concerning the agricultural landscape this is particularly true for grassland habitats. Several significant changes in land use occurred after World War II with vast changes in terms of property ownership in former Czechoslovakia. As a consequence, traditional management of semi-natural grasslands declined significantly. Areas of the Czech and Slovak Republics, Eastern Germany and Hungary were particularly struck by similar symptoms, such as changes in the hydrological balance of the landscape due to the drainage over large areas, vast eutrophication and air / water / soil pollution etc (Kvet 1993). One such example is the significant decline of grasslands of wet habitats, which belong to the order of Molinietalia (in the framework of the Braun-Blanquet system) in the last few decades within the whole Czech Republic. This occurred mostly due to large-scale draining, as mentioned above. Moreover, in dense-settled areas (Prague for example) there is extreme pressure to destroy such natural habitats by building sites; hence, occurrence of this type of ecosystem in the landscape is rather fragmented nowadays, both in lowlands and in uplands. Remaining localities are strongly endangered by numerous human activities concerning the whole spring area.

There are plenty of rare and endangered species that are confined to meadows of wet habitats with low nutrient content. Such ecosystems disappear continuously from the landscape and these species become more and more endangered. Some valuable localities represent communities of Molinion (wet meadows). These are among the most threatened plant communities (Moravec 1995) and are threatened by extinction due to human activities such as systematic drainage, as mentioned before. Near the settlement of Blatov (east of Prague) there is a “locus classicus” – a grassland well known from the 19th century when an eminent botanist, Celakovský, discovered a tiny fern Ophioglossum vulgatum there which is a strongly threatened taxon mentioned in the Red list of the flora of the Czech Republic (Holub et Procházka 2000). This species is now confined to two remaining places within the whole Prague area. Other species, such as Trollius altissimus, Dacytlorhizamajalis, Isolepis setacea etc. are also threatened taxa of the Red list (Šprynar et Rezác 1995, 1996). Since this locality is no longer mown, Phragmites communis (common reed) has begun to colonize the site. The measures to stop this succession are relatively simple and would mean mowing the meadow regularly in June, as Phragmites stands reach their vegetative maximum before they start to blossom. Nevertheless, permission of stakeholders would be necessary for such management, and this becomes a serious problem because there are several owners. Some of them are keen to collaborate with conservationists and scientists while others show distrust and lack of understanding.

- Why?

Some of the owners hoped to use their part of the locality as a building site. State administration however has not permitted such activities because of the scientific and biodiversity value of the
meadow. Other stakeholders would be glad to sell their part of grassland, but the price is too low to be reasonable. As a consequence, they have not decided how to carry out any proceedings.

- The problem

The problem of lack of care within the cultural or semi-natural grassland ecosystems is quite general and widespread in the Czech Republic. The solution depends on many different factors such as presence of local conservationists or NGOs, willingness of owners to let these people to carry out the management etc. In this case, cooperation amongst the authorities/NGOs and the stakeholders is too weak (or missing all together) and no good personal relationships have been established until now.

- Possible solutions of the problem on different levels

A mayor of the town district could play a positive role; he might publicize the value of the area, its significance for nature conservation and its role within the landscape in the vicinity of the capital, etc. There are also state funds (of the Ministry of Agriculture, Ministry of Environment) that could allocate a grant for stakeholders who care for their grasslands in a sufficient and an appropriate way. It is necessary to improve communication between stakeholders and local authorities, as well as with the conservationists and scientists so that the owners can trust these personal relations and take advantage of a financial support of the state institutions and/or foundations. There is also a necessity to improve possibilities of being well informed about funds dedicated to the landscape care and conservation management. A final important consideration is to have a stable state policy acting as a framework that concentrates on long-term effects.

7.4.4. Sinaia case study (Romania)

Sinaia is located in the Southern Carpathians, at an altitude of about 750 m a.s.l., on the Prahova River valley, between the Bucegi and Bâlceului massifs. Since it is close to Bucharest (only 120 km north), many residents from Bucharest own holiday houses in the area. Bucegi is a protected area and Prahova valley is the buffer zone where traditional activities are permitted.

Dominant ecosystem types in this area are grasslands and forests. However, while residents from Bucharest prefer grassland areas for housing and development purposes, both local residents and conservationists want to maintain these grasslands in a natural state and use them for grazing. These differences in opinions and interests generate conflicts between local population, managers and landowners.

The new buildings also need associated infrastructure such as water supply, more waste water treatment, solid waste management, electricity, access roads. Water resources in this area are limited because the Bucegi mountains are a calcareous massive and very permeable. The extensive water capture causes drainage in wet grasslands severely disturbing this ecosystem type. The increasing amount of waste water exceeds the existing capacity of waste water treatment facilities and pollutes the Prahova River. The engendering of solid waste is increasing too, with a growing need to extend existing landfills and create new ones. New landfills, existing access roads and new access may reduce and divide in fragments natural ecosystems (hayfields, pastures, forests).

7.4.5. Pirin National Park (Bulgaria)

The Pirin National Park is a state owned Natural World Heritage Site located in the Pirin Mountains, South-west Bulgaria and covers a total area of 40,060 ha, including the Baevi Doupki-Djindjiritza Biosphere Reserve (2,873 ha) and Yulen (3156.2 ha). The park lies at an altitude of 1,000 m to 2,915 m, mostly composed of granites and slates although local areas of limestone lie between the summits of Vikhren and Kamenitza, as well as in the central part of Pirin. The mountain ridges are generally of early Pliocene age but in some localities between 1,200 m - 1,600 m are of old Pliocene age. The denudation of the area occurred more widely during the Quaternary period when the snow cover descended to 2,200 m - 2,300 m. Limestone rocks, marble, south Bulgarian granites etc., karst formations, and typical glacial features (over 100 glacial lakes, deep valleys, circuses, crags etc.) are
present. Pirin Mountain stretches from northwest to southeast between the valleys of the Rivers Strouma and Mesta. There are many rivers and waterfalls.

- Biodiversity & Conservation Values

The Pirin National Park (with an area of 40,447 hectares) is included in the UNESCO Convention for the Preservation of World Natural and Cultural Heritage Sites. The park includes unique ecosystems, rare endemic and relict animal and plant species. The forests cover 60% of the territory. The 100 peaks over 2000 m asl, the 186 glacial lakes, cirques, moraines, waterfalls, caves, the rich flora (over 1089 species) and the variety of fauna (172 vertebrate species) represent nature's generosity. Vertebrate species occurring in the park include 4 fish, 10 amphibians, 14 reptiles, 102 birds, and 42 mammals. 114 of these species are listed as threatened to varying extents. Five species are included in the World Red Data Book-the Greek turtle, the Big night bat, the Gray wolf, the Pole cat, and the European otter. Four species in Pirin are threatened with extinction in Europe- the Long eared bat, the Brown dormouse, the Mole, and the Brown bear. Among the mammals and birds listed as threatened within Bulgaria are the Brown bear, the Gray wolf, the Pine marten, the Rock marten, the Polecat, the European otter, the Wild cat, the Balkan chamois, the Golden eagle, the Capercaillie, the Hazel grouse, the Eagle owl, the Black woodpecker, and the Three-toed woodpecker.

The presence of limestone rocks, the southerly position of the range and close proximity to the Aegean, coupled with its relative isolation, has made Pirin Mountains an important refuge. Forests in the park are mainly coniferous with endemic Macedonian pine *Pinus peuce* being widespread and forming the treeline in the granite part of the mountain. Endemic Bossnian pine (*Pinus heldreichii*) occurs in the highest zone of the karst area. Unique stands of *P. peuce* and *P. leucodermis*, up to 250-300 years old and 30-45 m high, are found in Baevi Doupki-Djindjiritsa Reserve. Some individuals of *P. leucodermis* tree are over 500 years old. Silver fir (*Abies alba*), Austrian pine (*Pinus nigra*), spruce (*Picea abies*), Scots pine (*Pinus silvestris*), and beech (*Fagus sylvatica*) form a mixed coniferous-deciduous forest type. Generally, the tree-line has developed as a result of man's interference over a long period and descends as low as 2000 m asl, but in some places reaches 2200-2300 m asl. In the subalpine zone there are thickets of dwarf mountain pine *Pinus mugo* and *Juniperus sibirica*. Above 2400m-2600 m is a layer of alpine meadows, stony slopes, screes, rocks etc. The flora of the Pirin Mountains, comprises of many rare species and is of great interest and beauty. One of the most active flora speciation in Bulgaria is situated in the limestone part of the mountain. The Pirin Mountains have a mixture of central European, Alpine, Balkan Mountain and Sub-Mediterranean species; in addition there exist about 30 local endemic species. There are about 70 Bulgarian endemic species, over 10% of vascular plants of Pirin are Balkan endemics, and about 20% of all plant species in the Bulgarian Red Data Book occur in the park.

The area has a management plan and is under an effective management regime. There are five different management zones: nature reserve zone where human activity is prohibited; tourism, recreation and sport zone; a primitive nature zone at about 2,000 m altitude where no construction is allowed and only traditional managed pastoral activities are permitted; and a zone above 2,000 m altitude where the natural environment is slightly modified. In order to prevent unauthorized camping, it is proposed to renovate existing chalets and build new ones and two camp sites along tourist routes. Ski slopes and lifts have been constructed at Chiligarnika-Todorka, above the town of Bansko. To date four slopes, two chair lifts and two t-bar lifts have been constructed. Recreation sites with benches and fountains etc have been installed along tourist routes. The park comprises an ecological/recreational zone surrounded by a buffer zone beyond the perimeter.

- Conflict identification

Human interference occurs in the area near the chair lifts and especially in the regions of Banderishka Poljana and Tzarna Mogilla. Litter disturbance is a problem around the huts and ski lifts. Also, conflicts arise as a result of intensive tourism, car traffic, grazing, collecting herbs, construction activities (buildings, roads etc).
The main source of conflict, however, is the construction of 3 additional ski runs in the Valley of Banderitza River. The effects on uplands ecosystem and biodiversity of these ski runs include the clear-cutting of significant areas (20 ha) covered with century old spruce trees, Macedonian pines and Mountain pine forests including *P. peuce* - a Balkan endemic species – the only tree species in Bulgaria included in the World red book. The direct destruction and loss of habitats of rare and protected species will ultimately lead to the extinction of the species. Populations of animal and plant species in the area will be threatened including species from the IUCN Red List and the Bern Convention. As the Yulen nature reserve is bordering the reconstruction activities, it is anticipated that this will cause disturbance and that steep slopes will be threatened by erosion and pollution. Overall, the new ski runs will have a very negative effect on the landscape of the biggest valley in the Park, which could result in the park being excluded from the list of World Nature Heritage sites. As the project is in violation of the Protected Areas Act and the Nature Protection Act, legislation measures will have to be put in place and implemented. The constructions are also in disagreement with the management plans, which could lead the small land owners to be excluded from the management of the lands and create a considerable social tension between the local population and corporative capital.

Other conflicts will arise from these development plans. The land use change will entail a change in ownership, as well as increased tourism and urbanization, leading to a negative impact on plant and animal communities located close to the ski runs. Easy access to the area will increase anthropogenic pressure, trampling and pollution. Possible resolution strategies here could be to devise alternative tourism such as eco-tourism and the development of traditional crafts and traditional agriculture. A range of other resolution strategies will have to be put in place including legislation and regulations, anti-erosion measures, planting or allowing the forests to recover and monitoring through the system of limits of acceptable change (LAC).

7.4.6. Kresna Gorge (Bulgaria)

This case study envisages future possible conflicts between biodiversity and human activity arising from inappropriate planning on behalf of the Bulgarian government, which plans to build the Struma Motorway (which is a part of the Trans European Corridor N 4 Sofia - Athens) directly through the Kresna Gorge and the town of Kresna.

- Background
The Kresna Gorge is located in the southeast part of Bulgaria, along the banks of the Struma River. The river passes between the Pirin and Malashevska Mountains for 18 kms and forms the steep and picturesque slopes of the ravine. The gorge is on the border between the continental and Mediterranean climatic zones, resulting in extremely high abundance of species in a territory smaller than that of Rila Mountain.

- Conservation value
A number of plant and animal species occurring here are included in Red Data Books of Bulgaria, and are covered by the European Laws and Conventions for the Protection of Natural Heritage. The ravine is also a biological corridor for the migration of large mammals between the mountain ranges of the Balkan Peninsula as well as a very important bird migration route (via Aristotelis). Part of its territory is defined as an ornithological important place according to Bird Life International criteria. The ravine is also a CORINE site, according to the Bern Convention, and will be part of European Ecologic Network Emerald and Natura 2000. Of the 141 CORINE Biotopes sites found in Bulgaria, the gorge is rated seventh in terms of biodiversity protection.

There is a great diversity of plant communities: In the South part of the ravine, the evergreen Mediterranean forests of Greek juniper *Juniperus excelsa Bieb* (also referred to as tissa) are present, while in the North forests of oak and lime-trees prevail. Along the riverbanks, the riparian forests of oriental plane tree, black poplar and willow trees dominate, and oak forests occupy higher altitude places. There are 457 plant species found in the Kresna Gorge, a large number of them endemic or relict. The Kresna Gorge is of worldwide importance for the preservation of the arboreal juniper
forests and the oriental plane tree forest. Kresna Gorge is also home to 58 mammals, including bears, wolves, otters, stone martens, red deer, wild cat; 17 different bat species (more than in the whole of Central Europe); 232 bird species, of which 135 nesting, such as the Golden eagle, Short-toed eagle, Hobby, owl, Black Stork and Mediterranean species; the Olive-tree warbler, Masked shrike, Black-eared Wheatear, Rock partridge; 31 species of amphibians and reptiles (the gorge is extremely important for the conservation of the two Mediterranean tortoise species, the leopard snake and the four-lined snake); 14 fish species; 942 species of butterflies and moths, some of which are endemic for the gorge.

- Conservation management
Less than 5% of the territory of the gorge, including its most valuable habitats, is under the protection of the Tissata Reserve and its buffer zone.

- People
The town of Kresna is situated at the southern end of the gorge. Most people in the region live from agriculture and cattle breeding. The arable land is mostly in the valley of the Struma River and its tributaries. Local agriculture consists mainly of vineyards from which several famous brands of wine such as Keratzuda and Melnishko are produced. The Kresna Gorge and its surroundings have great potential for the development of rural and eco-tourism. The villages in the region have maintained traditional local architecture and livelihoods. In the nearby village of Vlahi, locals still breed the disappearing Karakachan dogs, horses and sheep for which the area is famous and there are ongoing efforts to turn it into an eco-village. Tourist routes for entering Pirin National Park start from the town of Kresna and the villages of Senokos, Oshtava and Vlahi. There are numerous mineral springs in the region with healing qualities, but only the Gradeshkite Mineral Baths are popular among tourists. The Struma River, flowing through the Kresna Gorge, is the best place in Bulgaria for extreme water sports (such as rafting).

- The consequences
The current international road Sofia – Athens E-79, passes through the Kresna Gorge and the town of Kresna. The 9-meter-wide road is already responsible for the death of hundreds of animals during their migration to the Struma River. The future motorway is planned to be 25 - 29 meters wide and pass through nearly the same route. The construction of the motorway through the ravine will destroy the slopes and the riverbanks of the Struma River. The motorway can be constructed through the gorge only if it passes through the Tissata reserve, which is in a violation of the Bulgarian protected area legislation. The plants may never recover due to the crumbly and unstable nature of the rock in the gorge. The Struma Motorway will lead to air contamination, noise and safety risks for the population of Kresna. The motorway through the gorge will turn into an insurmountable ecological barrier for most of the small mammals, causing an increase in their death rates. This will result in the extinction of many of these species.

The project has not considered that by following the current construction plans, the motorway will eliminate hundreds of rare plant and animal species. The slopes and the riverbanks of the Struma River will turn into a building site. Plant populations destroyed under these circumstances may never recover.

The construction will undercut and probably ruin the large Melo Sand Hill, which is one of the landmarks of the town. A large portion of the fertile arable land currently used for agriculture in the region of the Struma River will be converted into asphalt. Small family-run businesses along the current road will disappear. The rapids of the Struma River, presently favoured by rafters and kayakers of all levels, will no longer be suitable for river sports.

The motorway will pass 30 meters from outlying homes and the local school. The people of Kresna are going to lose their most fertile agriculture lands, their clean air, and the possibilities of tourism development in the region. In order to reach their fields the inhabitants of Kresna will have to go across the motorway, as there is no planned secondary road. Under these circumstances they will lose
the possibility of using slow-moving means of transport such as tractors and horse drawn carts which are vital to their livelihoods.

- Alternative solution
More than 15 national and international organisations have been involved in the “Save Kresna Gorge” campaign since 1997. An alternative project for motorway building is proposed avoiding this conflict. Diverting the motorway out of the gorge and away from the town will protect the natural environment and will turn the existing road into a tourist route, as opposed to a massive transportation corridor. In 2001, a coalition of Bulgarian environmental organizations sought help from independent engineers (Voltan Consult), who designed an alternative plan for a route, passing outside of the gorge. The alternative passes nearly 5 kilometres east of the defile and 2 kilometres away from the town, through an even site, situated on the slope of Pirin Mountain, at an altitude of 500-600 m and avoiding villages, arable lands, the most precious natural habitats and biological corridors and the mineral springs in the region of the existing gas pipeline. The route passes 6 km away from the Pirin National Park and does not affect it. It includes tunnels and viaducts that enable the migration and the traffic of all the wild animals, and at the same time keep the identity the landscape. The extension of the international road would be no more than 1-2 km.

The number of rare animals killed on the road will significantly decrease. The noise and the contamination in the gorge and the town of Kresna will decrease to a minimum level. At the same time, the existing road in the gorge will turn into a local tourist route, giving access to all sites, attractive for tourism, and to the local villages in the region. Diverting the transit traffic outside of the gorge will only improve the possibilities for tourism development. Most of the territories in the gorge, which are now exposed to contamination and strong noise, will be relieved from the impact of the transit traffic. The road through the gorge will be only of local and tourist importance. The whole territory of the gorge and the mountains in the direction of the Macedonian border will have the opportunity to form a nature park, offering a variety of tourist services, independent from the east link with the territory of the Pirin National Park. The town of Kresna can become one of the main centres for this area. The link with the high parts of Pirin will not be significantly affected. The tourist routes in this direction will cross the motorway in such places where the motorway goes through tunnels and viaducts.

The motorway will not affect most of the mountain villages (Brezhani, Senokos, Oshtava, Vlahi) situated on the slopes of the Pirin Mountain. These villages will have the opportunity to develop as tourist centres in the contact zone between the Kresna Nature Park and the Pirin National Park. The opportunities for the development of the other three villages in this direction (Rakitna, Mechkul and Old Kresna) will unfortunately not be as bright. However, unlike the proposed route through the gorge, the effect of the noise contamination can be significantly decreased through the construction of the noise protecting walls.

Bulgarian environmentalists are working on the issue of proclaiming the entirety of the Kresna Gorge as a protected area, which may facilitate its expansion into a Trans-border Nature Park in cooperation with the Republic of Macedonia.
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