Estonian Ministry of the Environment
United Nations Environmental Program (UNEP)

Estonian Biodiversity Strategy and Action Plan

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FOREWORD

At the World Conference of Environment and Development held in 1992 in Rio de Janeiro, Estonia signed the Convention of Biological Diversity. Joining this global convention bound Estonia with several obligations. One of the first obligations of every signatory of the convention is the implementation of state-sponsored planning for the protection of biological diversity and the sustainable use of nature. Besides the environmental sector, there is a multitude of institutions involved with issues connected with biological resources, thus it is inevitable that all these institutions and interest groups participate in the protection of biological diversity and the sustainable use of nature.

The preparation of the Estonian National Biodiversity Strategy and Action Plan was carried out from the second half of 1998 until the second half of 1999. The project co-ordinator was Tiiu Kull, and the members of the Steering Committee were Rein Ratas, Jaak Tambets, Lembit Nei, Mart Külvik, Kaja Peterson, Kalev Sepp and Tiiu Kull. The Planning Committee consisted of 18 members. The work was conducted in ten sectors headed by responsible experts. The sectors covered the following areas and the respective responsible experts were: genetic resources and biotechnology – Kaja Peterson, education – Kaja Peterson, landscapes – Kalev Sepp, nature conservation – Mart Külvik, agriculture – Kalev Sepp, forestry – Mart Külvik, fishery – Toomas Saat, transport – Mari Jüssi, tourism – Kaja Peterson and industry – Anto Raukas. Economic consultant was Lybov Gornaya. More than one hundred people participated in the work, and their names are presented on p. 162. The analyses of biological diversity, strategic aims and action plans compiled by the sectors were reviewed by experts who did not participate in the work. Comprehensive unification of the strategy and the action plans was done by Aleksei Lotman.

INTRODUCTION

Natural diversity is an important guarantee of diversity and richness of culture, which is a part of the same ecosystem. In the case of biological diversity in Estonia, several internationally important aspects deserve attention.

Compared to other regions with similar areas situated to the north of the 57th northern parallel, the diversity of Estonian flora and fauna is one of the richest in the world. The reasons for it are geographically conditioned diversity of Estonian climatic conditions; the existence of both islands and continent; the influence of the sea and large number of inland waters; diversity of soils, simultaneous incidence of Silurian (to a lesser extent Ordovician and Devonian) limestone and Devonian sandstone as bases for the formation of soils, and the resulting incidence of neutral, lime-rich and lime-poor soils; extension of a large number of species distribution range borders to the territory of Estonia; large proportion of natural landscapes in Estonia; retention of traditional methods of land use until the middle of this century – and in many areas until the latest decades, and the respective relatively extensive retention of semi-natural habitats (heritage habitats) and the relatively unimportant role of alien tree species in forestry.

Small-scale species richness of some Estonian habitats is one of the greatest in the world. Such are the communities in preserved wooded meadows under long-term use in western Estonia, where the number of vascular plants may be as high as 74 species per square metre. One of the important reasons for the fact is retention of traditionally extensive methods of land use until the middle of this century.

General high diversity of landscapes in Estonia is conditioned by a diversity of natural conditions, as well as by the preservation of natural and semi-natural habitats in a relatively large number of landscape types, and the presence of a large proportion of landscape types that have nearly disappeared in the rest of Europe (mires, semi-natural communities).

The preservation of bogs, wooded meadows, wetland forests and several other landscape types, mostly destroyed in the rest of Europe, has been possible due to stopping of amelioration works before such activities had covered all areas, relatively late introduction of intensive land use and retention of manual labour in the agriculture of the country until the last quarter of this century. Thus, Estonian biodiversity richness has, besides local and regional importance, global value.

ABBREVIATIONS IN THE TEXT

BD	biodiversity
BDAP	Biodiversity Action Plan
CAP	Common Agricultural Policy of the EU
CBD	Convention on Biological Diversity
CITES	Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora
EABK	Estonian Agrobio Centre
EBST	Estonian Biotechnology Strategy and Action Plan
EIA	Environmental Impact Assessment
EU	European Union
EVIKA	Estonian Plant Biotechnical Center Evika
GMO	genetically modified organism
GTO	Genetic Technology Department of Tartu University
IFOAM	International Federation of Organic Agriculture Movement
KTK	National Environmental Action Plan
KTO	Environmental Technology Department of Tartu University
NEAP	National Environmental Action Plan
NGO	non-governmental organisation
PEEN	Pan-European Ecological Network
REC	Regional Environment Centre for Central and Eastern Europe
RT	State Herald
SEA	Strategic Environmental Impact Assessment
TELO	Youth Centre
UN	United Nations
UNEP	United Nations Environmental Program

BASIC TERMINOLOGY

The Convention on Biological Diversity and its implementation process have brought several new terms into the international conservation community's vocabulary. Step-by-step, these new-fashioned terms are introduced to national languages, including the Estonian language. Even the term "biodiversity" has proved to be a complicated word to translate perfectly.

Central terms of the Convention. In the text of the CBD the term *biological diversity* is explained very generally, in a way that indeed covers all the variability of life. Since mankind is related to the biological world first hand via utilisation, the convention uses here another proper term *biological resources*.

> Article 2.
> **"Biological diversity"** means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
> **"Biological resources"** includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.

Tasks of the Convention. The CBD concerns conservation of biological diversity both in the wild and for domesticated or cultivated forms, both conservation and sustainable utilisation, as well as all activities and processes in society which even indirectly influence biological diversity. Hence the Convention influences several aspects of society and reflects obligations of different authorities. In addition, it embraces international obligations, pertaining to fair and equitable sharing of costs and benefits among parties.

> Article 1.
> ... The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the **conservation** of biological diversity, the sustainable use of its components and the fair and equitable **sharing of the benefits** arising out of the utilisation of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Implementation cycle of the Convention. Each party of the Convention is obliged to initiate the procedure of planning biodiversity protection and sustainable use measures. On the basis of the text of the Convention relevant national strategies or programmes should be developed or existing measures should be adapted.

> Article 6.
> Each Contracting Party shall /.../
> Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned...

Current experience around the World has shown that the following stages in the implementation cycle of the convention are to be foreseen:

- Initiate and organise the compilation of the national country study which gathers and evaluates

information on the status and trends of the nation's biodiversity and biological resources, laws, policies, and organisations, programs, budgets, and human capacity; creates a preliminary statement of goals and objectives, identifies gaps and does a preliminary review of ways to close gaps.

- Initiate and organise the compilation of the national strategy, which determines goals and operational objectives of the biodiversity process and selects specific measures and procedures that will close the gaps identified.
- Prepare national action plan, which determines which organisations will take charge of implementing which activities denoted in the strategy, geographically in what location or region, by what means, and with what resources (people, institutions, facilities and funds); distinguish time phases for action.
- Launch activities in practical terms, to implement the strategy and action plan; have partners take charge of particular elements of the plans; have biodiversity planners become implementers in the key ministries, NGOs, communities, industry etc.
- Establish and manage the monitoring and evaluation process of CBD implementation. Adopt indicators of success, tracking the status and trends of biodiversity (species, genes, and habitats and landscapes), implemented policies and laws, accomplished specific actions and investments, developed capacities.
- Ensure regular reporting of all prior stages and high public profile of the process at local, national and international levels.
- Initiate continuous re-iterating process of implementation of the Convention.

Sectoral character of the Convention. As the subject of the CBD is very general – the whole of living nature and its production – then the only practical way to achieve the objectives is through detailed planning in all the principal sectors of the economy and society. Despite the fact that biological diversity is primarily connected to environmental and conservation sector, the experience of implementation so far reveals that only representatives and specialists of each sector themselves can propose a realistic strategy and an action plan able to be implemented. The policy planning is indeed a public and co-operative process between different interest groups with the aim of reaching final consensus.

> Article 6
> Each Contracting Party shall /.../
> (b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Obligations of the Convention. Both the national policy for biodiversity protection and its sectoral parts should be based on obligations stated in the Convention. Hence the main components of the relevant policy should be the following:

- Identifying the components of biological diversity in need of protection and the processes which threaten biological diversity;

> Article 7.
> Each Contracting Party shall /.../
> (a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I; /.../
> (c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques;

- Protection and sustainable use of biodiversity – this should embrace the impact assessment of principal projects and main directions of action (policies);
- Monitoring of biological diversity as such on one hand and the processes potentially threatening to biodiversity on another.

  Article 7.
  Each Contracting Party shall /.../
  (b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;

- activities in the field of research, education and information.

  Article 12.
  Each Contracting Party shall /.../
  (b) Promote and encourage research which contributes to the conservation and sustainable use of biological diversity /.../

  Article 13.
  (a) Promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes;

Sectoral planning and activities should be based on the precautionary principle and hence the first interest should be the causes of biodiversity disappearance. Biological diversity should be maintained through a combination of conservation and sustainable use. Sustainable use is considered of utmost importance. This should lay on the principle of critical loads and should be aimed at such environmental factors as:
- pollution;
- alteration of physical environment, including various forms of land use and extraction/harvesting of natural resources;
- the modification and release of organisms.

Public awareness of the Convention. The experience of the democratic World emphasises the importance of ensuring that the plans enable all relevant sectors of society to gain access to information and opportunities to contribute to this work. The principle of open communication and public participation in decision-making is strongly emphasised in the several chapters of Agenda 21. It should be ensured that other authorities, business and industry, NGOs and the general public have access to information, and the opportunity to participate in every stage and sector of the biodiversity process.

The Convention and sustainable development. The UN Conference on the Environment and Development in Rio in 1992 called attention to the loss of biological diversity as one of the main obstacles to efforts to achieve the transition to sustainable development. The Estonian Biodiversity Country Study asserts that although the loss of biological diversity in Estonia has been less severe than at the global level, this has nevertheless curtailed our national freedom of action. In many cases, such impediments are the result of many factors working together, each of which may appear to be insignificant if considered in isolation. It is important to maintain a high level of ambition in the sectoral plans and give the possibility of integral choices at national and international levels.

I THE DEVELOPMENT OF THE BIODIVERSITY PROCESS IN ESTONIA

Estonia was among the 157 states who signed the CBD at the UN Conference on Environment and Development, Rio de Janeiro, on 12 June 1992. The time interval between signing the CBD and ratification was about two years: the Convention was ratified on 11 May 1994 by the Riigikogu (the Parliament of Estonia) and approved on 26 May 1994 by the President. It can be said that during the years 1992–1994, the activities related to the Convention were more of a spontaneous nature and were not organised in a goal-oriented manner.

• Time period up till ratification

Some officials of **Governmental authorities** were appointed to take responsibility for setting and following the schedule for the ratification, which, due to some uncertainties in procedures used by the *Riigikogu*, was quite a complicated task. At the international level, the contact person for the Convention has been Mr. Andres Kratovits from the Department of International Relations, at the Ministry of the Environment. Though there has been no special **group of experts** formally established to support the implementation of the convention, the functions of an initial expert team on biological diversity were performed by specialists of the nature conservation department. A ministerial *ad hoc* group on sustainable development (The Committee on Sustainable Development) has partly been concerned with the topics of the CBD since year 1993.

Several **NGO-s** have been active at safeguarding biological diversity in Estonia (*e.g.* the Estonian Fund For Nature, Union of Protected Areas of Estonia). However, relatively little attention has been paid to the comprehensive tasks of the CBD as such. As a positive example, the Discussion Club on Sustainable Development of Scientific Societies can be mentioned. The Club has had a lively schedule of seminars for reviewing different sectors concerning the CBD since 1992.

Participation of the **scientific** sector in the CBD process has become active. The Board of the Division of Biology, Geology and Chemistry of the Academy of Sciences held a session addressed on CBD implementation already on 8 December 1992. In 1993, the Institute of Zoology and Botany of the Academy of Sciences, jointly with the Institute of Botany and Ecology, Tartu University compiled a comprehensive research programme, for the implementation of which funding has not been found to date. The Section of Theoretical Biology of the Estonian Naturalists' Society held its 19th Spring Session in 1993 concerning the theory of biodiversity. The Commission for Nature Conservation at the Academy of Sciences held the Plenary Session devoted to the problem "Diversity of the Estonian Nature and its Protection" on 11 May 1994. The seminar theses are in press. A national popular-scientific journal "Estonian Nature" began a series of articles on biodiversity in early 1994. Reports have been published which *i.a.* include references to the numbers of biotic taxa in Estonia and the respective Estonian data is included in international sourcebooks.

• Time period after ratification

The ratification of the Convention in May 1994 by the Estonian Parliament was an act of a rather formal step and indeed has not brought along any significant practical developments. A step of special importance for the CBD implementation in the region was taken by UNEP by holding a **Workshop on the Practical Implementation of the Convention on Biological Diversity in the Baltic Countries**, in Tallinn on 16–18 October 1994. The meeting was organised by the United Nations Environ-

ment Program (UNEP), through its Regional Office for Europe, in co-operation with the Interim Secretariat for the Convention on Biological Diversity. Two background papers were presented concerning the implementation of the CBD at the national level, prepared as a co-operative effort by consultants from Latvia, Lithuania, Finland, and Norway. Representatives from each of the Baltic countries discussed their national views on biodiversity, highlighting state-of-the-art approaches, the science of biological diversity, and the perspective of non-governmental organisations (NGOs). As an input into their national biodiversity programs, the three countries made recommendations for national and sub-regional strategies for implementing the Convention. The workshop produced a list of recommendations on strategies and follow-up actions in the three countries.

The UNEP Workshop (1994) recommendations: Estonia

1. The outcome of the Group Work Session should be presented to the Minister of the Environment.
2. The Minister of the Environment should convene an *ad hoc* Task Group consisting of representatives of different institutions that could potentially be involved in the CBD process.
3. The Task Group should:
   (a) prepare a background paper for the Government describing the substance of the CBD and giving practical examples on possible benefits for different institutions, that arise from the implementation of the CBD. (b) outline a program for the Estonian country study;
   (c) consider the possibility of co-operation aimed at the implementation of the CBD on sub-regional and regional levels;
   (d) elaborate recommendations for the Minister of the Environment regarding the measures necessary to involve the Government in the CBD process.
4. Based on these recommendations, the Minister is to submit a proposal to the Government for convening a permanent Working Group for implementing the CBD.
5. The permanent Working Group should
   (a) initiate the necessary country study and
   (b) develop the national strategy for implementing the CBD.

In November–December 1994, **the First Conference of the Parties to the CBD** took place in Nassau, the Bahamas. The members of Estonian delegation were Tõnis Kaasik, Tiit Randla and Jaak Tambets. The Conference of the Parties elected *i.a.* Jaak Tambets to the position of **vice-president of the Bureau of the Conference of the Parties** to the CBD. The post, we hope, was a recognition of Estonian progress and also gave the country a possibility to participate in international decision-making in that field.

Soon after the UNEP Workshop in Tallinn and the First Conference of the Parties to the CBD in Nassau, the **National *ad hoc* CBD Task Group** was assembled in January 1995 and held its first two meetings. The first meeting on the 5th of January, held in an apartment of the Ministry of Agriculture, aimed to reach consensus concerning the goals and strategies among participants representing different sectors. The second meeting on 20 January heard the status reports from different sectors and formed two sub-groups, one for parliament lobby on the draft Act on Sustainable Development (especially concerning the aspects relevant for BD in it) and the other for governmental regulation on BD. An adopted version of the Norwegian national action plan for biological diversity – guidelines for sectoral plans – was presented at the same meeting.

Shortly thereafter, the first results of the work were already visible – on 22 February 1995 the

Riigikogu passed **the Act on Sustainable Development** including Article 9 which concerns the guarantees for the main steps of CBD implementation.

Act on sustainable development (State Herald 1/ RT1 1995, 31, 384)

Article 9. Preservation of biological diversity

(1) Preservation of biological diversity shall be guaranteed by development and implementation of a national program and an action plan approved by the Government of the Republic of Estonia, the development of which shall be financed from the national budget.

(2) The principles of preservation of biological diversity are the following:

1) in the case of natural species – the conservation of these at the level of the lowest possible taxonomic unit and aiming at the preservation of all possible species;

2) in the case of local cultivated plant varieties and domestic animal breeds – the registration of these, and the keeping of databases concerning possibly all varieties and breeds;

3) preservation of different types of ecosystems and landscapes as well as creating a network of natural and semi-natural communities to counterbalance and compensate the impact of human population and economic activities;

4) the determination of genetic material of social, economic or scientific importance.

Another sub-group of the CBD Task Group drafted a version of **the Government Decree on the implementation of the CBD**. The aim was to convene a) a permanent task force at the government level with certain responsibilities on CBD implementation (Governmental Commission) and b) to give responsibility to the minister of the Environment for taking practical steps in the national process of CBD implementation. This Decree was passed by Government on 11 April 1995 and it foresees *i.a.* the preparation of the National Action Plan.

During the first half of the same year – 1995, on the initiative of the World Bank and WWF-Sweden, Estonia together with the other Baltic Countries prepared a document called the **Key Elements of the National Biodiversity Action Plan**. This paper reviewed current status, efforts to protect and strategy to safeguard national biological resources. A part of the plan provided a list of projects and activities which could be supported by donors.

Another important project in this respect has been the implementation of *the Act on Sustainable Development and the Biodiversity Convention in Estonia* funded by the EU LIFE programme. This gave a possibility to evaluate the ways of integrating the requirements of the Convention on Biological Diversity into the management plans of protected areas.

In the year 1995, the signing of the **Estonian-European Union Association Agreement** was also a politically significant step in the implementation of the requirements of the CBD in Estonia. For example, in order to meet the requirements of this agreement, the resolution to work out corresponding legislation concerning bio-technology and GMOs was passed.

An example of the co-operation between the Baltic Countries has been the workshop on *Status and Implementation of the CITES and the Convention on Biological Diversity in the Baltic States*, held in Hiiumaa in June 1996. The workshop was organised by the Ministry of the Environment, Estonia and the Baltic Environmental Forum. The joint meeting was held to exchange information of the CITES and the CBD and to find ways of solving these problems. Another aim was to plan co-operation between the Baltic Countries and also with other neighbouring states and the Secretariat of the CITES and the Convention on Biological Diversity. Similar conferences on implementation of environmental conventions in the Baltic States have been held three times since 1993 by the Stock-

holm Environment Institute – Tallinn. Among other aspects, these meetings have given the opportunity to discuss details of the implementation of the CBD.

As an important component of the Estonian national biodiversity process the development of two national policy papers – the **Estonian Environmental Strategy** and the **Estonian Forest Policy** should be considered. During the preparation of both documents the working-groups on biodiversity issues have been assembled and in the final versions of these, adopted in 1997, the relevant chapters were included [1].

Following logically from the Environmental Strategy, the National Environmental Action Plan has been prepared during the years 1997–1998. Also during the creation of this document, separate environmental activities on landscape and biological diversity have been defined, containing five policy objectives with 77 short-term actions and 40 long-term actions [2].

Since 1996 Estonia started to compile a **Biodiversity Country Study**. The project was supported by UNEP and administered by the Ministry of the Environment with the assistance of the Resident Representative UNDP in Tallinn. The project gave an overview on existing biological resources and defined the basic needs for effective conservation and rational use of national level. The preparation of the Country-Study project has enabled the formation a large and strong team – about a hundred experts of different experience have been engaged. The project has been concluded and its results published in the form a working-paper [3]. The most extensive contributions like the ones concerning Estonian vegetation site types, flora and aquatic biota are or will be published as separate books.

The internationally available **progress report** on the Estonian CBD implementation process has been prepared by the Ministry of the Environment by May 1998, to meet the obligations of the 5th Conference of the Parties, held in Bratislava [4].

Since 1998, the **Estonian National Biodiversity Strategy and Action Plan** is being prepared with UNEP support. Never before has a co-ordinated biodiversity management planning process for ten different socio-economic sectors taken place in this country. The current report is attempting to compile the work done by a large number of individuals and organisations representing very different fields and professions.

[1] Eesti Keskkonnastrateegia. Ptk. 3.9. Maastike ja elustiku mitmekesisuse säilitamine (RT I 1997, 26, 390) ja Eesti Metsapoliitika (RT I 1997, 47, 768)

[2] Eesti Keskkonnategevuskava, kinnitatud Vabariigi Valitsuse otsusega 26.05.98.

[3] Külvik, M., Tambets, J. (koostajad) 1998. Bioloogilise mitmekesisuse ülevaate (country study) materjale. UNEP ja Keskkonnaministeerium. 338 pp.

[4] First National Report to the Convention on Biological Diversity, Estonia. 1998. Estonian Ministry of the Environment. 29 pp.

II RELATION BETWEEN THE BIODIVERSITY STRATEGY AND ACTION PLAN TO OTHER PROCESSES IN ESTONIA AND ABROAD

- **Relation to other domestic processes**

The biodiversity process has a number of parallel political actions at the national level, which support and cross-feed the biodiversity protection and sustainable use in the country. Some of them are of general environmental character, others of more specific sectoral nature.

The **National Environmental Strategy** was approved by the Riigikogu on 12 March 1997. This strategy specifies the trends and priority goals of environmental management and protection, and sets the main short-term and long-term tasks to be achieved by 2000 and 2010 respectively. The National Environmental Strategy proceeds from the main traditional goal of environmental protection – which is to provide people with a healthy environment and natural resources necessary to promote economic development without causing significant damage to nature, and to preserve the diversity of landscapes and biodiversity while taking in into consideration the level of economic development. The priorities presented in the strategy are taken into account when planning environmental activities, developing international co-operation and allocating national funds.

The Estonian Environmental Strategy contains the following aims on the maintenance of landscapes and biodiversity.

Goal: to ensure the preservation of viable populations of local plant and animal species, natural and semi-natural communities and landscapes typical to Estonia.

Tasks by the year 2000:

- to improve protection of plant and animal species, their habitats and landscapes in accordance with revised legislation, bearing in mind international agreements and European Union requirements;
- to improve the existing network of nature reserves in accordance with EU recommendations in order to ensure protection of ecosystems;
- to establish a network of protected forests according to nature conservation criteria thus ensuring preservation of all natural and semi-natural forest types and communities.

Tasks by the year 2010:

- to establish a network of nature reserves corresponding to EU recommendations where zones of strict protection (strict nature reserves and special management zones) would cover up to 5% of the terrestrial area of Estonia.

In 1997–1998 on the basis of the Estonian National Environmental Strategy the **National Environmental Action Plan** (NEAP) has been developed. The Government of Estonia approved NEAP on 26 May 1998. Responsibility for the implementation of NEAP was assigned to the Ministry of the Environment. This document will constantly be reviewed and amended as necessary in order to reflect rapid socio-economic changes in Estonia and the process of acceding to the European Union.

The NEAP includes a section on biological and landscape diversity with five specific goals which are formulated into 117 short-term (1998–2000) and long-term (2001–2006) actions:

9.1: Integration of the landscape and biodiversity protection into other sectors

9.2: Improving legal and institutional capacity for management of protected areas, nature objects, landscape conservation and planning

9.3: Improving the education, research and public awareness system for biodiversity and landscape conservation

9.4: Improving protection of species and communities/habitats
9.5: Development and implementation of the ecological network concept and Geographical Information System

By the late nineties thematic sections on protection and sustainable use of biodiversity in policy and development documentation of several sectors have appeared. Forestry has been one of the most active sectors among others. Biodiversity has become a key word in the **Estonian Forest Policy** [5]. The Estonian Forestry Development Programme has prepared a reference paper for biodiversity policies in managed forests [6]. Preparations of the **Estonian Forestry Development Plan**, presumably well elaborated in biodiversity aspects, have been started in 1999. This is a national policy instrument where forestry development tasks are formulated and based on which these will be realised during 10-year periods.

Agriculture has been another major sector, which has developed its specific policies on biodiversity issues. Chapter 7 of the **National Strategy for Sustainable Agricultural Development** has been devoted to agri-environment. In the chapter, several problems of protection and sustainable use of biodiversity have been elaborated, among others, biodiversity maintenance in agricultural landscapes and conservation of aboriginal varieties and breeds for Estonia.

The obligations and tasks i.a. for biodiversity conservation of high political priority are determined by the **National Programme for the Adoption of the EU Acquis 1999** [7]. The main obligations in this field are connected with the directives regulating the protection of wild species and their habitats, and with the related regulations (92/43/ECE, 79/409/ECE, regulation ECE/3254/91, regulation 35/97/EC). Transposition and implementation of these legal acts is labour-consuming, requires a considerable amount of finances and employment of additional staff. Therefore the relevant extension time is proposed until the year 2010. For example, during 1999–2002, the existing *Act on Protected Natural Objects* will be supplemented, an implementation plan for Natura 2000 (a national action programme) will be prepared, the structures necessary for the implementation of Natura 2000 will be developed and the relevant staff trained, and the conversion key between the directive 92/43/ECE and the Estonian classification of habitat types will be created. The draft *Landscape Protection Act*, which will harmonise part of the Habitat Directive (92/43/ECE), is expected to be completed in 1999. From the year 2000, Estonia is also planning to participate in LIFE III programme, in the framework of which it will be possible to resolve part of the problems related to the implementation of Natura 2000.

- **Relation to other international processes**

As is the case for many other environmental problems, the loss of biodiversity is a problem that can only be resolved internationally, though the co-operation of several instruments. Other international nature conservation agreements besides the CBD are still playing a crucial role by regulating activities in particular areas of biodiversity protection. A large number of these international forums are or could be of significance for Estonian biodiversity.

[5] Eesti Metsapoliitika (RT I 1997, 47, 768)
[6] Külvik, M. (Editor). 1998. Biodiversity management strategy for commercial forests in Estonia. Estonian Forestry Development Programme. Tartu. 173 p. /Manuscript/
[7] National Programme for the Adoption of the Acquis 1999: http://www.eib.ee/el/vv_tegevuskava_99/doc2/index.html

Conventions

Since 1991, Estonia has re-established itself as the subject of international law. Conventions on nature conservation ratified by the Parliament (Riigikogu) up to now are the following:

- The Berne (1979) Convention on the Conservation of European Wildlife and Natural Habitats (became effective in Estonia on 23.08.1992);

The purpose of the convention, to protect European species of wild animals and plants and their habitats with a special emphasis to endangered and vulnerable species, does coincide in many ways with the goals of the Biodiversity Convention.

- Ramsar (1971) Convention on Wetlands of International Importance Especially as Waterfowl Habitats, ratified by Estonia in1993.

The former Soviet Union included Matsalu on the list of Ramsar sites already in the 1970s. Estonia re-designated the area in 1994 as an Estonian Ramsar site. Since 1998 there are 10 Ramsar sites in Estonia: Matsalu Nature Reserve, Soomaa National Park, Nigula bog, the Muraka mire complex, Puhtu–Laelatu–Nehatu Reserve, Islets of Hiiumaa and Käina Bay, Alam-Pedja Nature Reserve, Emajõe Suursoo mire, Endla Nature Reserve and Vilsandi National Park. Sixteen areas, including already protected areas like the Läänemaa–Suursoo mire complex, Nätsi-Võlla Bog, etc., and areas not yet protected, such as Kihnu Straits, Hari Kurk Straits, etc., have been designated as potential Ramsar sites.

- Washington (1973) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), ratified by Estonia in 1993;

This convention supports the CBD through controlling the trade of most endangered species on the World.

- Helsinki (1974/1992) Convention on the Protection of the Marine Environment of the Baltic Sea Area (applied in Estonia on January 22, 1992);

In addition to environmental problems of the Baltic Sea the convention also pays attention to the conservation of natural habitats and biological diversity and to the protection of ecological processes throughout the Baltic Sea catchment area. The integrated coastal zone management plans for the Matsalu and Käina wetlands were elaborated by the respective task teams of the Working Group on Management Plans for Coastal Lagoons and Wetlands (HELCOM PITF MLW) in 1995–1996. *Baltic Sea Protected Areas* – is one of the programs under this instrument. Area to be set aside for representative ecosystems in the Baltics as well as to guarantee sustainable use of natural resources is an important contribution to ensure ample provident protection of the environment and biodiversity. The Helsinki Convention through its Recommendation 15/5 has adopted in 1994 three marine and coastal areas in Estonia (Lahemaa, Matsalu and Vilsandi) to be a part of the system of Baltic Sea Protected Areas (BSPA-s). Another two areas – Kõpu Peninsula and Islets of Hiiumaa, both of them included in the West-Estonian Archipelago Biosphere Reserve – are planned to be established as BSPAs.

- Gdansk (1973) Convention on Fishing and the Convention of the Living Resources of the Baltic Sea and Belts (ratified on Feb. 25, 1993).

- Paris (1972) Convention on the Protection of the World Cultural and Natural Heritage.

This convention addresses man-made and natural sites and objects of global significance. Tallinn is included on the list of World Cultural and Natural Heritage Sites and the Tallinn Old City has got a

certification as an "Object of Global Natural & Cultural Heritage". The Soomaa National Park and the Ontika Landscape Reserve are the other sites which have been proposed by the Estonian Government for inclusion on the list of UNESCO World Heritage Sites.

- Another UNESCO international programme is "Man and Biosphere". To this international network, consisting of 328 biosphere reserves in 82 countries, the West-Estonian Archipelago Biosphere Reserve (1989) belongs as the only representative of the Baltic countries.

The old nature protection conventions mentioned above can be said to cover limited parts of the broad areas covered by the CBD. This means that good co-ordination work should be achieved between the instruments, obviously through the co-ordinating role assigned to the CBD.

Pan-European processes

The importance of international work on nature conservation that embraces the whole of Europe is increasing – the Pan-Europe ("West-Europe" + Central and Eastern Europe + CIS-countries) – under the auspices of the Council of Europe, UN Economic Commission for Europe (UN/ECE) and UN Environmental Programme (UNEP). The framework of such co-operation is in many ways co-ordinated by the *Environment for Europe* process. The Council of Europe is one of the significant forces in this field, mostly as the host of the Berne Convention on the Protection of European Wildlife and Natural Habitats, to which many of the pan-European countries have now acceded.

The Pan-European Biodiversity and Landscape Strategy (PEBLDS), since the adoption by the European Environment Ministers Conference in Sofia, in 1995, has became the most important integrating response to the Global CBD process in the region. One of the main concepts in the strategy – Pan-European Ecological Network (PEEN) – entails the designation of natural heartlands, buffer zones around them, and ecological corridors between the heartlands. PEEN is also conceived as a communications network between states, institutions and persons in questions of relevance to nature management.

EU co-operation

Until the EC Habitats Directive was adopted in 1992, EU work on nature conservation in a broad sense was of relatively limited scope. One exception, however, was the field of birds due to the EC Bird Protection Directive adopted in 1979. The Habitats Directive conforms largely to the Berne Convention, but the Directive assigns higher priority to the protection of habitats and it is binding on the member states. However, the Directive's main concern is bound primarily to the CBD Article 8 approach.

Estonia has signed and ratified the Europe Agreement in1995. The process of Estonia's accession to the European Union has accelerated the process of integrating the country into EU nature conservation co-operation. The approximation of legislation has already started. The completion of the CORINE biotopes survey and the preparations for the NATURA 2000 are some of the examples of this work.

III MEANS FOR SUSTAINABLE USE AND PROTECTION OF BIODIVERSITY

3.1. GOALS AND MEANS OF PROTECTION OF BIOLOGICAL DIVERSITY IN ESTONIA BY THE STATE (RECORD OF LEGISLATIVE ACTS)

Explanatory Note:
Estonian environmental legislation interprets "biological diversity" (BD) in a wider and a narrower meaning. In the narrower meaning, BD is limited to "natural communities and landscapes," i.e. the objects of classical nature protection. In the wider meaning encompassed also by the Convention on Biological Diversity (CBD) the concepts "genetic resources" and "biotechnology" are added to the above (CBD Arts. 15–19).

1. The issue: the necessity to preserve BD is one of the seven high-priority environmental problems in Estonia.

Environmental Strategy (Resolution of Estonian Parliament (Riigikogu), RT I, 1997, 26, 390) treats BD in the narrower meaning.

A high-priority environmental problem in Estonia is (also): " ... *the endangered status of habitat and landscape diversity, including dangers to ecological network, conservation areas, species and specific objects proceeding from economic activity and land property reform*" (p. 16).

2. What is/are "the object(s) of biological diversity and the principle(s) of its/their conservation"?

Sustainable Development Act (*RT 1*, 1995, 31, 384; *RT* I, 1997, 48, 772, Art. 9, cl. 2) treats biological diversity in the wider meaning, i.e. the context of CBD.

"The *principles of conservation* of biological diversity are:
1. in the case of natural species – the conservation of these at the level of the lowest possible taxonomic unit and aiming at the preservation of all possible species;
2. in the case of local cultivated plant varieties and domestic animal breeds – the registration of these, and the keeping of databases concerning possibly all varieties and breeds;
3. preservation of different types of ecosystems and landscapes as well as creating a network of natural and semi-natural communities to counterbalance and compensate the impact of human population and economic activities;
4. definition of genetic material of social, economic or academic importance.

3. Goals of the state in conservation of biological diversity.

The *Estonian Environmental Strategy* (Resolution of Riigikogu, *RT* I, 1997, 26, 390) sets the aim of "conservation" only in the case of certain kinds of biological diversity (excluding genetic resources and issues connected with biotechnology) and makes the following provisions:
" ... *to guarantee conservation of viable plant and animal populations, natural and semi-natural habitats and landscapes characteristic of Estonia*" (Ch. 3.9).
1. To improve the protection of plant and animal species, their habitats and landscapes in accord-

ance with amendments of the legislation, international agreements and requirements of the European Union.
2. To improve the network of existing conservation areas in accordance with recommendations of the European Union in order to guarantee protection of ecosystems.
3. To implement a network of forests protected in accordance with requirements of environmental protection in order to guarantee conservation of all natural and semi-natural forest types and habitats.
4. To create a network of conservation areas in accordance with recommendations of the European Union so that the strictly protected zones (strict nature reserves and special management zones) would make up 5% of Estonian continental area.
5. Raising consciousness about the uniqueness of biological diversity of Estonian nature and about the need for its conservation (Ch. 3.11).

4. What are the means of the state for conservation of biological diversity?

Sustainable Development Act (*RT* I, 1995, 31, 384; *RT* I, 1997, 48, 772) provides:
1. "The conservation of biological diversity is *guaranteed with a national program and action plan, the formulation of which is financed from the national budget, and which is approved by the Government of the Republic*". (Art. 9, cl. 1)
2. "*In branches of economy and in regions*, where environmental pollution and utilisation of natural resources may endanger the conservation of the natural balance or biological diversity, *development is controlled on the basis of a national development plan*". (Art. 12)

5. Implementation of goals of conservation of biological diversity or Action Plan.

Estonian Environmental Action Plan (Ruling of Government of the Republic, 26.05.1998) treats biological diversity in the narrower meaning.

Principal goal 9: "Conservation of landscape and habitat diversity"

The planned actions are divided as follows:
- short-term actions (years 1998–2000);
- long-term actions (years 2001–2006).

The principal goal itself comprises **five specific aims**:
1. The application of principles of landscape and habitat diversity protection *in other sectors* (respectively 15 short-term and 2 long-term activities).
2. *Management of data* on landscape and habitat diversity protection for better definition of popular value attribution and for increasing the efficiency of relevant political decisions (respectively 26 and 11 activities).
3. Development of the system to *promote education, research and public awareness* concerning landscape and habitat diversity protection (respectively 14 and 10 activities).
4. *Development of the protection* of species and habitats (respectively 15 and 11 activities).
5. *Development and implementation of geological information system (GIS) covering ecological network and environment* (respectively 7 and 7 activities).

3.2. SCIENCE

The role of science from the point of view of strategy and tactics of protection of biological diversity is the conduction of a number of studies of Estonian nature which would fill some significant gaps in the knowledge about biological diversity in Estonia. This involves tasks which cannot be solved without special research. The following are of the highest priority.

1. Number and list of organisms naturally belonging to Estonian habitats

The number of species of organisms living in Estonia may be estimated at 35,000 to 45,000. By now research has established the existence of about 24,000 species. Thus a large part of species composition on the territory of Estonia is unknown. The groups particularly poorly covered by research are prokaryotes, protists, and several groups of invertebrates, especially insects. Of all Estonian insects probably less than a half have been identified.

It is necessary to develop studies of flora and fauna with the aim to establish the number of species in Estonia and to compile a respective list. Attention should be focused on entomology and microbiology of soil and water as areas of lowest coverage from the point of view of biological diversity.

2. Major changes and trends concerning the number of species

The existing monitoring system has been concentrated on monitoring the status of rare species in some selected habitats. However, there is no information about the changes of the status of the most widely spread and ecologically more significant species. Though it can be presumed that the number of butterflies has decreased ten-fold in the last fifty years, and the spread of cow parsley and ground elder have grown ten-fold, there are practically no scientific data to prove these claims.

Thus it is necessary to conduct studies which would establish the more important trends in the spread of Estonian biocoenoses that could be used for developing a rational monitoring system to gather further data in the most economical way.

3. The Black Data Book of Estonian nature

Biological invasion is a globally intensifying process endangering local biological diversity everywhere. There are, respectively, two complementary aspects in the protection of biological diversity – protection of rare indigenous species, the status of which is reflected in regular updates of the Red Data Book, and the restriction of dissemination and spread of immigrant species, the status of which should be reflected in regular updates of the Black Data Book. To date, an Estonian Black Data Book has not yet been compiled, however, there are several immigrant species (e.g. American mink, Sosnovski cow parsnip and alien camomile, etc.) which have caused serious problems and conflicts by ousting local species (e.g. European mink).

Thus it is necessary to compile the Black Data Book of Estonian nature and its regular updating analogously to, and in parallel with, the work with the Red Data Book.

4. Indicators of diversity of biocoenoses

Present information about the biological diversity of Estonian biocoenoses has a relatively haphazard character. There are studies of species richness of specific groups of organisms (especially trachephytes and birds) in different habitats, but there are nearly no data about the species richness of whole biocoenoses and the influence of different factors and conditions on it. As it is not realistic to undertake the study of all species in all biocoenoses, it is rational to do it in some selected habitats and to

determine specific indicator parameters for best assessment of general species richness of biocoenoses. Such studies should also establish the influence of basic environmental factors and utilisation methods on biological diversity in different biocoenoses in order to make it possible to make projections of respective changes and to create a scientific foundation for consideration of biological diversity in landscape and economic planning.

It is necessary to conduct studies to determine the main factors influencing the biological diversity in Estonian biocoenoses and to specify the indicator parameters necessary for assessment of biological diversity.

5. The role of nature in Estonian culture

Changes in biological diversity are mainly conditioned by human activity and the degree of impact is dependent on the part and role of nature in local culture, i.e. on the changes taking place in the relations between man and nature. It is connected with values attributed by people to the components of nature surrounding them and with the knowledge of people about nature. At present there are practically no scientific data about popular knowledge about nature and about popular valuation of nature in Estonia; there are also practically no cultural-ecological studies and, as a result, there is no picture of the position of nature and natural values in modern Estonian culture. Any forecasts about the trends of human influence on biological diversity presume massive use of such data.

This necessitates culturological and ecosociological investigation of popular knowledge of nature, relationships between man and nature and the changing role of nature in Estonian culture.

3.3. ACCESSIBILITY AND PUBLICATION OF INFORMATION ABOUT BIOLOGICAL DIVERSITY IN ESTONIA

1. Monitoring of status of biological diversity (BD)

The goal of monitoring of biological diversity is to obtain continuous information applicable for the organisation of protection and utilisation of BD. The protection and sustainable use of BD is regulated by various legislative acts of different levels. The more prominent of these are dealt with below.

Sustainable Development Act (*RT* I, 1995, 31 384) is framework legislation, Art. 3 of the Act provides the basic principles of sustainable utilisation of natural environment and natural resources, Art. 9 provides the principles of conservation of biological diversity and Art. 11 gives the definition of environmental monitoring. In the context of this Act the main task of environmental monitoring is, first and foremost, the prediction of changes in the status of environment. Monitoring data are seen as a basis for planning and formulation of development plans. Monitoring of biological diversity is one of the sub-fields of environmental monitoring.

> "Art. 11. Environmental monitoring is consistent observation of the status of environment and factors influencing it, the main goal of such monitoring is the prediction of the status of environment and gathering of data necessary for formulation of programs, plans and development plans. The system of organisation of environmental monitoring is provided in law."

Evaluation: Data in the framework of the environmental monitoring program have been gathered for more than five years and there is a draft version of Program of Biological Diversity Monitoring. However, there is no evaluation of usability of gathered data and no system for the application of the data in predictions, programs, planning and development plans, which, in the case of BD, should first of all mean protection organisation plans and regional planning.

Necessary activities:

- To evaluate all parameters measured in monitoring projects from the point of view of usability at national, regional, and local levels in order to simplify the process of adopting organisational decisions, and to achieve simplification of planning at all mentioned levels.
- To set up a system of BD indicators that would yield a simplified survey of the BD situation of a region (depending on the administrative level) and make it possible for specialists of wider and less specific fields to participate in planning.

Act of Protected Natural Objects (*RT* I 1994, 46, 773; 1998, 36/37, 555) sets forth the order of applying nature protection to natural objects requiring protection, the character of protection, and rights and obligations of land owners, users and other persons concerning the protected natural objects. The protected natural objects are divided into nature reserves, separately protected objects, protected species, fossils and minerals.

Chapter 5 of the Act deals with monitoring of the status and recording of protected natural objects. Approval of the order of monitoring of the status of protected natural objects and of related research is delegated to the Minister of the Environment.

> "Chapter 5
> Monitoring of the status and recording of protected natural objects.
> Art. 25. Monitoring of the status of protected natural objects and related research is conducted in accordance with the order approved by the Minister of the Environment."

Evaluation: The above order has not as yet been approved.
Necessary activities: Development of the above order.

Estonian Environmental Strategy (*RT* I 1997, 26, 390) does not deal directly with monitoring, but the achievement of several priorities which include conservation of landscape and biological diversity presumes the existence of a monitoring system. In the **Estonian National Environmental Action Plan**, approved by the Government of the Republic on 28 May 1998, the following activity has been envisaged for achievement of the goal of conservation of landscape and biological diversity:

> elaboration and implementation of a modern and efficient system for monitoring of biological diversity and landscapes.

Evaluation: A draft version of Estonian Program of Biological Diversity Monitoring has been drawn up, but it has to be completed and implemented.

Necessary activities: Completion and implementation of Estonian Program of Biological Diversity Monitoring.

Environmental Monitoring Act (*RT* I 1999, 10, 154) is an enforcement regulation of the Act of Sustainable Development setting forth the order of practical monitoring and the system of data processing, also the relations between the monitoring authorities and real estate owners, it also includes sanctions for violations.

"Art. 1. Scope of application of the Act
This Act provides for the organisation of environmental monitoring, the procedure for processing and storing data obtained, and the relations between persons carrying out the environmental monitoring and owners or possessors of immovables.

Art. 2. Environmental monitoring and purposes thereof
(1) Environmental monitoring is the continuous observation of the state of the environment and the factors affecting it, the main purpose of which is to predict the state of the environment and to obtain data for programs and plans and for the preparation of development plans. The functions of environmental monitoring are to:
[. . .]
5) assess and analyse the current state of biological diversity;
[. . .]."

Evaluation: There is the draft version of Estonian Program of Biological Diversity Monitoring and inventories of several habitats, but there is no complex system for continuous analysis of status of biological diversity.

Necessary activities: To supplement Estonian Program of Biological Diversity Monitoring with obligation of data analysis in accordance with information requirements of different administrative levels and of the public.

International agreements

Chapter 7 of the **Convention on Biological Diversity** ratified by the Estonian Parliament (Riigikogu) on 11 May 1994 makes it obligatory for the parties to monitor biological diversity.

"Art 7. Identification and Monitoring
Each Contracting Party shall, as far as possible and as appropriate, in particular for the purposes of Arts. 8 to 10:
(a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I;
(b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;
(c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and
(d) Maintain and organise, by any mechanism data, derived from identification and monitoring activities pursuant to subparagraphs (a), (b) and (c) above;"

Evaluation: The provisions of the Convention on Biological Diversity have to date been observed only in a very general manner and no studies specifying the fulfillment of the provisions have been made.

Necessary activities:

- To evaluate the correspondence of clauses describing monitoring in Estonian Program of Biological Diversity Monitoring to clauses (a) and (b) of Art. 7 of the Convention on Biological Diversity.
- To observe clause (c) of Art. 7 of the Convention on Biological Diversity and compile a list of

respective processes and categories of activities, and incorporate it into Estonian Program of Biological Diversity Monitoring.
- To create Estonian Information System of Biological Diversity taking into account clause (d) of Art. 7 of the Convention on Biological Diversity.

Convention on Wetlands of International Importance as Waterfowl Habitat (The Ramsar Convention) ratified in the Riigikogu on October 20, 1993 (*RT* II 1993, 27/28, 84) and indicating the necessity for the monitoring of wetlands.

> "Art. 3.2. Each Contracting Party shall arrange to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the List has changed, is changing or is likely to change as the result of technological developments, pollution or other human interference. Information on such changes shall be passed without delay to the organisation or government responsible for the continuing bureau duties specified in Art. 8."

Evaluation: The initial list of Estonian regions subject to the Ramsar Convention has been approved, but there is no public information system about their ecological status and its changes.

Necessary activities: To incorporate the Ramsar areas in a maximum possible extent into Estonian Program of Biological Diversity Monitoring and to incorporate them completely incorporate into Estonian Information System of Biological Diversity.

Convention on International Trade of Endangered Species of Animals and Plants (CITES) ratified on October 20, 1993 (*RT* II 1993, 27/28, 83) demands that the parties compile periodical surveys of the status of populations present on their territories and included in the Annexes of the convention.

Evaluation: At the moment the Convention is implemented mainly through training of customs personnel and border guards and through licensing, but there is no periodical surveillance of the status of the populations of species covered by the Convention in Estonia.

Necessary activities: To publicise data about the status of the populations covered by the Convention in the media in the form of periodical surveys published at least annually.

EU Directive on Protection of Natural Habitats, Flora and Fauna (92/43/EEC) does not directly address monitoring of biological diversity. But in order to achieve several of the aims of the Directive it is necessary to apply a scheme of monitoring in correspondence to the requirements.

Although Estonia is not yet a member of the European Union, the harmonisation of domestic legislative acts with the legislation of the European Union is part of preparation for joining the European Union.

2. The information system of biological diversity and organisation of data storage and processing

For better management of BD information and to ensure greater efficiency of information flows it is necessary to create a uniform national information system.

In addition to the above-mentioned legislation, the main laws about the movement of BD informa-

tion in Estonia are the Copyright Act (*RT* I 1992, 49, 615) and the Databases Act (*RT* I 1997, 28, 423). The European Union Directive 90/3 13/EEC (EECR 15 8, 23.06.1990) on free access to information concerning environment (environment protection) is of recommendation character.

Act on Protected Natural Objects

All natural objects in Estonia to which nature protection is applied, including habitats of protected species, are recorded in the National Register of Nature Protection.

"Chapter 5. Monitoring of the status and recording of protected natural objects [. . .]

Art. 26. Recording of protected natural objects

(1) All natural objects including habitats of protected species and finding sites of fossils and minerals are recorded in the national register.

(2) Information recorded in the national register on the location and terms of protection of protected natural objects is conveyed to the administrator of the land register."

Evaluation: The system of making records to the independent National Register of Nature Protection and the information content of the records should be given a better accessible form and made compatible with the Estonian Information System of Biological Diversity.

Necessary activities: To integrate the National Register of Nature Protection into Estonian Information System of Biological Diversity.

Environmental Monitoring Act

Art. 7. Storing of environmental monitoring data

(1) Data from state environmental monitoring shall be stored in a general national register established by the corresponding Act.

(2) The cases of and procedure for the interbase cross-usage of data from state environmental monitoring and environmental monitoring carried out by local governments and undertakings, and the exchange of data with other state databases, shall be provided by law or on the basis of an Act.

Art. 8. Publication, use and release of environmental monitoring data

(1) Data from state environmental monitoring, environmental monitoring carried out by a local government and environmental monitoring carried out by an undertaking to the extent determined by a natural resources exploitation permit or a pollution permit are public and shall be published in the manner determined by the Minister of the Environment, except in the cases specified in subsection (2) of this section.

(2) Only persons performing official functions shall have access to environmental monitoring data, if:
   1) publication thereof may endanger health or protected species;
   2) the data are being processed;
   3) the data contain or concern business, industrial or intellectual property secrets.

(3) International exchanges of environmental monitoring data shall take place to the extent and pursuant to the procedure provided for in international agreements.

(4) Upon use and publications of environmental monitoring data, reference shall be made to the institution responsible for the monitoring and to the sub-program on the basis of which the activities were performed.

(5) Public environmental monitoring data may be accessed and excerpts may be taken therefrom without charge.

(6) A service fee may be charged for the release of public environmental monitoring data in any form, except

for the release of data to a state agency or local government. The rates of service fees charged for the release of data shall be established by the Minister of the Environment.

Evaluation: At the moment the data of biological diversity monitoring are stored in the Center of Information and Technology of the Ministry of Environment in the form of different data files not incorporated into a uniform database. The data on monitoring of biological diversity are also stored in institutes conducting the monitoring and in actual monitoring agencies.

Necessary activities:

- Creation of a central national register for storing *inter alia* data on monitoring of biological diversity, and subsequent incorporation of this register into Estonian Information System of Biological Diversity.
- Education of local authorities about the need for biological diversity monitoring in accordance with current legislation.
- Establishment of a system for issuance of monitoring data and determination of respective service charges.
- To meet public interest data about monitoring biological diversity should be made generally available. In order to achieve this, the Centre of Information and Technology of the Ministry of Environment should periodically publish printed material about the biological diversity status of Estonian nature (at national, regional and local level). Such printed material may be in an electronic form.
- The above issues should be regulated with a decree adopted in line with the law on monitoring.

Copyright Act

In the gathering of biological diversity data outside of the national program copyright legislation should be observed and, if necessary, charges and fees should be payable for data also. The requirement of reference to the source of data should be taken into account in publication of the data.

Databases Act

In creation of the main national register the provisions of the Databases Act are to be adhered to. At the same time all existing biological diversity databases of national and local importance are to be re-evaluated bringing them into accordance with requirements set forth in the said act, which significantly simplifies organised storage, processing and publication of data.

3. Subjects and objects of biological diversity information

The main target groups of biological diversity information are planners, thus also local authorities and conservationists. More indirectly an equally significant target group includes land owners and entrepreneurs who are also directly involved with planning. At the national level segmental target groups from other ministries should be kept mind.

A questionnaire conducted among different target groups in the beginning of 1998 demonstrated that the existing amount of information about natural diversity is insufficient and that there is an urgent need for further data. Need for information about biotopes/habitats was evaluated as greatest.

Thus indicator species used in habitat monitoring should be used as a basis for applied research conducted to define the quality parameters of particular habitats; in parallel local authorities are to be educated to be able to evaluate the indicators.

Environmental Monitoring Act

Art. 4. Environmental monitoring carried out by local government

(1) A local government shall carry out environmental monitoring to perform the functions imposed on the local government by law or to organise the activities of the local government. Environmental monitoring carried out by a local government shall be financed from:
   1) allocations from the state budget for specific purposes intended for the local government;
   2) the city or rural municipality budget;
   3) the Environmental Fund.

(2) Environmental monitoring which is carried out by a local government and is part of an international program shall be financed from the budget of the program.

(3) the basis for environmental monitoring carried out by a local government shall be the environmental monitoring program of the city or rural municipality. The procedure for implementing the environmental monitoring program and for processing and storing environmental monitoring data collected on the basis thereof shall be established by the local government.

Evaluation: At the moment environmental monitoring conducted by local authorities is not based on any specific program. The storage and processing of data originating from studies of biological diversity organised by local authorities is neither uniform nor systematic.

Necessary activities:

- To draw up a plan for environmental monitoring by local authorities that would be based on a compatible national program.
- To set up a national meta-database comprising the databases of biological diversity which would contain data collections of local importance and their data structures, thus improving accessibility and usability of data.

IV ANALYSIS OF THE STATUS OF BIODIVERSITY PROTECTION IN DIFFERENT SECTORS AND MAIN OBJECTIVES

4.1. GENETIC RESOURCES AND BIOTECHNOLOGY

1. Genetic resources: concepts

The Convention on Biological Diversity (CBD) defines genetic resources as genetic material including all kinds of material of plant, animal and microbial or other origin containing functional units of heredity (art.2.) On the basis of appendix 1 of the CBD, in addition to ecosystems and habitats and species and communities, "described genomes or genes of social, scientific or economic importance" are also components of biological diversity.

On the basis of appendix II of the CBD the objects of the current chapter are "genetic resources" and topics associated with their conservation:

1. *Domesticated or cultivated species* (art.2; art.9). The CBD states that facilities for their conservation and research must be established and maintained preferably in *their country of origin* (art. 9(b)).

Here the problems associated with the in situ conservation of Estonian cultivated plant species and animal breeds will be dealt with.

2. *Gene-banks, bacterial and micro-fungal cultures, virus strains, animal and plant cell cultures*. The CBD states that facilities for their conservation and research must be established and maintained preferably in their *country of origin* (art. 9(b)).

Under this heading the existing biological collections in Estonia, as well as the problems associated with their compilation, maintenance and proprietorship, are analysed. In addition to the genetic material of cultivated and wild plant and animal species of Estonian origin the problems of collecting and preserving human genetic material are also considered here. Regarding collections, terms in the current chapter are used in the following sense:

An *article or item or specimen* may be any thing of biological origin which is preserved in a collection.

A *collection* is a set of articles/ items/ specimens.

Biological collections are zoological collections, herbaria, bio-banks, etc

The general term *"bio-bank"* is used to denote gene-banks and collections of bacterial and micro-fungal cultures, virus strains, and animal and plant cell and tissue cultures.

A *gene-bank* is both a collection of genes as well as a collection of data about genes. In the latter sense the term "bio-data-bank" is also used.

3. *Genetically modified organisms or GMOs* (art.8(g)). On the basis of the CBD every contracting party must legally regulate the release of GMOs into the environment and establish a national and international framework for information exchange about these. The CBD foresees the establishment of national GMO registers to fulfil the latter obligation.

The current chapter discusses the preparation of the relevant legislation in Estonia and questions concerned with its administration.

Improving "Access to genetic resources" (art. 15.) is a separate topic in the CBD. In this field the CBD specifies actions concerned with:

- keeping registers

- compiling and keeping collections
- collecting and transmitting information

An overview of the biological collections held by various institutes in Estonia, and their condition, is presented in this chapter.

Art. 16 of the CBD discusses the transfer of biotechnology and the need for sufficient investment, taking into account all the rights to genetic resources and technologies. In this field, questions associated with patent and intellectual property rights are of essential importance. *Education, research and training* (art.12(c).) in the field of genetic resources and biotechnology are also important priorities in the CBD. The need to use scientific advances is stressed.

Bio-technologies and the research and development work associated with them are analysed in the second part of this chapter.

In Estonian legislation, only the Sustainable Development Act (RT 1 1995,31,384) defines the fundamental principles of conservation of biological diversity. These include:

- Protection of natural species on as low a taxonomic unit level as possible in order to preserve all species, if possible;
- recording of local cultivated plant varieties and domestic animal breeds and the conservation of their genetic information in databases, for all varieties and breeds, if possible;
- specification of genetic material of social, economic, or scientific importance.

The current chapter analyses the obligations arising from both the CBD and the Sustainable Development Act and the status of their implementation.

2. The current situation and problems associated with the collection and conservation of genetic material from cultivated plants and wild plant and animal species.

During the last decade the conservation of biological diversity, including the creation of gene-banks and the long-term conservation of genetic resources, have been the focus of a great deal of attention throughout the world. It has been realised that, in addition to endangered species, cultivars and varieties of cultivated plant species also need to be "saved" and preserved. Continuous work, effective breeding and the conservation of genetic resources are necessary in order to ensure that plant breeders will be able to supply competitive high yield varieties suited to local conditions. Genetic resources include cultivars, local varieties, and the wild varieties of these species.

Overview of the status and condition of biological collections

From a general scientific point of view the following aspects should be stressed:

1. the collections are a database for research into the species diversity of world ecosystems since they cover very extensive areas;
2. considering the rapid development of molecular-biological methods the relative importance of the collections (primarily herbaria) as initial data sources for research will grow;
3. herbaria and collections of live fungi cultures are sources of material for research in fungal systematics and particularly in molecular systematics, and are a gene-bank containing potential source material for biotechnological work;

4. the collections contain source material for monographies on fungi of the world and especially of the boreal zone of the northern hemisphere, and also about the spread of plant and fungus diseases;
5. collections contain information about the incidence of Red Data-book species.

From a local aspect:

1. we are dealing in fact with an archive which can be used by researchers now, and in the future, containing information about the changes which have occurred in Estonian nature during the past 50–100 years;
2. most of the monographies and handbooks written about Estonian wildlife (the 11 volume "Flora of the Estonian SSR", taxonomic guides, the Estonian Red Data-Book, handbooks on Estonian fungi, butterflies, *Coleoptera* and other animals) have been compiled on the basis of these collections;
3. concerning cultural history, we should mention the historical herbaria in museums and biological stations and the personal collections of many famous naturalists.

Over the years many rich biological collections have been put together in Estonia, which are not protected by any law. Furthermore there is no such notion as "biological collection" in current Estonian legislation. The Museums Act (RT I 1996,83,1487) refers only to those institutions whose function is to "collect, study, and preserve items of cultural value connected to man and his environment". Estonian universities and scientific establishments every day collect, and have collected for decades, a significant quantity of genetic material (biological collections). Since the Museums Act is the only act which refers to collections, if an establishment's charter does not specify its role as a museum of biological collections, then the Museums Act cannot impose any legal right or obligation to collect and preserve material, collected during scientific programmes or projects, as a museum collection. According to the Government of the Republic Regulation No. 31 of 11 February 1997, there are 11 national museums in Estonia, including the Estonian Natural History Museum.

Written or digitally collected and recorded data is dealt with in the Data Collections Act (RT I 1997,28,423). This act could theoretically also encompass some biological collections, for instance a portion of gene-banks or the so-called bio-data-banks. However the act does not consider data collections which are maintained and used for scientific purposes.

Therefore it is very important to work out legislation which applies to biological collections.

3. The development of biotechnology as a scientific and industrial sector in Estonia

Biotechnology is one of the most modern and rapidly developing industrial sectors in the world today and is the result of fundamental research achievements in many different fields of science. In the developed countries of the world biotechnology as an industrial sector is providing more and more new jobs and is a significant contributor to export growth. The most influential branches of biotechnology are primarily genetic technology and environmental technology, which have a great potential for raising the quality of life through advances in medicine, agriculture and environmental protection. However, due to the highly scientific nature, technological complexity and rate of development of biotechnology the potential dangers it may pose to the environment and human health are also very difficult to predict. Therefore the preparation and implementation of biotechnology strategies is of great significance for environmental protection and health protection related fields. As an example we can take Canada. There, a national biotechnology strategy, which covers the whole spectrum of

issues concerned with biotechnology, from education and research to environmental protection and public education and participation, has been prepared.

In Estonia, fundamental biotechnological research has been carried out over more than 10 years. Biotechnology as an industrial sector has not yet evolved in Estonia. There is awareness of and interest in the development of biotechnology in Estonia on a governmental level. Genetic and environmental technology have been recognised as priorities for Estonian scientific research. There is a technology centre at Tartu University, two large departments (of five) of which are: Genetic Technology and Environmental Technology. A genetic technology centre has been created at the faculty of chemistry at the Tallinn Technical University. The Estonian Bio-Centre in Tartu and the Institute of Chemical and Biological Physics in Tallinn are closely associated with biotechnological research projects. Gene and cell technology advances are also used in the new Biomedicum of the faculty of medicine of Tartu University.

Tartu University has in the last decade started to offer higher education in biotechnology. A biotechnology department has been opened within the Institute of Molecular and Cell Biology. Since biotechnology cannot exist without knowledge of classical molecular-biology and genetics, the whole Institute (8 departments in all) can be viewed as a single organisation providing biotechnology education. Tallinn Technical University offers courses in genetic technology. Teaching is carried out primarily by the three departments of the Genetic Technology Centre. These are the departments of Genetic Technology, Molecular Diagnostics, and Molecular Biology.

In Estonia, genetic technology research is carried out in both Tallinn and Tartu. In Tartu this is done primarily at the Institute of Molecular and Cell Biology of Tartu University. On the initiative of professors M. Ustav and A. Metspalu, independent laboratories have been set up in recent years; these are concerned with human hereditary diseases and molecular diagnostics of human pathogenic bacteria and viruses. The uses of plant and animal genetic technology are being developed at the Estonian Agricultural University. Genetic technology has been studied in Tallinn for 15 years at the Institute of Chemical and Biological Physics. In the laboratory DNA diagnostics methods and immunodiagnostics have been developed together with the formulation of the respective antibodies. One of the avenues of research at the Genetic Technology Centre of Tallinn Technical University is the search for genetic technology solutions to the problems of plant disease research (especially viral diseases) and control. Genetic technology methods are used to breed new plants, including field crops.

Cell technology discoveries are used in both the Institute of General and Molecular Pathology at Tartu University as well as in the Estonian Agricultural University.

The large-scale cultivation of bacteria and animal cells is modelled at the Institute of Chemical and Biological Physics with the aim of making biomass production more efficient. Bacterial cultures are also used in environmental technology solutions, e.g. in bio-remediation where bacterial cultures are used in the cleaning of both wastewater and polluted soil.

Environmental biotechnological developments are associated with the Institute of Molecular and Cell Biology at Tartu University. A technology that has already been used for five years in Põlva for the biological removal of phenolic compounds from the wastewater of a timber glue lamination plant was devised at this Institute.

The use of methods associated with in vitro fertilisation in animals and humans can only indirectly be associated with biotechnology. Sperm banks have been set up in Estonia for the in vitro fertilisation of animals. In humans, in vitro fertilisation is carried out at many clinics. It should be stressed that in no way is this associated with human cloning. In vitro fertilisation is the imitation of natural processes in cases where parents cannot have children naturally.

4. Genetically modified organisms and their use

One of the stipulations of the CBD is the regulation of the use of genetically modified organisms (GMOs). The Republic of Estonia has undertaken to harmonise its legislation with that of the EU by the year 2003.

In EU legislation this field is regulated by a number of directives – European Council Directive 90/219/EEC and 90/220/EEC (Fig.1.) The first of these regulates the *intentional introduction of GMOs into the environment and their marketing;* and technical progress has given rise to the Commission Directive 94/15/EC as the first amendment to this. These directives regulate the presentation and transfer of information about GMOs and specify precise rules for the introduction of GMOs into the environment and for their marketing.

The use of GMOs in closed conditions is regulated by EU Directive 90/219/EEC (amended 98/81/EC) which stipulates the use, conservation, cultivation, transport, storage, and destruction of GMOs in conditions where physical barriers or a combination of physical, chemical, and/or biological barriers are used to restrict contact between GMOs and the population and environment. The classification of GMOs (4 classes) is based on their potential risk to cause disease and spread in the environment. A Biosafety Protocol has been devised within the framework of the CBD to regulate the international trade and transport of GMOs. Due to differences of opinion between the contracting parties of the CBD this protocol was not ratified at the last conference in February 1999 in Cartagenas, Columbia.

The use of GMOs can be divided roughly in two: use for scientific purposes and for industrial (including agricultural) production. The use of GMOs to develop pesticide and virus resistant grain and vegetable varieties and their cultivation in nature as well as the use of GMOs for food production and in food itself has been met with fierce public reaction throughout the world.

In Estonia the use of GMOs is regulated by several acts:

- The Introduction of Genetically Modified Organisms into the Environment Act (RT I 1999,10,151);
- The Seed and Propagation Material Act (RT I 1998,52,771);
- The Food Act (RT I 1999,30,415);
- The Environmental Control Act (RT I 1997,86,1460).

The introduction of GMOs into the environment is regulated by the Act passed on 12 January 1999 (RT I 1999,10,151), which is in accordance with the EU directive 90/220/EEC and regulates the intentional introduction of GMOs into the environment and their marketing. The Environmental Control Act (RT I 1997,86, 1460) has assigned the task of monitoring the introduction of GMOs into the environment to the Environmental Inspection.

In order to implement the act on the introduction of so called GMOs into the environment the following lower order legislative acts are being prepared in 1999:

- Government of the Republic Regulation " The setting up of the genetic technology commission and the endorsement of its statute";
- Government of the Republic Regulation "Establishment of the genetically modified organisms registry and endorsement of its statute";
- Minister of the Environment Regulation "License form for the introduction of genetically modified organisms into the environment and their marketing";
- Minister of the Environment Regulation "An amended list of information to be presented together with a license application, and the application form".

The preparation of the draft bill for the regulation of the use of GMOs in closed conditions according to EU directive 90/219/EEC will probably be assigned to the Work Environment Department of the Ministry of Social Affairs to be completed in the year 2000.

Although there was no legal framework for the production and marketing of GMOs in Estonia until the adoption of the GMO act (1999), the Seed and Vegetative Propagation Material Act (RT I 1998,52,771) required the labelling of the retail packaging of certified genetically modified seed and vegetative propagation and cultivation material with the letters "GMO". In the absence of a national database there is no information about the use of GMOs in industry and agriculture nor about the enterprises which use them.

GMOs are used in Estonia primarily for fundamental research work. The three most important establishments where such research is conducted are the Estonian Bio-Centre, the Institute of Molecular and Cell Biology at Tartu University, and the Genetic Technology Centre of the Institute of Chemical and Biological Physics. Work on the applied aspects is carried out at Tartu University in the Genetic Technology Department (GTO) of the Technology Centre and in the Genetic Technology Group of the Environmental Technology Department (KTO GTG). The strategic activities of the GTO are focused on technologies which can be used in gene therapy, gene vaccination, and the identification of genes and contagious diseases, also on the development of technologies which are used in gene diagnostics and genome analysis. One essential avenue of research is transgenetic animal technology, which enables diseases and gene functions to be studied in a defined model system. The genetic technology sub-section of the KTO is investigating the ability of microbes to consume aromatic compounds. Theses aromatic organic compounds are common by-products of the chemical industry, which pollute the environment. Some micro-organisms are capable of using these "pollutants" as sources of energy for their own needs. Therefore their investigation is important not only from a theoretical scientific aspect but also for the development of new methods for the cleaning up of pollution.

The search for naturally occurring microbes with modified metabolism strings is also an essential component in the investigation of the biodegradative paths of microbes. There is a sufficiently good overview of the use of GMOs in academic institutions; only information about smaller research laboratories is missing. There is, however, a complete lack of information about the use and planned use of GMOs in private enterprise. In the experimental manufacturing section of the Agrobio Centre, the vaccine "tuberculin" is manufactured for use by livestock breeders.

The use of GMOs in food is regulated by the Food Act (RT I 1999,30,415). Paragraph 13 discusses "novel foodstuffs" which include foodstuffs "...which have not been used extensively as food before and which contain or consist of genetically modified organisms, or which are produced by GMOs but do not contain them...". The law requires that novel foodstuffs be investigated and evaluated in regard to the respective standards and that a license for their processing be obtained from the Veterinary and Food Inspection.

5. Veterinary biotechnological research and experimental production in Estonia

Already during the previous century the Tartu Veterinary Institute of the time was dealing with the formulation of several original veterinary microbiological preparations. Until 1940 the National Serum Institute in Estonia was concerned with the formulation and production of veterinary and medicinal serums and bacterial preparations such as Tuberculin, Mallein, and BCG vaccine. *E. coli*, streptococcus, staphylococcus, and other anti-serums were manufactured at the Insitute in a sufficient quantity to meet national demand.

In 1987 the Estonian Agrobio Centre (EABK) was founded to:
1) formulate the vaccines and serums necessary for the immunisation of animals against contagious diseases;
2) devise modern equipment for the diagnosis of contagious diseases;
3) formulate biological preparations which promote the growth and development of livestock.

The vaccines and tuberculins produced at the EABK completely meet the needs of Estonian livestock producers.

In the last ten years the incidence of tuberculosis among the human population in Estonia has doubled and the trend is continuing. In the light of the fact that the infectious agent for human and animal tuberculosis is the same (M. *tuberculosis* and M. *bovis*) the effective diagnosis of tuberculosis in animals is of particular importance. In 1995 and 1997 tuberculosis in chickens was diagnosed in the myco-bacteriosis laboratory of the EABK. The EABK co-operates with the tuberculosis reference laboratory of Tartu University Lung Clinic and has forged ties with the Danish National Serum Laboratory.

A *mammalian tuberculin manufacturing technology* has been devised at the EABK and was taken ito use in 1995. The experimental production of this meets national demand. In order to increase the effectiveness of the preparation, the optimisation of the cultivation conditions of myco-bacteria on synthetic culture is of essential importance. Technology for the manufacturing of tuberculin for birds is in the final stages of development.

The EABK has specialised on the formulation and experimental production of so called local vaccines. This enables effective immunisation to be carried out. In co-operation with other research establishments it has become possible to formulate some new generation vaccines on the basis of recombinant DNA technology. Looking to the future, it will be necessary to develop combined vaccine production technologies for the production of recombinant genes on the basis of bacterial antigen determinants.

The development of research into veterinary vaccines and diagnostic agents and the expansion of their production could be one potential avenue of development for applied biotechnology, as well as their inclusion in prospective national programmes.

6. Legal protection of industrial property

Of the biological resources discussed, the Patent Act (RT I 1994,25,406; RT I 1998,74,1227) enables new micro-organisms (including genetically modified organisms) and their uses to be protected as inventions. It is also possible to protect other inventions associated with biotechnology, including the use of well known micro-organisms for a new purpose (Patent Act §6, subsection 1). the protection of new micro-organisms was given a legal basis in 1996 when the Republic of Estonia signed the 1977 Budapest agreement on international recognition of the deposition of micro-organisms for patent assessment (RT II 1996,14/15,49).

Therefore, Estonian legislation in principle affords appropriate legal protection to the owners of all biotechnological inventions. Nevertheless the Patent Act §7 p.1. states that inventions which violate the norms of public order and morality will not be afforded patent protection. This clause enables protection to be refused for such technical solutions which endanger biological resources. This clause can also be applied to inventions which are associated with the cloning of humans and other organisms if it is considered necessary to prohibit these. The Patent Office has declared that the prohibition

of the formulation and use of such technological solutions should be regulated by other legal acts. For instance, the protection of plant varieties and animal breeds is regulated by other acts: the Plant Variety Protection Act (RT I 1998, 36,553) and the Livestock Breeding Act (RT I 1998, 12,154) respectively.

The Patent Act foresees the limitation of the rights of the patent holder through the compulsory issue of licenses in cases where the patent holder does not use the patent him/herself and does not grant licenses for its use by others, thus deliberately hindering the development of a particular field. This clause can be used in regard to inventions which are important to Estonia from a biological resource development or conservation aspect and the patent holder attempts to block a whole field using his/her patent protection rights. In addition to the above the Patent Act does not permit, §16 subsection 3, the patent holder to use his/her patent rights to hinder scientific research work in important fields associated with biological resources. The Patent Office is of the opinion that questions in the CBD which deal with payments for the use of biological resources, including for the use of inventions, should be regulated by the Liability Law Act or by some other act which deals with contract law.

By November 1998, 32 applications for the registration of micro-organisms, i.e. code C12N according to the international patent classification index, had been received in the period 1994–1998 by the National Patent Register, which is maintained by the Patent office. The 32 applications mentioned are international applications (according to the patent co-operation agreement of 19.06.1970), i.e. the application for patent registration to the Estonian Patent Office has been made by a foreign party. For instance, among the international patent applications there are 12 patent holders whose patent has been issued in the USA, 6 have been issued in Germany, 6 in Sweden, 3 in Finland, 1 in Denmark, 1 in Belgium, and 1 in Andorra. No applications have been received from Estonian inventors – probably since inventors are interested, above all, in registering their patent in such countries that have industries which may be interested in the use of micro-organisms.

7. Summary, assessment and objectives

On the basis of the above, **five principal conclusions** can be drawn:

1. There is a lack of legislation and lower order legal acts to regulate the conservation of genetic resources, including the creation and conservation of collections and the dissemination of information. There is no national system or associated funding aimed at creating and preserving gene, cell, and tissue culture collections.
2. Responsibility for activities to preserve genetic resources is shared by many different sectors and activities are uncoordinated and ineffective.
3. The conservation of Estonian plant varieties and animal breeds must be dealt with more actively and effectively. There are 13 local breeds registered in Estonia at present.
4. Although the Government of the Republic has declared biotechnology to be a priority, no steps to ensure the preferential development of this field have been taken. The Estonian Biotechnology Strategy and Action Plan (EBST) should be prepared.
5. There is no national data bank of genetic resources and safe biotechnologies, (those which do not pose a threat to the environment and to human health). The public is uninformed about the extent of the use of different GMOs in Estonia and about the potential risks to health and the environment.

On the basis of the above summary the working group defined three **objectives**;

1: Ensure the in situ conservation of genetic material in Estonia and the collection, systematisation, and general dissemination of information pertaining to this (based on conclusions 1,2, and 3).
2: Ensure a higher standard of scientific research and development work associated with the formulation of biotechnologies, safe in regard to the environment and human health (based on conclusions 4 and 5).
3: Promote the introduction of biotechnologies, safe in regard to the environment and human health, in industry and agriculture (based on conclusions 4 and 5).

4.2. EDUCATION

1. The role of the general education system in protecting and introducing the principles of biodiversity.

According to the Estonian Education Act, the education system in Estonia is divided into general, vocational and special interests education. This is supplemented by adult education.

Legislation which regulates education:

- Education Act of the Republic of Estonia (RT 1992, 12, 192);
- Basic and Upper Secondary Schools Act (RT I 1993, 63, 892);
- Private Schools Act (RT I 1993, 35, 547);
- Vocational Education Institutions Act (RT I 1998, 64, 1007);
- Institutions of Applied Higher Education Act (RT I 1998, 61, 980);
- The Universities Act (RT I 1995, 12, 119);
- Adult Education Act (RT I 1993, 74, 1054);
- Organisation of Research and Development Act (RT I 1997, 30, 471)

The handling of the subject of biodiversity in schools is associated with natural science subjects, primarily with the teaching of nature studies, biology and geography.

The national curriculum, which became effective in September 1997, establishes the minimum and maximum duration of the study period, school education goals, results, and topics. Each school is free to draw up its own curriculum and subject syllabi on the basis of the national curriculum. Schools also differ in the type and availability of textbooks and teaching aids. Since the Ministry of Education has favoured many different groups of authors and publishers of school textbooks, both when financing and recommending textbooks, and since the responsibility for purchasing textbooks has been placed on the local authorities, this has resulted in a situation where, due to differences in available choices and in financial means, different schools use different textbooks and even have different curricula and syllabi. In order to better implement an educational standard the state could promote and finance a single comprehensive range of school textbooks. State support to local authorities for the purchasing of textbooks and teaching aids is also very important. The purchasing of teaching aids (e.g. tissue samples, stuffed animals, herbaria, etc.) for Natural History and Biology teaching is essential. Currently there is no system equivalent to that for textbooks for the preparation and distribu-

Table 1. The education system in Estonia

Type of education	Level of education	Education type classification	Age of students (in years)	Education establishment type	Founder of education establishment
		pre-school education	0–7	Kindergarten	local authority, private individual
General education	Level I	basic education	7–15	Kindergarten–pre-school pre-school basic school	local authority, private individual, state
	Level II	general secondary education, vocational secondary education	15–17	upper secondary, vocational education institution, institution of applied higher education	local authority, private individual, state
Higher education	Level III	higher education	17–20	vocational education institution, institution of applied higher education; university	local authority, private individual, state legal person in public law
Vocational education	Level II + vocational, special, and occupational training	vocational secondary education	15–17	vocational education institution	state, local authority, private individual
	Level III + vocational, special, and occupational training	vocational higher education	17–20	institution of applied higher education, vocational education institution	state, local authority, private individual
Special interests education	0 – ~	special interests education	3–17	music school, sports school, craft centre, nature centre, creative centre etc.	state, local authority, private individual
Adult education	Levels I,II, and III + occupational training + adult further education level	occupational, and further educational	17 +	adult education establishment	state, local authority, private individual, legal person in public law

tion of such teaching aids. The biological collections (entomological collections, herbaria, etc.) in schools have mostly been founded on the initiative of the teachers themselves and are often not valued by school and local education administrators. Schools often relinquish old teaching aids too readily while new ones are expensive and local authorities do not have the financial means to supply them.

Therefore, it is necessary to construct legislation that would obligate local authorities to ensure that the schools in their jurisdiction are sufficiently well equipped with the teaching aids necessary for the teaching of environmental studies, including nature conservation topics. It is just as important to work out and implement a state support mechanism for the production of these teaching aids and to give local authorities and schools an opportunity to buy them.

According to the new national curriculum, Nature Studies is spread between several different subject-syllabi. The topic "environment" is one of the so called "integrated themes" in the curriculum, which means that environmental issues are taught in both the Chemistry and Physics syllabi as well as in Mathematics, Local studies, Geography, Music and other subjects. Schools and different subject teachers need methodological guidelines (e.g. teaching manuals) on how to present the topics of environmental and nature conservation within different subjects. Currently there are no such guidelines.

There is insufficient time within the normal school hours of general and vocational school students for generating interest in nature and for satisfying this interest. The state and local authorities should assist schools and the school administration should assist teachers in the organisation of field trips and camps, competitions, and Olympiads which promote respect for the environment and for nature and enlarge students' practical knowledge of nature. Outside school hours pupils should be able to pursue their special interests in a number of special interests schools.

2. The role of Nature Centres in the field of nature education

The extramural children's education establishments concerned primarily with nature education are: The Estonian Youth Special Interests Centre's TELO Nature Centre in Tallinn, Tartu Youth Nature Centre, and Pärnu Youth Nature Centre.

1. Nature centres are the main extramural children's education establishments dealing with nature education, but their activities are limited by a lack of funding.
2. There is no accurate information about the establishments dealing with extramural nature education, nor about the level of nature education in kindergartens.
3. Nature centres are classed as special interest schools by law, however, as the main architects of the environmental awareness of the next generation, they should not be equated with hobby and recreational activities.
4. Environmental education work is not sufficiently recognised or supported by the state.
5. The activities of nature centres could influence large target groups, for example: kindergarten teachers, kindergarten children, general and vocational school teachers, etc.
6. The nature education provided for Tallinn schoolchildren is inadequate.
7. There is no regional centre for environmental education in north-east Estonia, at the same time the demand for environmental education activities for Russian speakers is considerable and the current activities inadequate.
8. There is no overall centre providing information about environmental education matters (current projects, training, etc. and information about different environmental educators).
9. In order to make environmental education more effective it is necessary to receive regular feedback about children's and young people's environmental knowledge, attitudes, and values in different regions (using sociological surveys etc.).

3. Environmental (including nature conservation) education in Estonian universities.

1. Most Estonian higher education establishments and universities do not have compulsory environmental courses with an up-to-date approach and content, intended for all students.
2. Most of the courses on offer are descriptive and are aimed at describing the situation and informing the student. The educational technology they use is out of date.
3. New courses – Sustainable Development Strategy, Environmental Policy, and Environmental Management – are taught only to a few students, for instance at the Technical University, to future public administrators.

What needs to be done:

1. Introduction of a compulsory course about the environment into all university curricula. The content and teaching materials of the course could be prepared by specialists from the universities. The content of the course should be adaptable to suit the needs of different specialities.
2. Organisation of the preparation (compilation and translating) and regular updating of course materials of modern technical design.
3. Treatment of environmental education as an integrated whole from school through higher education (university) to practical employment (further training!).
4. Researching of ways to improve the effectiveness and success of environmental education.
5. The extension of environmental education related co-operation in Estonia as well as on an international level.

4. The role of non-governmental environmental organisations (NGO) in the implementation of the Convention on Biological Diversity.

Estonian non-governmental environmental organisations or non-profit organisations dealing with environmental protection could be responsible for a large share of the work to raise general public awareness and spread information. In the register, based on the results of a survey by the Regional Environmental Centre for Central and Eastern Europe (REC), 125 Estonian non-profit organisations, with the dissemination of environmental or nature education included as a sphere of activity in their charter, are listed. This is a potential force, which can and should be harnessed and directed in the task of informing the public about important environmental policy issues. These organisations also include school clubs but mostly we are dealing with adults who have a common interest in a particular subject. The membership of NGOs also includes a large number of competent specialists who have been responsible for carrying out high quality research work and other projects, financed from funds and other non-governmental sources.

It is also essential to note the co-operation between NGOs and the joint projects undertaken with sister organisations abroad, and the campaigns, to solve specific environmental protection related problems, initiated by the large world-wide environmental organisations such as the European Environmental Bureau, EEB and Friends of the Earth FoE.

The issues raised by the convention on biological diversity are closely related to all the other fields of environmental protection and offer a multitude of topics for NGO projects. There are NGOs in Estonia for whom the protection of biological diversity is a primary objective (the Estonian Fund for Nature, the Estonian Ornithological Society, the Estonian Naturalists Society), and others whose impact on the protection of natural diversity is indirect since they promote sustainable transport, energy, agriculture, etc. At the same time, there are topics included in the convention with which Estonian environmental organisations have not dealt to any great extent – e.g. the subject of genetically modified organisms. The Estonian Green Movement touched indirectly on this subject in a project whose primary goal was to evaluate how different public institutions answer to questions and letters from the general public and from environmental organisations.

Apart from the dissemination of information and participation in projects there is also a third level: the highlighting of environmental violations through the courts. Estonian environmental organisations have not participated in these activities until now, but they have already been reminded of this on an international level.

5. Environmental education goals within the Estonian Environmental Action Plan and their funding.

According to the Estonian Environmental Strategy (1997) and the Estonian Environmental Action Plan (1998), the conservation and protection of biological diversity and public awareness work are closely interwoven activities.

Goals and activities associated with environmental education (including nature education) can be found in the main section of the Estonian Environmental Action Plan (KTK) under main goals 1 and 9 but also in more detail under goal 10.1. For main goal 1 " The promotion of environmental awareness and environmentally conscious consumption" and main goal 9 "the conservation of landscape and biological diversity" the following number of short-term (until the year 2000) and long-term (until the year 2006) activities are listed:

Main goal	Number of activities
"1"	67
"9"	117

The more detailed goal 10.1. states as its aim, the development of an environmentally friendly life style and the protection of the traditional cultural environment. The KTK for-sees the following activities for the conservation of biological diversity: the improvement of landscape and biological diversity protection education, research, and the system of raising public awareness; the development of an environmentally friendly lifestyle, and the conservation of the traditional cultural environment; to achieve these the KTK describes 14 short-term activities in the first paragraph and 5 in the second one, to be completed between 1998 and 2000.

The activities in the next three years embrace both further training, education programmes, the founding of faculties of nature protection at universities, public opinion surveys, and the working out of sustainable development principles in different sectors.

The role of the Ministry of the Environment and the Estonian Environmental Fund is to ensure both the protection and conservation of biological diversity and, in connection with this, to also finance two specific programmes: 1) The promotion of environmental awareness and inclusion of the public in the programme, and 2) The landscape and wildlife conservation programme. The Ministry of the Environment and the Estonian Environmental Fund finance nature education, training and information services both from the state budget as well as via the Environmental Fund. Estonian Environmental Fund scholarships have been introduced to encourage pupils or students to study natural and environmental sciences. In addition, funding has been made available to enable students and teachers to participate in international conferences and exhibitions, to conduct studies of the local environment and also for the setting up of nature clubs in various Estonian schools. Assistance in the creation of new courses ("Landscape protection and maintenance" and "Landscape architecture" at the Estonian agricultural university) is also an essential activity.

Environmental promotions and publicity campaigns have been carried out in co-operation with NGOs.

It is essential for biological diversity protection that officials and specialists receive further training. One of the most valuable projects has been the LIFE Estonia Programme Office project "The implementation of the Convention on biological diversity and the Sustainable development act, in Estonia". The project was financed by the EU through its LIFE programme from 01.01.1996 to 31.08.1998. The project was also supported by the Ministry of the Environment and by the Environmental Fund.

The aim of one biological diversity sub-project was to introduce EU directives 79/409/EEC and 92/43/EEC (Bird and Habitat directives) and their requirements to officials from Estonia and the neighbouring countries, and also to provide the knowledge and skills necessary for their implementation. Four training courses (with 45 to 66 participants), which concentrated on the implementation of EU habitat and bird directives and the development of the NATURA2000 network, were held for nature protection officials and experts. In 1999 the Ministry of Education intends to create a new state-run structure in its jurisdiction, the Environmental Education Centre. The purpose of creating the centre is to develop the environmental awareness of the public and with this to assist in the implementation of the Estonian environmental strategy and national action plan.

The Estonian TV educational programmes "Osoon" and "Environmental News" and Estonian Radio nature broadcasts promote and provide information about nature protection.

TV and radio presenters and translators of films and books bear a large responsible for the appropriate presentation of environmental issues. Navigation of the ever increasing deluge of incoming information in this field requires a lot of work on the part of journalists, translators and editors, but also a sense of responsibility in the presentation of problems and in the use of correct terminology. Training courses in environmental and nature protection issues would be of great benefit for TV and radio journalists.

If we analyse the short-term activities in the Estonian environmental action plan – 1998 to 2000 (9.3.), we will see that the execution of many of the activities listed has already been financed from the national budget and by the Environmental Fund. We need a more thorough analysis of the results and effectiveness of the activities in the Estonian Environmental Action Plan.

6. Assessment of natural history education in Estonia in regard to the responsibilities imposed by the Convention on Biological Diversity

On the basis of what has been described above we can state the following:

1. Environmental education (including natural history) is not sufficiently well recognised on a national level in Estonia. The low priority of environmental education is illustrated by the fact that most political parties do not have their own environmental policy conception.
2. Many schools do not have sufficient teaching aids and the ones they do have are not valued highly enough.
3. School curricula do not include nature study days while sports days are included.
4. Present working practices in schools do not promote the further training of teachers including further training to improve natural history teaching skills.
5. The pupils of Russian language schools do not receive enough instruction about Estonian nature. There is a great shortage of specialists in teaching methods, of teachers with a good knowledge of Estonian nature, and of textbooks.
6. State financing of environmental education is not open enough; information about the funding principles has not been made public.
7. Education orientated towards biological diversity goals is unavailable in higher education establishments; there is no biological diversity convention module and no degree course.
8. The incompetence of journalists and translators (incl. film and book translators) in the field of nature conservation is worrying. At the same time scientific consultations on nature are not considered important.

9. The activities of special interests schools concerned with nature education are not highly valued on a national level. The situation in Tallinn is particularly regrettable where the TELO Nature Centre has been under-financed for a long time.

Objectives:

1: To create a national system of environmental (including nature) education, and financing for this.
2: To ensure that education establishments are sufficiently well supplied with teaching aids and that these are properly maintained.
3: To ensure that the subject of biological diversity is included in teacher training and in teachers' and school administrators' further training programmes.
4: To promote the integration of environmental topics, including biological diversity, into the curricula of different types of schools and pre-school education establishments, and into different school subject syllabi.
5. To promote the inclusion of the subject of the environment, including biological diversity, in all university and institution of applied higher education course syllabi.
6: To achieve a higher level of nature education and practical knowledge of Estonian nature among the population.
7: To promote the development of a network of extramural nature education establishments throughout the country.
8: To promote the activities of public organisations in the field of nature education.
9: To promote a nature-conscious lifestyle among the population through the media.

4.3. LANDSCAPE AND ITS PLANNING

1. The sources of Estonian landscape diversity

Estonia has a great diversity of landscapes for the size of its territory. The sources of this diversity are differences in:

1) the geo-chemical and physical properties of the geological base and surface substrate layers
2) the variability of the thickness of the surface substrate (surface forms)
3) the distance from the sea and height above sea level (climate)
4) hydro-thermal conditions
5) the condition of natural vegetation
6) the development stages of ecosystems
7) the effects of human activity.

As a rule, the greater the variety and height differences of surface features in an area, the more diverse and varied the waters, soils and plant communities.

Landscape diversity may be understood as *the complexity of the landscape pattern or picto-structure which is created by the alternation of different strip and spot features (strips of woodland, groups of trees, and trees) of different scale landscape units and man-made elements (roads and buildings).* More diverse landscapes contain greater numbers of different valuable assets. A diverse landscape provides the necessary conditions for the growth of biological diversity in that area.

2. Landscape aspects requiring special recognition

Quality of life: The landscape as a healthy, clean, aesthetic living environment.

Economic value: Every part of a landscape possesses a certain potential for certain activities. These landscape properties and advantages may promote both the initiation and the cessation of economic activities primarily in the fields of agriculture, tourism and recreation.

Ecological value: A large proportion of ecosystem diversity is derived from the variability of landscape components – geological structure, relief, climate, water, and soil. Landscape diversity is created by the above landscape components and by natural conditions and past and present land use. Landscape diversity is the key to an area's distinctiveness.

Cultural and scientific value: The various farming methods and agricultural techniques implemented by human society over the centuries have left an impression on the landscape, thus making it a valuable source of local historical information. The landscape can also help us to discover the relationships between society and nature and the patterns of natural resource use.

Cultural and social processes bring about changes in human values, which in turn lead to the restructuring of the landscape.

3. The influence of changing land use on biological diversity

Man has partly shaped and modified the landscape over thousands of years and has created new landscape elements – agricultural coenoses, quarries, settlements, roads, canals, etc. have become essential landscape elements. In earlier times the human activities which changed the face of the landscape the most were the creation of land suitable for agriculture (both for farms and manors), the felling of forests, and the building of human settlements. Tourism and other recreational activities have generally affected the landscape to a lesser extent but their effect can still be significant in some natural beauty spots.

The factors affecting the structure of land use can be divided into three broad categories: **natural, political, and socio-economic**.

The following **natural** factors should be mentioned in Estonia: firstly, Estonia is divided into higher and lower Estonia according to the upper level of the local glacial lakes. Lower Estonia, which has been influenced more by glacial lakes and by the sea, is more marshy, more densely wooded and flatter than higher Estonia, which has been untouched by flooding from glacial lakes and the sea. The mosaic pattern of the landscape is particularly pronounced in the highlands of south-east Estonia. The other essential natural factor is the base rock – mainly Silurian limestone in northern Estonia and Devonian sandstone in southern Estonia. It is primarily due to the fact that the soils in northern Estonia are more alkaline and the ones in southern Estonia more acidic. The third essential natural influence is the climatic bio-geographical transition zone – *Estonia intermedia*, which divides Estonia into a maritime west and more continental eastern part.

Of the political factors affecting land use, the most important are land reforms, changes in social order, and urbanisation.

Two main **economic** factors which affect the pattern of land use should be mentioned – land drainage and the concentration of agricultural production in the soviet period. In Estonia the eco-

nomic value of landscapes has all too often been considered to be of primary importance and the landscape has been shaped with the aim of raising this value. This activity has caused the loss of many ecological and essential non-commercial natural treasures.

For centuries man has tilled the soil in order to grow food. As a result of centuries of uninterrupted land-use traditional agricultural landscapes have developed. The diversity of these landscapes, in turn, provides valuable habitats for many organisms which could not exist elsewhere. The intensity of land use is connected directly with the survival of natural habitats. The most important problems in this field are:

- The destruction of natural habitats through the intensification of land use.
- The disappearance of semi-natural habitats due to the cessation of active land management.
- The fragmentation of habitats.

The following principal trends can be observed in the development of the pattern of land-use during the current century:

Firstly, the shift of agricultural land-use from western Estonia to eastern Estonia following far-reaching political changes.

The second trend in land-use dynamics is the polarisation of landscapes. The general trend this century has been a fall in the proportion of agricultural land and a growth in the proportion of forested land. During this century the proportion of agricultural land has fallen from 65% in 1900 to 33% in 1992; in the same period the proportion of forested land has grown from 14% to 44%. This change has mainly occurred through the afforestation of natural grasslands. According to statistical data, agricultural land-use fell by 16% between 1990 and 1995 (1116.3 thousand ha. in 1990 and 935.0 thousand ha. in 1994). In addition to this a further 254,000 ha. of farmland remained unused in 1995.

The afforestation of land suggests the reversion of landscapes to a more natural state. In the soviet era agricultural land was increasingly intensively cultivated. Drainage robbed the huge fields, which had been created, of the last vestiges of naturalness. Most landscapes became more natural; at the same time agricultural lands became more and more unnatural. Fortunately this polarisation has led to the development of a network of compensating areas (ecological network). This hierarchical system compensates for the disruptions to natural matter and energy flows caused by man, and provides habitats for plant and animal species. The landscape structure, the articulation of the network on different levels, which has developed in Estonia today can be favourably compared with that in other European countries. The macro-elements of landscape pattern are massive support areas (larger nature reserves, extensive forests and mires). Macro-elements are inter-linked by a lower order ecological network. Nevertheless the survival of the network remains a problem in today's economic conditions.

The third main tendency in the development of land use is the wave-like movement towards the simplification of the landscape structure. Drainage and the intensive farming technologies of the recent decades encouraged the development of large uniform fields and straight lines in the landscape. Land, which was unsuitable for cultivation, was left aside and soon became afforested. The former small articulated pieces of farmland, which were separated at least by field margins, have been replaced with large uniform plains and cultivated pastures, especially in higher Estonia, and almost as extensive expanses of scrub. Therefore, on the one hand, a great deal of new fields have been created, but on the other about half of the former fields have become afforested.

The cessation of intensive land use leads to a steady rise in the emergence of more natural habitats. All the same, the fragmentation arising from the building of new roads and communications networks is a threat to the structure described above.

Landscape diversity trends in the near future. As we said, the structural changes of the landscape reflect the socio-economic processes occurring in society. The current re-privatisation of land and the rapid development of the private sector in the economy will certainly influence the pattern of land use in the near future and, through this, the diversity of the landscape. It is still too early to say what these changes will be. A growth in the proportion of land left fallow and of scrub-land is certainly to be expected in the coming years. The fragmentation of natural landscapes will increase with the building of new roads and communication networks. In rural regions, denser colonisation of low-density settlement areas, especially near major roads, is to be expected. Delicate coastal areas should be protected from extensive building. Despite the enforcement of the Act on Coast and Shoreline Protection, intensive building activities can still be seen in many coastal areas (the West Estonian islands and the areas bordering on Tallinn). The taking of peat into use as a local fuel may bring about considerable changes in mire landscapes.

Landscape diversity and its dynamics reflect to a large extent the socio-economic, political and cultural transformations in society. The present landscape pattern has developed over centuries, largely as a result of human activities.

4. Landscape use and protection. Planning

4.1. Landscape protection and management

In the period following WWII, the foundation for the creation of landscape protection areas in Estonia was laid by the third nature protection act, passed in 1957, namely the law on the protection of nature in the Estonian SSR. The first landscape protection areas were created on the basis of this act in the same year. In 1967, the Estonian SSR Council of Ministers commission on landscape protection and design was set up. The commission produced "the Provisional Guidelines for Landscape Protection and Design in the Estonian SSR". These guidelines were taken into use by design offices and other institutions for work involving the protection and design of landscapes. The functional zoning of Estonian landscapes was completed in 1982 on a scale of 1:200 000. More detailed functional zonings were produced for NE Estonia, the surroundings of Tallinn, and the western Estonian islands. In 1986, work was started on the new version of the guidelines. The result of the protracted work was a mechanically compiled collection of excerpts from official normative and advisory documents, which, in the absence of any practical application, was never implemented. When Estonia regained her independence, many legal acts concerned with landscape protection and design became ineffective. In the soviet times environmental-protection-orientated landscape design was carried out primarily on a micro scale (drainage projects, protection zones around water-bodies, etc.); on a meso and macro scale a conceptual approach was applied.

At the moment no Estonian legal act determines the need (not even in connection with other activities) to deal with Estonian nature protection or landscape maintenance as a wider issue. The main shortcoming of planning and building legislation is superficiality. Although the law stresses the need for balanced solutions and supports sustainable solutions it foresees hardly any grounds or actions in its individual provisions to support these solutions.

From a practical point of view the greatest shortcoming is that the need to work out additional grounds and guidelines which would help to direct planning activities is not laid down in law. If a society has practically no planning traditions and lacks the respective supporting concepts, trained personnel, procedures, adequate information, etc. then it is difficult to foresee the development of the

field of landscape analysis and planning. The immediate difficulties today are associated primarily with finding an adequate content for planning activities and the general organisation of such work. In this context the state's role in directing and analysing activities has remained modest. In conclusion, the people who actually carry out planning do so without both guidelines and motivation to analyse the environmental aspects in greater depth.

Actions should be planned over a longer term, which would support the harnessing of borderline disciplines between nature protection and planning on a modern conceptual basis. Basic education and further training need support; access to information in general must be simplified.

Current legislation regulates the protection and use of individual landscape elements (The Coast and Shoreline protection Act, The Forest Act) and defines the rights and obligations of land owners and users in regard to elements of the landscape.

The Protected Objects of Nature Act defines the types of protected areas: national parks, nature protection area, landscape protection area, and programme area. A landscape protection area is a protected area containing rare natural or traditional cultural landscapes or ones typical to Estonia, which has been created for nature protection, cultural or recreational reasons.

The protection of landscapes and ecosystems consists primarily of the conservation of their structure and functioning. In practice, the greatest possible diversity of ecosystems and landscapes is of primary importance in order that natural elements are able to compensate for the negative effects of environmental simplification.

The proportion of territory under protection in Estonia can be considered to be satisfactory (4 national parks and roughly 300 other protected areas cover nearly 10% of the territory of Estonia). In conditions of changing land ownership and the new economic situation the territories and zoning of the existing protected areas are being re-appraised and new protection rules and protection management plans are being drawn up.

4.2. Land policy

National land policy is a part of social policy. Land policy is the basis for all economic sectors which are directly tied to the land: agriculture, forestry, construction. The economic aspects of land policy can be regulated mainly via land prices and land taxes. Land policy is primarily land-use policy with which, on the basis of the country's historical background, the social, legal and economic relationships in the country are regulated. At every stage of the country's development, changes have also taken place in land policy; the main issue has always been the different interests in land ownership and land-use.

Today's land policy is characterised by the allocation of land ownership – returning of land to former owners, privatisation through sale, nationalisation and municipalisation of land.

National land policy has an important role to play in the resolution of environmental protection issues. This happens via the respective legal acts which safeguard and regulate land as real-estate. Land policy is influenced mainly by the following environmental aspects: soil conditions, groundwater quality, surface water conditions, the condition of livestock farms, hazardous waste. From now on we should take the aims of biological and landscape diversity conservation into account. The improvement of every factor requires knowledge of the effects and amplitudes of a whole host of subordinate factors, a rise in general landscape maintenance activities, and the protection of the existing (good) conditions. A great deal of attention must also be paid to the evaluation of all the pollution sources in Estonia and to the reduction of their negative impact. The condition of land no longer being used for agricultural production must be evaluated from an environmental protection point of view

and the possibilities for its use in the new production environment should be considered. For the return of land, 158,000 applications were made but the applications pertained to only 50% of the territory of Estonia. Unfortunately, reclaimed and non-reclaimed lands are often interspersed; this complicates the process of returning land and hampers its subsequent use.

Local authorities are the second level implementers of land policy. Legislation, which forms the basis for land policy implementation in rural municipalities has designated the municipality councils as the sole land policy implementers. The wide-reaching authority which the council wields in the realisation of land policy in the rural municipality is also stated in the Land Reform Act.

4.3. Planning and legislation

National laws regulate processes in all spheres of social life, including planning.

The Sustainable Development Act defines the fundamental principles of the national sustainable development strategy. In economic sectors and regions where the pollution of the natural environment and the use of natural resources may endanger the balance of nature or the maintenance of biological diversity development is controlled on the basis of a state initiated development plan.

Every planning act must consider:
- the fundamental principles of sustainable use of the natural environment and natural resources
- the obligations arising from international agreements
- the conservation of biological diversity

The Government is responsible for ensuring the conservation of biological diversity through a national programme and action plan, the compilation of which is financed by the state.

The Sustainable Development Act foresees the following actions for the conservation of biological diversity:
1) Protection of natural species on as low a taxonomic unit level as possible in order to preserve all species where possible;
2) the recording of local cultivated plant varieties and domestic animal breeds and the conservation of their genetic information in databases, for all varieties and breeds where possible;
3) the conservation of different ecosystems and landscapes and the creation of a system to compensate for the impacts of human settlement and economic activities on natural and semi-natural communities;
4) the specification of genetic material of social, economic, or scientific importance.

The Planning and Building Act (RT I 1995, 59,1006; 1996,36,738; 49,953; 1999,27,380; 29,398, 29,399) states that the purpose of the act is to ensure conditions which take into account the widest possible range of society's members for the transformation of the environment, its long-term sustainable development, the use of land and the interrelation of socio-economic and physical planning,.

The main principles in the act are defined as follows:
- mandatory plans for high density areas
- mandatory design criteria in low density areas
- mandatory public disclosure
- mandatory building design documentation and building permit
- mandatory permit for use

The same act defines the hierarchy of planning for different areas where each plan forms the basis for the next planning level.

Types of plans

National planning policy statement – an outline for the physical development of the territory of the state which is prepared for the entire territory of the state.

County plan – prepared either for the whole territory of a county or a part thereof.

Comprehensive plan – prepared for the territory of a rural municipality or city.

Detailed plan – prepared for a smaller part of a city or rural municipality and is the basis for construction activities in the short term.

According to the act the national planning policy statement, county plan and comprehensive plan must address:

- the formulation of the development strategy and concepts;
- the formulation/definition of the principles of long-term sustainable development and their interrelation with physical and economic development.

Each planning stage also includes more specific tasks, which have to be solved in the course of the planning work.

It is the task of the **national planning policy statement** to make proposals to ensure the conservation of various types of ecosystems and landscapes and to create a system of natural and semi-natural biotic communities to balance and compensate for the effect of human settlement and economic activities.

It is the task of the **county plan** to ensure the conservation of valuable arable land, landscapes and natural biotic communities, and to determine general conditions for the use of land and water areas and fundamental zoning principles.

It is also the task of the **comprehensive plan** to ensure the conservation of valuable arable land, landscapes and natural biotic communities, and in addition to establish general conditions for the use of land and water areas and general construction criteria for these, and to zone territories in order to determine the primary use of the territories or parts thereof.

Today, however, Estonian society has to face the fact that there are many different interest groups within the society, whose premises and views differ. According to the principle of democracy, everyone in a society has equal rights and the voice of every lobby group is of equal weight and must be taken into consideration. An area plan, too, can not demand that it be viewed only from its own perspective. The toleration and recognition of other opinions, and the ability to negotiate and search for common ground with someone representing a completely different or opposing view is a mandatory requirement for planning in an open society. A situation must be reached where planners do not view the plan as an authority in its own right but as an agreement between interested parties.

The objectives of planning are no longer self-evident; they need to be justified both within the open society itself and in international dialogue.

Planning and the Baltic Sea region

Estonia has been co-operating with the Baltic Sea countries for over five years. The region's joint project, which involves all the counties in the Baltic sea catchment area, bears the name "Vision and

Strategies around the Baltic Sea 2010".

The planning project is directed primarily at developing international co-operation. At the same time, attention is also focused on the preparation of national area plans and strategies and the decentralisation of planning on a county and primary local government level.

In the project the Baltic Sea region is divided into three elements:

- the system of human settlements (pearls)
- the inter-linking infrastructure networks (strings)
- different types of land uses in rural areas (patches)

The essential uniting principles are:

- **development activities**

create favourable conditions for the efficient use of the Baltic Sea Region's resources and potential
reduce insecurity for investors
facilitate the development of a wide spectrum of activities
help regions to develop on the basis of their specific strengths and potentials

- **environment**

shape an energy-efficient settlement structure
avoid non-sustainable land use
promote the use of environmentally friendly modes of transport
protect valuable environmental and nature potentials and promote biological diversity

- **freedom**

create conditions for the efficient supply of services and employment opportunities in all regions
ensure an adequate physical accessibility of these
facilitate a planning process with a high degree of local/regional participation
promote participation of people and businesses in the planning process

- **solidarity**

enable compromises between conflicting land use demands considering economic, social and environmental needs
reduce inter-regional discrepancies in living standards
establish a co-ordination system to balance regional and supra-regional demands
promote a development which is based on regional specific strengths and characteristics

5. Landscape maintenance

Landscape culture and the activity which produces it, landscape maintenance, occupy a central position in Estonian rural culture. Landscape culture can be viewed as an amalgamation of principles from different cultural spheres, which has arisen from landscape ecological, aesthetic, and traditional local knowledge.

In rural areas, spatial plans and economic development plans should be based on the need to preserve the area's ecological diversity, aesthetic values, and historical continuity. Landscape maintenance must be considered in all developmental activities (preparation of land use plans, plant cultivation management, building activities, etc.)

The principles of landscape maintenance are:

- When tying man-made forms with the landscape it is most important to consider naturalness and functionality;
- The shore zone around water bodies must remain uncultivated;
- Agricultural lands should be separated by natural communities;
- Man-made reservoirs are not only important as sources of water but also because they essentially increase biological and landscape diversity;
- If a choice must be made between preserving an object with a complex or a simple structure then it is best to choose the former;
- **The most important problem is the loss of the aesthetic and cultural value of the landscape**.

Landscape maintenance must ensure:
- the conservation of buffer zones around water bodies (ditches, rivers, streams, lakes, seas, springs) – the maintenance of natural biotic communities around water bodies in order to reduce the pollution of surface water bodies and increase the biological and landscape diversity of the area;
- the conservation of valuable nature and landscape elements. In the landscape, for instance, springs, stone walls, clefts, ponds, old riverbeds, hedges, trees standing alone or in groups, banks, and dunes;
- the conservation of semi-natural communities (wooded meadows and alvar regions; flood-plain, coastal and dry meadows; and forest pastures) and their maintenance or restoration;
- the conservation of natural biotic communities (swamps, transitional mires, bogs, wetlands);
- the conservation of the strips of uncultivated land with natural vegetation, between arable fields, and their maintenance – ensuring that fertilisers and weed killers are not used on field margins – in order to increase the biological and landscape diversity of agricultural areas and help increase their stability;
- the growth of landscape diversity; through the planting of hedges and coppices, the planting of trees, the creation of ponds, wetlands, and other areas with natural biotic communities in order to increase the biological and landscape diversity of agricultural areas and help to increase their stability;
- the conservation and maintenance of historical and archaeological monuments (stone barrows, sacrificial stones, sacred groves, etc.).

Objectives:
The main goal is to ensure the protection and development of biological diversity through the sustainable use of valuable landscape assets.
1. Ensure the conservation and protection of valuable landscapes, landscape elements and parts thereof as an essential prerequisite for the conservation and protection of landscape and biological diversity.
2. Take into consideration the objectives of landscape and biological diversity conservation and protection at different planning levels, in land use planning, and land reform policies.
3. Promote a landscape maintenance approach in the achievement of landscape and biological diversity conservation and protection goals.

4.4. NATURE CONSERVATION

In the present analysis, the definition of biological diversity taken from the Convention on Biological Diversity has been used: *the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*.[8]

A framework for assessing the effects and trends has been in the formulation of the goal of biodiversity protection and use in the Estonian National Environmental Strategy: *to ensure conservation of viable populations of local plant and animal species, natural and semi-natural communities and landscapes typical to Estonia*[9].

1. Brief biodiversity background for the country

The Estonian territory is traversed by an important European bio-geographical borderline, which divides the area into two provinces. **Phytogeographically**, the western part of the country belongs to the mid-European province (on Ordovician-Silurian limestone bedrock with alvars, calciphilous fens, species-rich wooded meadows, broad-leaved forests, numerous calciphilous species dominating in plant communities, etc.). The eastern part belongs to the east - European province (with acid soils on Devonian sandstone bedrock, acidophilous plant communities with forests dominated with pine forests).

The numbers of native species in different organism groups are given in Table 1.

Five hundred thirty-eight (538) vascular plant species are at the border of their distribution range in Estonia (so-called margin-species): 121 species on the **northern** margin (*Cladium mariscus, Heliochrysum arenarium, Berula erecta, etc.*), 128 species on the north-eastern margin (*Arenaria procera, Trisetum sibiricum etc.*), 45 species on **the eastern** margin (*Juncus subnodulosus, Litorella uniflora etc.*), 56 species on the **south-eastern** margin (*Carex brunnescens, C. globularis etc.*), 27 species on **the southern** margin (*Cornus suecica, Cerastium alpinum etc.*), 11 species on the **south-western** margin (*Botrychium virginianum etc.*), 15 species on the **western** margin (*Chamaedaphne calyculata, etc.*), and 52 species on the **north-western** margin (*Chaerophyllum aromaticum, Dianthus superbus etc.*).

During one century, many vascular plants, lichens and bryophytes have become extinct in the flora of Estonia or have become very rare. Flora species which have gone extinct are *Alisma lanceolatum, Blechnum spicant, Botrychium lanceolatum, B. simplex, Carex rhynchophysa, Cochlearia officinalis, Crassula aquatica, Eleocharis ovata, Erica tetralix, Galium schultesii, Geranium columbinum, Hypericum humifusum, Juncus anceps, Melica ciliata, Orchis coriophora.*

Bryophytes are a very important component in the ecosystems of Estonia, especially in forests and mires. Of the 525 known species, 407 belong to the class *Bryopsida*, 116 to *Marchantiopsida* and 2 to *Anthocerotopsida*. 199 moss species in Estonia are rare and endangered, and 10 species have become extinct.

Algae. At present we know more than 2000 freshwater, marine, soil and aerophilous algae species.

[8] Convention on Biological Diversity, Art. 2.
[9] Estonian National Environmental Strategy, Pt. 3.9. Conservation of Landscapes and Biodiversity (RT 1997, 26, 390)

Table 1. Number of natural species and distribution under protection categories in Estonia

Taxonomic group	Recorded number of species	Protection category I	II	III	Under monitoring procedure
Bacteria incl. Cyanobacteria	1000?				
Protista	500?				
Fungi incl. Lichenes	4500				
Planta					
Algae	2000				X
Bryophyta	525		23	2	X
Pteridophyta+Spermatophyta	1500	22	122	41	X
Animalia					
Invertebrata					
Porifera	3				
Coelenterata	11				
Ctenophora	1				
Plathelminthes	300				
Nematelminthes	450				
Nemertini	4				
Annelida	143		1		X
Bryozoa	7				
Mollusca	155	1			X
Anthropoda	üle 12 000			26	X
Vertebrata					
Pisces	74		2	2	X
Amphibia	11		4	7	X
Reptilia	5		1	4	X
Aves	222	7	36	88	X
Mammalia	64	2	15	12	X

One species of *Phaeophyta, Waerniella lucifuga*, is extinct.

Fungi. The largest groups of mushrooms are *Agaricales* (772 species), *Aphyllophorales* (388), *Uredinales* (275), *Helotiales* (225), etc. There are data concerning 300 edible species among mushrooms (production 35,000 t/yr), 15 species have been found poisonous.

Lichen-flora or lichenised fungi consists of 786 species while its composition consists of many very rare arcto-alpine, nemoral, xerocontinental and oceanic species. Lichens suffer essentially from air pollution – 38 macrolichen species have become extinct during the last five decades. Lichens are actively used in Estonia as the litmus organisms of air pollution levels in ecological monitoring.

Zoo-geographically, Estonia is situated within a transitional area of the western and eastern Palearctic regions, while western Palearctic species dominate. The Baltic Sea, and, of course, various types of inland waterbodies have particularly influenced the the development of this fauna.

Invertebrates is naturally the greatest macro-group. There are many rare, relict and endangered species of various (subarctic, boreal, atlantic, subboreal) climatic periods.

The richest with respect to the species composition in invertebrate groups are insects – more than

10,000 species. Several invertebrate species are under nature protection: the Freshwater Pearl Mussel *Margaritifera margaritifera*, the Common Red Ant *Formica rufa*.

The list of the Estonian native **vertebrates** consists of 376 species.

Cyclostomes (*Cyclostomata*) are represented by three species. Two species (the River Lamprey *Lampetra fluviatilis* and the Brook Lamprey *L. planeri*) are common while the Sea Lamprey *Petromyzon marinus* has been found occasionally.

Fish-fauna (*Pisces*, 74 species) includes only 1 chondrostean fish species. The Atlantic Sturgeon *Acipenser sturio*, one of the protected fish species, has been recorded last in the Estonian waters in 1997. Of teleost fishes, 31 marine species include the most important commercial fishes (the Baltic Herring *Clupea harengus membras*, the Baltic Sprat *Sprattus sprattus balticus*), and also several saltwater species which appear only rarely in Estonian brackish coastal waters. Numbers of most migratory fish species (the Atlantic Salmon *Salmo salar*, the Sea Trout *Salmo trutta trutta*, the Vimba Bream *Vimba vimba*) have declined during the past decades, mainly due to hydro-technical constructions and the pollution of spawning areas. Most freshwater fish (about 30 species) are also spread in the brackish coastal waters of the Baltic sea. The protected teleosts (the Wels *Silurus glanis*, the Grayling *Thymallus thymallus* and the Asp *Aspius aspius*) are distributed only in freshwaters. In addition to the Baltic Sea, commercial fisheries are well developed on our largest lakes, Peipus (Peipsi) and Võrtsjärv.

There are 11 species of **amphibians** (*Amphibia*) recorded in Estonia; however, the occurrence of the Marsh Frog *Rana ridibunda* in Estonia is not certain. Some species are relatively-widely distributed (the Grass Frog *Rana temporaria*, the Moor Frog *R. arvalis*, the Common Toad *Bufo bufo*, the Smooth Newt *Triturus vulgaris*), while others are more or less rare or sporadic (the Crested Newt *Triturus cristatus*, the Common Spadefoot *Pelobates fuscus*, the Natterjack *Bufo calamita*, the Green Toad *Bufo viridis*, the Edible Frog *Rana esculenta*, the Pool Frog *R. lessonae*).

Reptiles (*Reptilia*) are represented by 5 species (including the widely distributed Viviparous Lizard *Lacerta vivipara*, the Adder *Vipera berus*, and the Grass Snake *Natrix natrix*). The listed reptiles as well as the Slow-worm *Anquis fragilis* and the still rarer Sand Lizzard *Lacerta agilis* are included in the list of protected animal species.

Of the 332 **bird** species, 222 are breeding in Estonia (206 regularly); in addition to those, dozens of species have been recorded as transit migrants and/or winter visitors (e.g. Bewick's Swan – *Cygnus columbianus*, the Long-tailed Duck – *Clangula hyemalis*, the Redpoll – *Carduelis flammea*, the Common Scoter – *Melanitta nigra*, etc.). Many species have declined in numbers (e.g. the Great Snipe – *Gallinago media*, the Willow Grouse – *Lagopus lagopus*, the Roller – *Coracias garrulus* etc.), therefore a number of species (56) have been included in the Red Data Book. On the other hand, some species whose abundance is decreasing in western Europe have increased in numbers in Estonia, e.g. the White Stork (*Ciconia ciconia*) and White-tailed Eagle (*Haliaeetus albicilla*), which are interesting objects of study for many Nordic and western ornithologists who visit Estonia. The populations of several gull and passerine species are increasing while they often become urban inhabitants. The Estonian bird fauna is protected and thoroughly studied in the national parks (Vilsandi), state nature

reserves (Matsalu), and bird sanctuaries. Bird hunting has considerably declined during this century. At present, game birds are represented by many ducks, doves, coots, geese and some waders.

Sixty-four (64) **mammal** species have been recorded in Estonia. Five (5) species having been introduced into the Estonian fauna (the Raccoon Dog *Nyctereutes procyonoides*, the American Mink *Mustela vison*, the Muskrat *Ondatra zibethicus*, the Red Deer *Cervus elaphus*. The European Beaver *Castor fiber* became extinct in the mid-19th century but a vital population exists in Estonia again since the 1950s, as a result of its reintroduction from Russia.

Twenty-nine (29) mammal species have been taken under nature protection. The endangered mammal species in Estonia are the European Mink *Mustela lutreola*, the Flying Squirrel *Pteromys volans* and the gleridans (*Gleridae*).

At present, 17 mammal species are used as game animals; the Moose *Alces alces*, the Wild Boar *Sus scrofa* and the Roe Deer *Capreolus capreolus* being of highest commercial importance. Thanks to a reasonable hunting policy, moderate forest management, etc. there is an abundance of several mammal species, strictly protected elsewhere in Europe, whose populations have increased considerably during the last 60 years, and which have been included in the list of game animals in Estonia (e.g. Wolf *Canis lupus*, Lynx *Felis lynx*, Brown Bear *Ursus arctos*).

2. Habitats-biotopes

Forests. According to official data, 48% of the Estonian territory is covered with forests and forest lands (young forest plantations, open woodlands and bogs covered with trees). Estonia belongs to the temperate hardwood-coniferous forest zone. Twenty-two (22) site-types and 71 forest types have been distinguished within our territory. The most important types include dry pine forests on sandy soils, temperate spruce forests, hardwood-spruce mixed forests, transitional (mesotrophic) swampy forests, dry heath pine forests, bog (oligotrophic) pine forests, fen (eutrophic) birch forests, species-rich swampy black alder forests, as well as floodplain forests and alvar forests.

Grasslands. Grasslands, meadows and natural or semi-natural pastures are some of the vegetation types most characteristic of Estonia. In 1939, these areas covered 24.5% of the territory, now less than 20%. During the last fifty years the area of grasslands (meadows and pastures) has decreased significantly.

Mires (swamps, bogs, fens). Mires cover approximately 9,150 km^2 or 21.5%, together with water-logged areas where the peat layer is less than 30 cm, even 31% of the territory of Estonia. Fens (eutrophic mires) cover 57%, transitional (mesotropic) mires 12%, and bogs (oligotrophic mires) 31% of the total area under mires. Estonian mires are deep-layered; hundreds of bogs have peat layers thicker than 5 m. In the last decades, over 700,000 ha of water-logged meadows, fens and traditional mires have been drained. As the agricultural use of these areas did not often prove successful, a part of this land is presently covered with young forests and shrubs of low value. The fauna and flora have been damaged, many rare species and communities have lost their natural sites, and bogs important for freshwater reserves have been destroyed. Fortunately, due to the abundance of all kinds of mires, and the activity of scientists protecting mires from draining during the Soviet period), large areas of mires with economic and/or scientific importance have been maintained.

3. *In situ* conservation system

3.1. Protected Areas

Status. The Act on Protected Natural Objects (passed on June 1, 1994) establishes the following categories of protected natural objects *in situ*:

- protected areas,
- natural and natural-historical monuments,
- species, fossils and minerals.

Protected areas fall into one of four types:

1) **A national park** is a protected area of special national importance for the conservation, protection, investigation, and promotion of awareness of the natural and cultural inheritance; it includes ecosystems, examples of biological diversity, landscapes, national culture, and is subject to sustainable nature management.

   The National Parks of Estonia as of January 1, 1995, are the following:

- *Lahemaa National Park* – for the conservation of nature and cultural landscapes typical of north Estonia;
- *Karula National Park* – for the conservation of hilly landscapes rich in forests and lakes, typical of south Estonia;
- *Soomaa National Park* – for the conservation of the largest bogs in Estonia and the floodplain meadows and forests in the south-western transitional part of Estonia;
- *Vilsandi National Park* – for the conservation of west Estonian coastal landscapes and sea, as well as islets rich in birds.

2) **A nature reserve** is an area protected for its nature conservation or scientific value set aside for the conservation, protection, and investigation of natural processes and endangered or protected plant, animal and fungus species and their habitats, inanimate objects, as well as landscapes and natural monuments.
3) **A protected landscape** is an area of natural or cultural heritage value, which is rare or typical for Estonia, and is established for nature conservation, cultural or recreational purposes. Parks, arboreta and botanical gardens which have been taken into protection are also considered protected landscapes. Management plans are developed to determine the level of tourism, forestry and agricultural exploitation, as well as industrial development and urban construction. The protected landscapes may include limited management zones and special protection zones. Landscape reserves are protected parts of the countryside which contribute to its beauty and variety, where nature and the landscape features receive more priority.
4) **A programme area** is managed under a local, national or international programme for monitoring, investigation, or educational purposes as well as combining conservation and management of natural resources. The Biosphere Reserve and the Hydrological Reserve are considered as programme areas in Estonia.

All land and water area within a protected area is divided into **zones**, as specified in the Protection Rules.

A strict nature reserve zone is an area of land or water in its natural state and free from the direct impact of human activity, where conservation of natural associations resulting only from natural processes is guaranteed.

A special management zone is a land or water area protected in order to preserve resulting or created natural and semi-natural associations.

A limited management zone is a part of protected area used for economic purposes where restrictions, established by the authority which has taken the object under protection, must be taken into account.

A protected natural monument is a live or inanimate object which is of scientific, historical-cultural or aesthetic value, such as a tree, boulder, waterfall, cliff, terrace, cave, rock outcrop, and karst landform, or a group of these.

A protected species, fossil or mineral, is a plant, fungus, or animal species or its taxonomic unit, a fossil or a mineral, which is found in Estonia in its natural state, is endangered, rare or of scientific, nature conservation, aesthetic or local historical value, and which has been taken under protection. Protected species, fossils and minerals are divided into Protection Categories I, II, and III according to the strictness and specific features of protection requirements.

According to the Act on Protected Natural Objects, protection of species is arranged via lists of species under state protection and reserves for endangered species.

In addition to the above, an institution of the Red Data Book of Estonia has been established which has retained its advisory function. Recently, in 1998, the revised version of the Red Data Book has been prepared by the Nature Conservation Commission of the Academy of Sciences.

Current trends. Since the Act on Protected Natural Objects (passed on June 1, 1994, amended in 1998) came into force, a principal estimation and inventory of the protected areas network has commenced. The aim of the work, which has been carried out in parallel to Land and Property Reform, is to optimise and improve the protected areas network by selecting from among the up to 500 protected objects (protected areas and large natural monuments) the most valuable ones, and determine their protection categories according to the new classification settled in the Act on Protected Natural Objects.

Preliminary results of the ongoing revision show that there will be 2 programme areas (West-Estonian Archipelago Biosphere Reserve and Pandivere Water Protection Area), 4 national parks (Lahemaa, Karula, Soomaa, Vilsandi – established by the Act on Protected Natural Objects), about 55 nature protection areas and over 160 protected landscapes in Estonia. Currently about 438,800 ha. or approximately 10 percent (excluding the West-Estonian Archipelago Biosphere Reserve territory) of Estonia (terrestrial area) is protected. The strict protection regime applies to about 1 per cent of the territory today. The aim is to increase this figure to up to 5 per cent by the year 2010 as declared in the Estonian National Environmental Strategy (1997).

Next, protection rules of these protected areas and other objects will need to be developed and approved by the Estonian Government. By now, 75 protected areas have got updated and revised protection rules, which forms slightly more than one half of the total territory under protected areas. Only Matsalu Nature Reserve, Käina Bay and Alam-Pedja Nature Reserve presently have management plans for the whole territory. Management plans are currently under preparation for Soomaa National Park, Karula National Park and few other areas.

Considering the needs of the Land Cadastre, the boundaries of all protected areas and the different protection zones will need to be specified. As follows, the revision of protected natural monuments, parks and recreational forests will need to be accomplished.

Legal protection. The three national parks (Karula, Soomaa and Vilsandi) that have gained new protection rules according to the principles of the Act on Nature Conservation Objects are legally better protected against major developments (e.g. industrial, infrastructure etc.) than Lahemaa National Park, whose existing protection rules are out of date and the new ones are presently under preparation.

The Act on Protected Natural Objects establishes the procedure for taking natural objects (protected areas, single natural objects, and species) under protection. It determines the rights and obligations of landowners, land users and other persons with regard to such objects. The Act stipulates the procedure for establishment of environmental restrictions to property, and the obligations of owners concerning different types of protected zones. All possible restrictions and obligations are stipulated in the act while these may be specified and implemented in particular cases (partly through leaving out the irrelevant restrictions) by the Government of Estonia through protection rules. The Act also includes provisions for financial compensation to landowners for the restrictions in land use in protected areas. The compensation is granted via reduction of the land tax. The Act also defines the classification categories, and determines protection regimes and zoning.

Ownership. According to the Act on Protected Natural Objects, protected objects of nature may be in public (either state or municipal) or private ownership. All natural objects, which have been taken into protection, are provided an equal level of legal protection regardless of the owner or the authority which has taken the object into protection.

The **lands** of protected sites belong under state, municipal and private ownership. Due to the ongoing land reform, there are a lot of territories whose ownership has not yet been determined and which will need to be specified. According to present practice, the lands in strict nature reserves and special management zones with firm restrictions should remain under state ownership and not be returned to private ownership. Compensation for these lands should be made to their legal owners.

Funding. The national parks are funded from the state budget through the Ministry of the Environment. Additional finances for the concrete projects are available from the Estonian Environmental Fund. Furthermore, most National Parks have relations to special foundations for support of tourism activities.

Management planning organisation. The four national parks, six nature reserves (Alam-Pedja, Endla, Matsalu together with Virtsu–Laelatu–Puhtu, Nigula and Viidumäe), four landscape reserves (Haanja, Islets near Hiiumaa, Kõrvemaa and Otepää) and the Biosphere Reserve of West-Estonian Archipelago have an administrative body responsible for the management of the area. The protected areas are sub-ordinate to the Minister of the Environment. The National Forestry Board (with its 15 county forest departments and 120 forest districts) is responsible for the management of forests inside all protected areas (including national parks). Other areas are managed by County Authorities (through their Environmental Departments). Specifying the responsible manager for each protected area is one of the tasks of the ongoing reorganisation process of the Estonian protected areas system.

3.2. Species protection

Organisation. The organisation of species protection is largely the same as for protected areas. The environmental authorities are: the Ministry of the Environment and most directly related – Division

of Nature Conservation, 17 County Environmental Departments and 18 protected area administrations. The Forest Department and the Fisheries Department are responsible for their respective problems related to species conservation. The Chief Inspector with his office performs the enforcement function. Species protection is a field of active work of some NGOs. NGOs are involved by providing detailed information and expertise in their particular fields (the Ornithological Society concerning bird species and areas needing protection and the necessary degree of protection, the Estonian Theriological Society concerning i.a. mammals protection, the Naturalists' Society concerning lists of insect species, etc.). Some NGO-s like the Estonian Fund for Nature and *Nature Conservation Association "Kotkas"* carry out inventories and even manage the threatened species survival. Other NGOs worth mentioning in this context are the European Mink Conservation and Breeding Committee (EMCC) – Estonian branch, *Lutra* Society, Estonian Society of Lepidopterologists, *etc.*

Management plans. In the strict sense, no particular species yet has a management plan in Estonia. In a broader sense, many species are supported and managed in a planned manner. For example, the *Nature Conservation Association "Kotkas"* is actively involved in the management planning and implementation of the eagles species and Black Stork, and the European Mink is under observation of the European Mink Conservation and Breeding Committee (EMCC) Estonian branch.

Monitoring. The populations of rare and endangered species are monitored in the framework of the National Environmental Monitoring Program, launched in 1994. Especially species of terrestrial and freshwater biota come into consideration in relation to nature protection. The general requirements of a monitoring site include non-disturbance and continuity of ecological conditions over a long period of observations. Among the monitoring projects, there are currently 101 sites under observation for threatened plants species only. The monitoring database for threatened species is located at the coordinating institution of National Monitoring. A new GIS-based biodiversity monitoring system has been worked out in the frame of a Phare-supported project completed in 1998.

3.3. Biotopes and habitats protection

Biotopes, communities, ecosystems and landscapes are not so well elaborated terms in Estonian nature conservation legislation, therefore these are values to be protected both inside and outside protected territories. Two new laws – the Estonian Forestry Act (1998) and the Act on Protection and Use of Animals (1998) – introduce the first elements of biotopes protection into the legal system of this country. *Landscapes* as such have no direct legal protection in Estonia. Landscape features can be among the preconditions to set a territory aside for nature protection (after Act on Protected Natural Objects, *e.g.* Art. 2). Landscape is one of the features taken into consideration in planning and building procedures (after Planning and Building Act, *e.g.* Art 8). The protective forests (one of the three forest categories in Estonia) include forests which help protect the landscape.

In all types of protected areas, and natural monuments in addition, the landscapes can be protected according to the Act on Protected Natural Objects. The specifics of landscape protection should be identified in the Protection Rules of an area.

Pressures to habitats. The main trends in land-use dynamics in Estonia have been a decrease in the proportion of agricultural land, especially semi-natural grasslands (from 65% in 1918 to 30% in 1994) and an increase in the proportion of forests (from 21 to 48%, respectively). The most relevant driving

Table 2. Threats to habitats

Type of habitat	Primary threats	Secondary threats
Wetlands – peat bogs – fens – marshes	drainage commercial pressure on peat extraction	air pollution
Forests	commercial pressure on mature and primeval forests	localised impact of air pollution
Semi-natural habitats – coastal meadows – alluvial meadows – marshy meadows – wooded meadows	abandonment of grazing, drainage abandonment of mowing, drainage drainage abandonment of grazing and mowing	eutrophication
Agricultural land	changes in land use abandonment of land resulting in coppicing and overgrowth	wrong agricultural management practices (wrong timing of fertiliser application; ill-storage of manure etc.)
Sea/marine habitat	Over-fishing, pollution from shipping	eutrophication
Coastal habitats of the sea and lakes	extensive tourism resulting in heavy littering and erosion	eutrophication rannikuäärne ehitussurve
Riverine habitat	water pollution from point and non-point sources	eutrophication
Alvars	abandonment of grazing, resulting in overgrowth	
Parks	once well-managed parks in settlements and around mansions have become overgrown, however clearing should be carefully considered (potential bat habitats)	

factors of this shift have been land reforms, collectivisation, formation of the Soviet border zone along the coasts, concentration of agricultural production, and urbanisation.

To date, there are two main threats to the listed habitats: changes in land use systems and changes in management systems. Implications of the changes on the habitat structure and hence on the species and communities are unknown.

The land reform, which started in October 1991, has not yet been completed. Restitution of land and changes in land ownership exhibit major impact on the use of land and, thus, on the respective habitats. On the one hand, the set-aside land soon becomes overgrown and the reforestation process develops. On the other hand, the structure of the established land-use systems is changing: natural or semi-natural meadows are ploughed into fields, forests are clear-cut. Commercial pressure on certain habitat types is strong. Mature birch, pine, spruce and aspen forests suffer severely.

The Act on Protected Natural Objects, passed in June 1994 (amended 1998), fixed the land use provisions for a land-owner whose real estate is situated in a protected area or in the territory where a protected natural object is located. These regulations, however, do not necessarily ensure the proper land management and the follow-up of the prescribed protection measures. In all likelihood, the territory of the state-owned protected areas will decrease in years to come.

4. *Ex situ* conservation measures [10]

Gardening

The Tallinn Botanical Gardens which was established in 1961, have currently got 8,000 taxa of living plants, 2,000 of which are tropical and are grown under glass. The Gardens have 85 employees, 12 of which are research scientists. The Gardens are essentially involved in plant introduction, also managing limited activities in the field of rare species conservation. A computerised list of all the taxa maintained in the Gardens has been compiled.

The Botanical Gardens of the Tartu University was established in 1803 already. The collections include 4,800 taxa and varieties of living plants representing all continents. The plant systematics, dendrological, and medicinal plants are the main collections of the Gardens.

Zoos

The Tallinn Zoo has become a focal institution for the conservation of endangered animal species. Since its foundation in 1939, this organisation has gained rich experience in captive breeding of species. The *ex situ* collection of animal species in the Tallinn Zoo as of 1January 1996 is shown in Table 3.

Table 3. Endangered animals in the Tallinn Zoo

	Order	Familiy	Genus	Species	Individuals
Amphibians	2	6	6	5	41
Reptiles	5	13	20	31	104
Birds	12	21	62	102	583
Mammals	10	25	53	114	558
Total:	29	65	141	252	1286

Currently the Tallinn Zoo participates in the European Endangered Species Programme and is working with the revival of 21 species.

Considerable success has been reached in the breeding of *Aegypius monachus, Grus japonensis, Grus dauricus*, *Ursus arctos arctos, Crysocyon brachyurus, Equus hemionus kulan, Equus przewalskii, Bos javanicus*, as well as *Capra cylindricornis, Cervus elaphus bactrianis*. The biggest of 3 groups of *Capra cylindricornis* in captivity has survived in the Tallinn Zoo.

- **Measures to be taken in conservation:**

In protected areas:

- *Implementation of adopted legislation* regulating and supporting nature conservation procedures is needed, and the responsible administrative system should be developed.
- *Land use provisions* set for a land-owner whose land is located in a protected area or in an area including a protected natural object (as stipulated by the Act on Protected Natural Objects, passed in 1994) are foreseen as a legal measure. However, these alone do not necessarily ensure proper land management and the implementation of the prescribed protection measures. Governmental and lower level regulations are necessary for the implementation of the Act.
- *Governmental assistance* is highly necessary for ensuring sustainable and environmentally friendly agricultural and sylvicultural management practices, and – what is equally important – the survival of biologically-rich habitat types such as wooded meadows, alvars, alluvial meadows – i.e.

[10] *Ex situ* conservation measures for **forestry, animal husbandry** and **agricultural plants** are discussed in relevant sectoral studies for the Biodiversity Strategy

habitats which are typical to the Estonian landscape, but which have largely disappeared in the rest of Europe.
- *Economic incentives* for landowners and developers should be developed and used for ensuring the consideration of environmental requirements and use appropriate management tools in land use.
- *Compensation mechanisms* for land which is to be maintained under state ownership (e.g. forest, wetlands, mires) will need to be created for land-owners as well as for damages caused by protected animals.
- *EIA procedures* should be broadened to also include the impact on flora and fauna, as well as on the physical features in protected territories.

In zoos:
- In order to strengthen natural populations in the country, new breeding projects should be launched for the following species: *Eliomys quercinus, Muscardinus avellanarius, Falco peregrinus, Bufo viridis, Bufo calamita, Pelobates fuscus*, *Margaritifera margaritifera*, *Hirudo medicinalis.*
- In order to promote awareness concerning the diversity of wild species in Estonia and the nature conservation issues, an exposition group of Estonian wild animal species should be created.

In fisheries:
The following measures are necessary:
- rearing and stocking of salmonids and coregonids *ex situ*,
- keeping of brood stocks of endangered cold water species *ex situ*.

Objectives for the nature conservation sector

1. Implement effective political and administrative mechanisms for the fulfilment of the obligations of the Convention on Biological Diversity and secure cross-sector co-ordination of activities within biological diversity protection.
- Creation of a National Biodiversity Unit for the co-ordination of fulfilment of the Convention on Biological Diversity
- Creation of a guarantee for political and administrative support for the National Biodiversity Strategy and Action Plan
- Harmonisation of the implementation process of the Convention on Biological Diversity *inter alia* strategy and action plan with existing or under-preparation leading documents (Agenda 21)
- Harmonisation and amending of legislation (incl. sectoral) related to obligations coming from the Convention on Biological Diversity
- Improvement of identification and monitoring of the elements of biodiversity (Convention Annex 1) and availability of the corresponding information
- Updating of information and databases connected with the obligations under the Convention on Biological Diversity
- Development and linking of new sectors connected with the obligations of the Convention on Biological Diversity (cultural aspects, GMOs, condition indicators, planning, land use, etc.)

2. Develop and update classical nature conservation measures coming from international obligations and Estonian development.
- Reform of nature conservation administrative system

- Updating of lists of protected species and Estonian Red Book
- Preparation of management plans both for protected areas and protected species
- Adoption of adequate and well functioning system for compensating damages caused by protected species
- Adoption of wider and better considered *ex situ* protection measures
- Consideration of genetic variations in nature protection (i,e. salmon, seals, orchids)
- Promotion of a tax policy more favourable for nature protection
- Increasing of relative importance of habitat and community protection
- Greater attention paid to the problem of invading (non-native) species
- Development of a tax policy supportive of biodiversity protection
- Creation of conception of a national Natura 2000 and implementation integrated with the observance and fulfilment of other international obligations (Bern, Ramsar, Helsinki conventions, etc.)

4.5. FISHERY

1. Fishes

1.1. Species composition

Estonian fish fauna includes 74 species (incl. 3 species of cyclostomes). This list includes several marine species appearing rarely in low salinity waters of the eastern Baltic (eg. swordfish, dab). According to their **origin**, species can be divided as 1) marine species (herring, sprat, cod, garfish etc.); freshwater species (perch, roach, pike-perch, pike etc.); and 3) migratory species (spending part of their life cycle in fresh, another part in marine water (salmon, sea trout, eel, river lamprey). All populations or some of populations of several freshwater species (vimba bream, ide, dace, whitefish) inhabiting coastal waters of the Baltic Sea are semi-migratory, reproducing in rivers or river estuaries. The classification above does not include two euryhaline species (three-spined and nine-spined stickleback) which inhabit both marine and fresh waters. Nine-spined stickleback has permanent populations both in marine and freshwater environments, as well as migratory populations in the coastal sea reproducing in fresh water. During past decades, several fish species have been introduced in Estonia; three of them have become naturalised (reproducing in natural waters) and these species are therefore included in the list of the Estonian fauna (gibel carp, carp, rainbow trout). The fourth species (northern whitefish or peled) has reproduced during some years in Lake Uljaste, and the other introduced species (sturgeons, etc.) have not established permanent populations in natural waters.

Several species in Estonia are on the northern border of their distribution area (riffle minnow, sunbleak, wels, mud loach) or close to it (spined loach, razorfish).

Most freshwater species (except for some rheophiles such as riffle minnow, grayling, stone loach) also inhabit coastal waters of low salinity. The proportion of freshwater species is higher in the shallow and low salinity Väinameri region and Pärnu Bay, as well as in small bays of the gulfs of Riga and Finland.

Four species are **protected** by law (Atlantic sturgeon, wels, garyling and asp), and more than 20 species and forms are included in the Estonian Red Data Book. In addition, several species which are

protected internationally (EU, Bern Convention) or which are rare or protected in neighbouring countries inhabit the Estonian waterbodies.

The **distribution pattern** is rather peculiar in the case of several species. Some species (wels, mud loach, asp) inhabit only or predominately water bodies of the Lake Peipsi catchment area. Some freshwater species (e.g. spined loach, gudgeon, bullhead, minnow) are absent in geologically young rivers of islands and western Estonia but are common in adjacent coastal waters of the Baltic Sea. This pattern suggests that several species have arrived to Estonia by two different routes, via inland waters and via the Baltic Sea. This hypothesis is supported by recent data on DNA analysis of perch, which indicates differences in the genetic background of perch in Lake Peipsi and in the Baltic Sea. In the case of some species (whitefish, smelt, Baltic herring) several forms have been distinguished, which indicate wide genetic diversity. The distribution of some species (riffle minnow, grayling) is obviously not yet complete during the time elapsed from the last glaciation.

In the case of whitefish, salmon, sea trout, and brook trout, natural populations have been mixed due to artificial breeding and uncontrolled introductions. In some cases (pike-perch, smelt, vendace) populations inhabiting small lakes have risen from introduced specimens.

The abundance of several species has changed remarkably during the past years (due to overexploitation of stocks of predatory fishes, low natural reproduction of pike, and warm summers in the 1990s). The abundance of nine-spined stickleback, gudgeon, roach, vimba bream, gibel carp and some other cyprinids has increased. At the same time, there has been a catastrophic decrease in the abundance of perch, pike, whitefish and some other species all over the coastal sea or locally.

1.2. Fish communities, their structure and species richness

Coastal Sea. The structure of fish communities in the coastal sea varies seasonally. Several marine species appear here (predominantly or only) for spawning – in spring and early summer (Baltic herring, garfish) or in winter and early spring. Also in the case of several freshwater and migratory species, remarkable seasonal replacements between nursery and spawning grounds (whitefish, smelt, pike-perch, dace, etc.) occur. Two types of fish assemblages can be distinguished: 1) freshwater (where freshwater species are dominating; Väinameri, Pärnu Bay and other bays; coastal areas of the Gulf of Riga and central and eastern parts of the Gulf of Finland), 2) marine (marine species, mostly herring and flounder are dominating). By the Matsalu Bay example, it can be seen that as the water deepens further from the coast the number of species increases.

The abundance of predatory fish (especially pike, in past years, but also perch) has been too low in most waterbodies to effectively control the abundance of cyprinids and sticklebacks.

The main factors determining the species composition and richness in **rivers** are the minimum flow rate in summer and the maximum water temperature in summer; species richness increases with the increasing of flow rate and temperature. Species richness alone can not characterise the value of a community. For example, cold-water sections of rivers (rare in Estonia) are peculiar and deserve protection.

Lakes. Estonian large lakes (Peipsi, Võrtsjärv) are characterised by high fish productivity and high species richness. In the case of small lakes, more data exist for lakes of exploitable fish populations, eg. lakes Tamula, Vagula, Õisu, Saadjärv and other lakes of the Vooremaa region. The fish fauna in

small lakes appears to be more diverse than it was thought earlier. Upon application of proper monitoring methods (e.g. nordic type gillnets) two fish species in a lake on average have additionally been recorded.

1.3. Recent changes

Already in the 1970s and the 80s the proportion of cyprinids in the catches from some eutrophicated areas (Matsalu Bay) was increasing and the proportion of percids was on the decline. Surprisingly enough, the tendency (change of the composition of fish population) has soared in the last five years (despite the general decrease of pollution load in the coastal waters of Estonia and the Baltic Sea) and by now it is also true of the less eutrophicated areas (e.g. the sea around Vilsandi).

The likely causes for the changes are the following:

1) overfishing of percids (perch and pike-perch) since early 1990s (due to relaxation of fishing limits, especially the granting of fishing rights to coastal population, an abrupt increase of the procurement prices of perch and pike-perch, the spread of gill nets),
2) low abundance of pike since late 1980s (pike effectively controls the abundance of cyprinids), this decrease of abundance was caused by worsening spawning conditions and intensive exploitation, as well as by the increase of abundance of nine- and three-spined sticklebacks which serve as easily accessible prey for most of predatory fish,
3) the warm summers of 1990s; high water temperature and sufficient food resources has facilitated the increase of the number of cyprinids and their rapid growth,
4) low economic interest in the catch of most abundant cyprinids such as roach and white bream (in the last couple of years the situation has changed and the numbers of roach are also clearly on decline).

Unfavourable spawning conditions and over-fishing caused a critical situation for autumn-spawning stock of the Baltic herring in the gulf of Riga; in the last year the abundance of this kind of herring has increased.

The abundance of cold water marine species has decreased in the coastal area; natural reproduction of salmon and sea trout remains at a low level and, in addition to that, M74 syndrome has recently been detected in Estonia. The abundance of most whitefish stock remains critically low.

Inland waters. In the last decade two significant processes have taken place in the fish community of Lake Peipsi:

- the sharp rise of the abundance of pike-perch, the appearance of several strong year-classes and
- the exceptionally low abundance of vendace (in the last three years the abundance has risen, but remains many times lower than the long-term average).

Despite eutrophication of Peipsi, the warm summers of the latest years, and the unfavourable ice situation (which has an adverse effect on the embryonic development of autumn-spawning species) the abundance of Lake Peipsi whitefish is yet surprisingly high. A potential problem is the pressure from the fishing companies and the counties towards a more intense use of the fish resources of the lake, incl. the application of unfavourable fishing gear (Danish seine, gill nets).

There is no objective data on large-scale changes in the fish communities in small lakes and rivers. In the last couple of years the research program of the communities of Estonian rivers (incl. fish communities) has provided an excellent basis for the monitoring of fish communities of the rivers.

It can be speculated that the warm summers of the latest years have facilitated the natural repro-

duction of warm-water species, incl. rare species like wels.

No changes in the species composition of the Estonian fish fauna have been detected during the past decade. Probably our fish fauna will soon comprise bitterling, which has lately spread widely in Latvia.

1.4. Factors affecting fish biodiversity

1. **Human activity.**
- Fishery (incl. overexploitation partly due to low living standard; changes in the abundance of predators; management efficiency on economically important water bodies; pouching). It alters the structure of fish communities and (directly or indirectly) the abundance of species.
- Anthropogenic eutrophication of water bodies. This process affects spawning conditions (the muddying of spawning grounds); changes in water transparency affect the abundance of several species; worsening of the oxygen regime affects in the first place species with greater oxygen affinity and especially their reproduction (e.g. coregonids and salmonids) through changes of the nutrition basis, etc.
- Pollution. Especially harmful for fish reproduction (increased embryonic and post-embryonic mortality, disorders of gametogenesis).
- Water-flow regulation facilities (e.g. dams on rivers). First of all they influence spawning migrations (access to spawning grounds).
- Mechanical modification of water bodies, incl. displacement of sediments, dredging, modification of riverbeds, changes of water level due to amelioration works or dams. Direct mechanical influence is usually not great and more serious dangers are connected with the disappearance of spawning grounds and sedimental destruction of spawning grounds.
- Fish farming. Dangers ensue from contamination of water bodies with genetically modified forms. At the same time fish farming is often the sole possibility to preserve endangered species and forms.
- Introductions (incl. parasites, new food items, fish-eating predators).

2. **Natural abiotic processes.**
- Temperature regime of water bodies. With warming climate the fauna is partially replaced with other warm-water species and cold-water forms become endangered.
- Changes in the salinity of the Baltic Sea. Short-term changes connected with fluctuations of the amount of salty water entering through the Danish Straits influence the reproduction conditions of many species (especially cod and flounder); with the inflow of water of high salinity and oxygen content the living conditions are improved (especially in the deeps). The salinity of about 7‰ is usually the lowest critical level for the reproduction of euryhaline marine fish and the highest critical level for the reproduction of fresh water fish.
- Changes of the water level (connected with precipitation) influence the reproduction conditions of many fishes (e.g. pike). The species richness of rivers and brooks correlates with the stream volume.

3. **Natural biotic processes.**
- Changes in the abundance of fish-eating predators (seals, cormorants, etc.).
- Changes in the abundance of animals influencing the natural appearance of water bodies (beaver).

2. Invertebrates in water bodies

Coastal sea. Due to low salinity the species richness in coastal waters of the Baltic Sea is relatively low: approximately 525 species have been recorded. The greatest species richness is displayed by crustaceans (about 110 species), rotators (about 100 species) and insects (75). The fauna is dominated by fresh water species, there are considerably less brackish water species and euryhaline marine species. As the Baltic Sea is a young sea the fauna is exclusively composed of immigrants and there is no autochtonic component (Järvekülg, 1995). The changes in the community have been large, first of all in eutrophicated sea bays (Pärnu, Matsalu, Haapsalu and others), in heavily polluted bays (e.g. Tallinn Bay) and in the deep parts of the sea – mostly during periods with insufficient inflow of saline water from the North Sea.

Fresh water bodies. Nearly 2000 species of invertebrates have been recorded in Estonian fresh water bodies – lakes, rivers, springs, ponds, puddles, bog pools, etc. The most numerous classes are insects (about 750 species), crustacians (about 233 species), spiders (about 210 species) and rotators (about 200 species). The communities of fresh water bodies have been significantly influenced by anthropogenic eutrophication and pollution. The only species of potentially commercial interest is crayfish *A. astacus*. Many species are rare and two of them (pearl mussel *M. margaritifera* and *Hirudo medicinalis*) are protected by law. The number of species included in the latest Red Data Book (1998) is much higher than in the earlier version.

Water invertebrates are endangered by the following factors:

1. **Human impact**
- Anthropogenic eutrophication of water bodies
- Pollution of water bodies
- Water-flow regulation facilities (dams on rivers)
- Mechanical modification of water bodies, incl. displacement of sediments (dredging, modification of riverbeds, changes of water level due to amelioration works or dams)
- Introductions (incl. parasites, new food items, fish-eating predators)
- Long-term climatic change
- Fisheries (fish, crayfish)

2. **Natural abiotic processes**
- Temperature regime of water bodies
- Changes of salinity of the Baltic Sea and related changes of the gas regime
- Changes of water levels (connected with amount of precipitation)

3. **Natural biotic processes**
- Changes of predator abundance (fish, etc.)
- Changes in the abundance of animals influencing the natural appearance of water bodies (beaver)

3. Fishery – fishing and fish farming

It includes the utilisation of fish and other water organisms by man: river lamprey (cyclostome), crayfish, algae, etc.

Concerning the so-called internationally regulated species (Baltic herring, sprat, cod, salmon) the Estonian quota in the last couple of years has ranged around 100,000 tons (the actual catch of Esto-

nian fishermen has been 70–80 thousand tons); since 1999 the quota is decreasing (in connection with the decrease of stocks in the Baltic Sea). Part of the quota for the above species has been sold to the European Union (mostly for sprats); the quota at the disposal of Estonian fishermen has been practically fulfilled since 1997.

The catch of other species (mostly fresh water fish like perch, roach, vimba bream, pike-perch, etc. and some euryhaline marine species like flounder, garfish, etc.) has lately been variable, whereas the catch of pike-perch, and especially perch, has decreased (first of all due to low abundance caused by over-fishing).

About 90% of inland catch is obtained from Lake Peipsi-Pskov, the larger part of the rest comes from Lake Võrtsjärv. Main species of commercial interest are perch, pike-perch, bream, pike, roach and some others. The official recorded catch from Lake Peipsi-Pskov has recently ranged around 3000 tons. The catch has been constantly increasing and is now approaching the permissible limit. The most important industrial fish in Lake Võrtsjärv is eel whose natural migratory routes to the catchment of Lake Peipsi have been shut off (since the construction of a power station on the Narva River) and whose catch is based on stocking of juvenile fish in the lake.

In ocean fishing, a rapid increase has taken place in shrimp fishery.

The number of professional fishermen on the Baltic Sea exceeds 5,700 (being about 4,500 in coastal fishery, about 1,200 in trawl fishery) and the number of inland fishermen is about 900 (most of them on Lake Peipsi). In addition to that, the so-called coastal population has limited fishing rights and recreational fishermen use the fishing resources.

The average age of the Estonian fishing fleet (265 vessels of lengths greater than 12m entered into the ship register in 1998) is 21 years. There are 37 ports suitable for unloading of trawlers, 72 ports are used for coastal fishing (23 on Lake Peipsi, 2 on Lake Võrtsjärv, the rest on the Baltic Sea). The data are derived from the number of first sale points as registered in 1997. In actual fact, considerably more ports are used, and in addition to them there is a large number of mooring sites.

The most used fishing gear are gill nets. It is permitted to use about 30,000 gill nets at sea and about 3,000 in inland waters; the real number of the nets and the actual mesh sizes are difficult to monitor. In recent years fishermen have started to use the more efficient kapron nets. At sea, about 2,500 various trap nets are used, the number for inland waters is 500. About 230 seines are used for Baltic herring in coastal sea, 20 Danish seines are used on Lake Peipsi, trawls are used mostly for Baltic herring and sprat fishing.

The primary sector of fishery (i.e. fishing) employs about 7,000 employees (the economic crises in Russia is lowering the number), in many communities the fisheries were/are the main or even only employers. The proportion of the fishery sector (including both fishing and fish processing) is greatest in Hiiu County and makes up about 17% of employable population. The proportion of fishery (fishing) in GNP was the following: 1994 – 153.6 mil. EEK (0.5%), 1995 – 173.3 mil. EEK (0.4%), 1996 – 202.5 mil EEK (0.4%) and 1997 – 294.4 mil EEK (0.5%). The profits of fishery companies are scanty and in 1998 many finished in the red. In 1997 the export of fish and fish produce was 1,511,603 thousand EEK, the share of exports in the sales was 86.3%, the share of exports across all fields of activity was 10.6% and the share of exports in processing industry across the fields of activity was 11.0%. The volume of investments has been relatively modest (over 50 million EEK in 1996). The main article is canned fish manufactured mostly for the market in Russia and the former Soviet Union (about 75% of the exports was directed to Russia and the Ukraine); in the last couple of years culinary processing of fish has been rapidly developing.

Main **problems** influencing biological diversity:

1. Rapid privatisation of the fishing sector, cancellation of the administrative frontier zone regime at sea and granting fishing rights to coastal population have significantly increased the number of population involved in fishing. It has also been facilitated by rising fish procurement prices (especially in the cases of pike-perch and perch). The number of fishermen in view of the stock (especially considering the present tendency to stock decline) is too large. Many people with inadequate preparation who are not conscious of the need for sustainable utilisation of fish stock are involved in fishing. Inadequate control and lenient sanctions lead to the breach of fishing regulations and poaching. It is necessary to start certification of fishermen, amend legislation, develop efficient control, restrict fishing rights and provide training and education.
2. The number of nets, especially gill nets is too large.
3. The recording of species composition and volume of catches is inadequate.
4. The work of control bodies is inefficient.
5. The degree of financing of applied research in fisheries from the national budget is insufficient and is not proportional in view of the significance of fishery as a field of economic activity (part in GNP). In this connection there are often no data necessary for the adoption of decisions about fishing regulations.
6. Dissemination of information on fishery, training and further education are inadequate.

The volume of fish farming has undergone a many-fold decline in the last decades. When in 1992 Estonian fish farms produced 379 tons of rainbow trout and 234 tons of carp, then in 1997 the respective figures were 227 tons and 28 tons. The high cost of production and various mechanisms restricting the import of fish farming production have caused marketing problems in the industry. A growing part of fish farming profit is obtained from 1) production of juveniles for stocking in natural water bodies and 2) recreational fishing tourism. At the state level (mainly using the resources of Fishing Capital) the reproduction of salmon, sea trout, whitefish, brook trout, pike, crayfish and some other species is financed. Largely on the basis of financing by Fishing Capital the modern Põlula Fish Farming Center has been established for rearing of salmon.

A national program for reproduction of fish stock is currently being developed.

4. The impact of fishery on biological diversity

1. Fishing

- Changes in the structure of fish communities (relative abundance of species)
- Decrease of abundance of specific species (up to extinction), changes in the population structure
- By-catch of rare unprotected species
- Pollution of water bodies with fish dead in nets and traps/discarded undersized fish (especially in the warm season, a large part of discarded fish die)
- Impact on biological diversity of other parts of the fauna (animal groups):
  – change in the abundance of fish as food items for other animal groups causes changes in the numbers of many other species (e.g. seals)
  – other species are killed in fishing nets and traps: e.g. seals in trap nets and diving ducks in gill nets
- Mechanical influence of active gear on benthic biotopes: transportation of sediments into water

- Mechanical influence of boat traffic, of oil products released from vessels (logically it should be treated under the heading of transport)

2. Fish farming

- Impact on genetic diversity (inbreeding due to the low number of breeding stock; it is possible to increase/restore genetic diversity)
- Introduction into water bodies of reared alien species and forms (incl. their parasites and morbid agents)
- Introduction into water bodies of reared genetically modified forms (induced polyploids, hybrids, etc.)
- The change of population structure through introduction of juvenile fish into natural water bodies
- Impact on water polluted in fish farming
- Spread of fish parasites and morbid agents through fish used as breeding stock and introduced juvenile stock

3. Fish processing

- Pollution of water bodies with wastes of fish processing (in primary processing on the water body or from plants located on the shores)

5. Strategy of protection of biological diversity of the sea and inland waters

1. Adjustment of the level of the use of resources of water bodies to changing resources

- Optimisation of fleet (at the moment the fishing capacity of Estonian fishery industry exceeds the needs) *(The Baltic Sea Agenda 21 recommends the following strategic steps for the management of fish stocks)*
  – To determine prospective average (optimum) catch volumes for each species and its particular stocks
  – To determine the respective necessary (optimum) catch capacity
  – To inventory existing catch capacity
  – To determine necessary reduction (or, if possible, growth), to establish a time schedule to achieve it
- Improvement of efficiency of the fishing regulation system: gathering of statistical data of maximum possible precision and their prompt entry into easily accessible and efficient electronic databases which would provide continuos and complete information about current situation of utilisation of the fish resource
  – Adoption of current decisions concerning fishing on the basis of accurate information
  – Improvement of the efficiency of fishing control system implementing the decisions

2. Improvement of efficiency of monitoring of water body communities; use of best available scientific advice and technology in sustainable management of water bodies and their communities *(The fourth priority of the Baltic Sea Agenda)*
   There is a necessity for comprehensive improvement in the quality of fisheries science. It is vital to widen the scope of primary data gathering, as well as to improve its quality and to standardise the assessment methods used in different countries. Alongside with purely ichtyological topics, greater attention should be paid to the complex study of the sea environment, as fish stock is a part of the maritime ecosystem, which directly reflects changes taking place in the whole system.
3. Improvement of management of the fishing sector

- Control
  – Monitoring of the activities of shipping vessels
  Improvement of the efficiency of monitoring of fishing and related activities, inspection of activities of shipping vessels (unloading of fish, primary sale, transportation and storage); gathering of statistics about unloaded fish and primary sale. Elaboration of detailed regulations for inspection of shipping vessels, designation of fishing vessels and fishing gear, relaying of information about the location of fishing vessels and about the location of foreign fishing vessels and fishing products on board.
  – Catch statistics
  In accordance with the regulations of the State Sea Inspection, the catches by vessels of lengths of more than 10m are monitored on the basis of catch journals, on smaller vessels it is done on the basis of direct inspections. In order to do that:
  – Regularity of filling the unloading declarations is inspected, statistical processing of respective data is organised;
  – Primary sale of fish is monitored, regularity of filling the primary sale documentation is inspected, statistical processing of respective data is organised;
  – Unloading by foreign vessels is inspected and due relay of information about it to State Sea Inspection is checked;
  – Ship-to-ship reloading of fish at sea is inspected and gathering and processing of respective statistical data is ensured;
  – Application of international quotas is controlled and the European Commission is monthly informed before the 15th day of the current month about the use of the quotas during the preceding month, a forecast of quota use is provided, and quarterly the European Commission is informed about the total amount of caught and unloaded fish;
  – Information contained in the catch journals, declarations of unloading and reloading at sea, and primary sale documentation are juxtaposed and analysed: information about the results of the analysis and reliability of the data is given.
  – Control of fishing effort
  – Fishing effort is controlled and respective statistics is relayed to the European Commission.
  – Monitoring of fishing gear
  – Fishing gear and its correspondence to valid requirements and the particular fishing license is monitored; it is controlled if particular species are caught with gear approved for these species.
  – Fishery regulations and ban for fishery
  – Currently caught and unloaded volumes are compared with national quotas, terms of expiry of the quotas are determined, the European Commission is informed in due course (when over 70% of the national quota has been filled), implementation of decisions of the European Commission on ban for fishery is ensured.
  – The European Commission is informed of all violations and measures taken.
- Fishing gear database
  – Databases of vessels are improved

- **Aims and tasks**

1. In the long run the utilisation of water body resources must not endanger biological diversity, and the use of resources has to correspond to its natural or artificial renewal.

2. The main aim of Estonian fishery is the development of sustainable, environmentally friendly and socially and economically acceptable fishery on the basis of the following principles:
   – Conservation of biologically viable fish populations, conservation of water environment and biological diversity;
   – In view of the above requirements, achievement of a maximum volume of fishing and enhancement of selectivity of fishing through implementation of new technologies.
3. There should be a current picture reflecting the use of the resources and mechanisms for current regulation of resource utilisation (incl. compensation of economic losses of the users of the resources in cases where utilisation is restricted).
4. The users of the resources should be trained and educated; efficient sanctions applied on violations.
5. Changes in the ecosystems of water bodies should be currently determined; there must be legal means, economic incentives and sufficient knowledge for adequate response.
6. The utilisation of water body habitats by man should be sustainable and must not involve wastes.
7. Sanitary conditions in fish processing plants and fish farms should be brought into correspondence with the requirements of the European Union.
8. Sustainable methods and gear should be used in fishing. Legal fishing periods should be determined so that fishing would cause minimum damage to the life cycles of species (e.g. so that spawning would not be disturbed).
9. Environmental damage should be avoided in development planning of water body management. All damage incurred has to be compensated to an appropriate extent by the guilty party and the compensations are to be used for specifically determined purposes.
10. In the utilisation of water bodies, introduction of alien species and genetically modified forms into natural waters should be excluded.
11. Protected biotopes (water bodies) and species should be representative and of sufficient size to ensure actual protection of biological diversity. The know-how and economic incentives for the organisation of *in situ* and *ex situ* protection of species should be available.

4.6. FORESTRY

The survey concentrates on forestry-related **impact** on habitat diversity, the **status** of habitats and **trends** connected with the above influence. Causal **aspects** of impact, resulting status and trends in time have been dealt with whenever possible.

Forestry-related impact is analysed by types of forest utilisation, definitions applied in the Forestry Act currently in legislative process have been used:

Article 26. [. . .] types of forest utilisation [. . .]

(2) Types of forest utilisation are:

1) Conservation of protected natural objects (nature conservation);

2) Protection of landscape or its specific features, soil or water (environmental protection);

3) Protection of man from pollution originating from industry and transportation and harmful influence of weather conditions (sanitary protection);

4) Creation of possibilities for rest, recuperation, rehabilitation and sports (recreation);

5) Gathering of seeds, wild berries, mushrooms, herbs and decorative plants and their parts, moss, lichen, nuts, hay, branches and twigs, decorative trees, bark, roots, resin and birch sap, installation of beehives and use of land for grazing (secondary use);
6) Research and tuition;
7) Production of wood;
8) Hunting;
9) Military activity.

1. Nature conservation

Impact

In the case of Estonia compliance with the Convention of Biological Diversity is an important component of forestry-related activities in forest protection. The impacts of such activities are generally favourable, especially where nature conservation reserves (or areas of specifically targeted protection) in forests where nature has been retained in its original shape is concerned. On the other hand, trampling and felling on clearances at most heavily frequented natural objects and the resulting impoverishment of habitats present a problem. In the course of maintenance of forest and landscape protection zones (e.g. clearing of undergrowth, opening of views, etc.) diversity is changed both at the levels of habitat and landscape.

Status

The status of biological diversity influenced by the above impact factors may be considered good, as to date no irreversible changes have been detected.

Trends

It is likely that with the increase of the number of people visiting nature conservation areas respective influence (trampling and felling on clearances) will also grow. In forests in nature reserves (or areas of specifically targeted protection) danger of damage due to economic activity is expected to grow increasingly. As a result of controversy between economic interest and inefficient protective measures the efficiency of protection of various "transitional forms" of nature conservation, e.g. key biotopes, protective alluvial forests, etc., may suffer critically.

Aspects

One of the negative circumstances is insufficient administrative co-operation and co-ordination between nature conservation and forestry institutions and within the forestry institutions themselves.

2. Environment protection and sanitary protection

Impact

Forests categorised as protective forests and thus maintained for purposes of environmental and sanitary protection influence the flows of matter, energy and information in landscapes both in the physical-spatial and biological plane. Protective forests are often a significant barrier and buffer on the way of anthropogenic factors influencing biological diversity (e.g. protective alluvial forests help to preserve water ecosystems and the diversity of habitat has a buffer effect against agricultural

pollution). Attempts to apply alien species for raising the protective function of forests should be classified as a negative influence.

Status
The functional efficiency of protective forests and sanitary protective forests is largely variable both regionally and in terms of specific protective purposes; this is also true of diversity of natural habitats.

Trends
Assessment is problematic.

Aspects
The efficiency of protective forests is often dependent on the specifics of particular landscape and the character of the agent that is being avoided. To date this field of activity, concentrated to the overlapping area of different institutional interests (agriculture, planning, forestry), has not provided sufficient motivation for inter-institutional co-operation.

3. Recreation

Impact
The basic influence of recreation facilities ensues from the building of technical infrastructures and the tourist load itself (trampling, felling on clearances, introduction of alien species). At the same time (eco-) tourism helps improve general nature consciousness of population which through feedback could be expected to alleviate impact on biological diversity.

Status
Tourism has a highly regional and area-specific influence on nature and natural habitats. The situation is worst near water bodies and inhabited areas, also on the coast and islands. Drastic change has taken place in areas suitable for recreation purposes formerly under administration of Soviet border guard troops or the army.

Trends
With increase in general population income and foreign tourism throughout, the tourist load on nature is on the rise and this causes increased dangerous exposure of biological diversity.

Aspects
From the macroeconomic point of view, tourism-related income is not yet linked with damage caused to nature. Permissible limits and principles of dispersion of the load have not been formulated.

4. Secondary use

Impact
People gathering berries exert influence around cities especially in southern Estonia and on certain ecosystems (cranberry marshes). Excessive gathering of certain decorative plants is also to be noted.

Other gathering activities are of local or temporary character and from the national point of view strategically negligible.

Status
Generally satisfactory. Occasionally balance of plant habitats may be modified (blueberry forests, cranberry marshes).

Trends
Assessment is problematic and depends on the market situation and living standard.

5. Research and Education

Impact
The influence of biological diversity research can be classified as negligible. Similarly negligible is the impact of measures presumably implemented as a result of such research with the purpose to alleviate negative influences on the biological diversity of forests and their status. Other data necessary for formulation of the basic framework for assessment of biological diversity and monitoring do not exist, e.g. there are no data reflecting the real distribution of types of forest habitats, representation, etc.

Status
Such impact (lack of impact) has led to a situation where there is no sufficient information for making decisions about the status of forestry-related biological diversity efficient measures (legal, economic) based on such data.

Trends
Several political guidelines for better organisation of protection of biological diversity have been prepared [11], incl. definitions of tasks for development, research and tuition, therefore certain improvement of the situation is to be expected.

Aspects
Presently the analysis of the influence of forestry as a whole on biological diversity has been left out of institutionalized scope of attention, thus there have been no organisational grounds for gathering such information.

6. Wood Production

Impact
Indubitably the greatest impact on the diversity of natural habitats is exerted by wood production. The lack of influence of forest fires and the drastic impact caused by amelioration should be noted as factors influencing the natural forest ecosystem with an even more prominent role than the **physical** factors. Other significant factors in terms of biological diversity are the spatial pattern of the forest

[11] i.e. projects initiated by the Estonian Forestry Development Program: 1) Estonian Forest Conservation Network (code name EC1), 2) Estonian Biodiversity Protection Strategy for Commercial Forestry (EC2), 3) Sustainable forestry criteria and indicators in Estonia (EC3) and 4) Strategy for Sustainable Management of Estonian forested wetlands.

and the dynamics of its development. Due to habitat demands (incl. minimum biotope), the prism and ecoton or borderline effect the species composition is determined by the size, shape and connections of lots, and especially the size and configuration of felling lots. Thus the clearing felling does not influence biological diversity only through direct radical modification of the habitat, but also through creation of new ecotons and triggering of successional aspects. Among physical impact of forestry special mention should be made of technological damage to forest stands, i.e. to surviving trees, undergrowth, ground and plant life on the ground, soil. **Chemical** impact comprises liming of acid forest soil, which causes strong stress in forest types with narrower ecological niches and thus changes the appearance and composition of forest habitat. Due to fire surveillance and the resulting absence of natural fire cycle ash is not returned to the circulation of forest ecosystems. In Estonia there is no remarkable application of pesticides for forest protection. Any use of toxic substances makes it impossible to speak of natural forest habitats. **Biological** influences include introduction of alien species and the so-called forest amelioration which from the point of view of wood production is the only solution but which actually distorts natural processes. In commercial forests, the age, composition and spatial structure of stands has been modified for economic reasons through changed felling age and intermediate felling. This obviously changes the living conditions in the whole habitat and also the structure of the habitat. Through artificial renovation sites are frequently inhabited with unnatural tree types (habitation of syncologically unsuitable areas) and habitat borders are not related to growth conditions. In afforestation of agricultural lands the logic of natural succession has not been observed, which has resulted in the emergence of ecologically catastrophic consequences.

Status

Forest types – Habitats – Landscapes

In the course of the last century about 24–30 vascular plants, bryophytes and lichens have disappeared or become very rare in Estonian fauna. Partially this can be seen as a result of commercial activity, e.g. afforestation of heaths or total felling in the habitats of endangered plants. Zoogeographically Estonia is situated in the transition zone between western and eastern Palearctic regions and therefore there are relatively many rare and endangered species, especially among invertebrates and trees. Although Estonian zoological resources have been studied relatively thoroughly, there is no data about the influence of forestry on forest fauna. The same can be said of forest habitats where a fair amount of research has been carried out for more than 50 years, but where the influence of forestry on changes of natural habitats have not been studied in detail. This holds true also in the case of forest landscapes. We have good information about the dynamics of forestation of land across centuries and respective changes of land use, but the patterns of forest landscapes and their dynamics have not been studied from the point of view of forest use.

Trends

Though the patterns of forest landscapes and their dynamics have not been studied from the point of view of their influence on forest use, some general tendencies and trends have been observed:

- disappearance of hydrophilous species/habitats caused by forest amelioration,
- introduction of alien species (sorts, races),
- changes in the geochemical cycle (e.g. connected with water, nitrogen, ash),
- development of unnatural composition of forest stands,
- disappearance of key biotopes,
- development of unstable forest habitats in artificially or naturally afforested agricultural lands,

- development of synecological maladaptation of forest stands,
- development of technologically damaged stands and poorly regenerated ground,
- development of a specific biologically pathological status.

Aspects
One of the most serious causes of the above impacts and resulting trends may be the absence of control over the qualitative and quantitative level of forestry-related factors influencing biological diversity.

7. Hunting

Impact
Hunting exerts significant influence on a specifically limited part of habitats, i.e. the game, as it regulates the natural fluctuations of respective populations. The introduction of alien game species (mink, some ungulates, raccoon, pheasant, etc.) may be seen as a factor of specifically negative impact, as it impoverishes the aboriginal fauna.

Status
Due to the regulation of population size (e.g. moose, wild boar) a certain balance has been retained in forest ecosystems.

8. Military Activity

Impact
The presence of Soviet army in Estonia has had pervasive influence both in the negative (destruction, pollution) and positive sense (e.g. preclusion of extensive forest training and testing grounds from commercial activity). The impact of military activity on the Republic of Estonia has not as yet been established in sufficient detail.

Status
Military activity has led to the emergence of extreme habitats inhabited by a number of rare species (e.g. Värska heath). At the same time, several valuable natural habitats have been subjected to trampling and felling (Kõrvemaa, some coastal forests, etc.).

• Objectives

1. Nature Conservation
The needs for protecting biological diversity, more efficient and educational access for visitors and the achievement of other forestry-related interests are unified and supportive of each other on forested nature protection areas.

- A clearer understanding of the differing needs of protecting biological diversity in forested protected areas and the role of forests in its protection.
- Understanding of the needs of visitors, as well as of their influence on the forests where the nature is protected.
- An analysis of other forest uses and their influence on protected forest areas.
- Efficient norms for regulating the sector

- Efficient administrative mechanism for regulating the sector
- Economic compensation mechanism for increasing the importance of protecting biological diversity

2. Environmental protection and sanitation

Environmental protection and sanitation forests effectively fulfil the function of protecting biological diversity

- The functions of environmental protection and sanitation forests are specified through carrying out inventories
- The functions of environmental protection and sanitation forests in the protection of biological diversity and sustainable use are specified
- Identify the conservation forests whose landscape ecology functions are not serving the biological diversity protection functions, which should be delegated as protection forests.
- Co-operation of agriculture, planning, environmental and forestry administrations in the sector

3. Recreation and Tourism

Recreation and tourism in forests that supports and sustains biological diversity

- Study of the effects on biological diversity of existing recreation and tourism
- The carrying capacity of different biodiversity aspects in relation to the load of the recreation industry
- New recreational area planning, which takes into account the economic and social changes which have occurred
- The offering of forest nature as a recreation and tourism object as a financing solution
- Eco-tourism in a good state

4. Secondary use

Secondary use in forests which sustains biological diversity

- Existence of an indicator system, which indicates the level of damage to biodiversity caused by secondary use.
- Monitoring of damage to biological diversity caused by secondary use
- Existence of a system for alleviation and prevention of damages to biological diversity caused by secondary use

5. Science (Research) and educational work

Research and observing scientific study of the aspect of protection and sustainable use of biological diversity and educational work explaining the results of such work

- Information about the main principles of forest biodiversity is available
- Programmatic studies of the forestry – and all of its sector's – influence on biodiversity take place
- Collection of information about and monitoring of the forest environment (incl. biodiversity) is integrated into a unified monitoring program.
- An educational system which passes on appropriate learning
- There is a directing body which plans, co-ordinates and implements forestry science policy

6. Wood production

A system is in place, which controls the quantitative and qualitative levels of the influences to biological diversity during wood production.

- Assessment of impact of existing forestry measures and forest policy is made and conclusions drawn.

- The effect on biological diversity of various felling methods, volume and degrees is explained
- Irreversible changes resulting from forestry activities are avoided
- Existing methods for protecting, saving and promoting biodiversity are employed to their full extent (key biotopes, standing trees, lying wood, use of natural regeneration, controlled and restricted burning, etc.)
- Indicators to measure the quantitative and qualitative levels of forestry influences to biological diversity are worked out.

7. Hunting

The principles for protecting biological diversity are defined in Estonia hunting policy

- A central institution responsible for hunting is established
- Explanations of the effects of hunting measures (incl. under and over-hunting) on the biological diversity of forests as a whole are given
- Indicators are worked out for measuring the effects of hunting on biological diversity.

8. National Defence

National defence activities in forests spare and protect biological diversity

- The needs for biological diversity and national defence within forested areas are explained and unified
- Appropriate instructions, codes, control, and as necessary damage compensation mechanisms are compiled and put in place.

4.7. AGRICULTURE

Estonian agriculture, with its 4000 year-old-history, is largely an expression of Estonians' traditional and environmentally sustainable lifestyle. The agricultural landscape comes out distinctively in the general landscape of the country. And as these agricultural lands generally constitute semi-natural – or heritage – landscapes, these are a national treasure which should be preserved. For example, 23.3% of the species of vascular plants, which have been entered into the Estonian Red Data Book have a close relation to survived meadows.

After World War II, Estonian agriculture, which had always been based on farms, was collectivised and the whole branch of economy was mostly specialised to producing milk and meat for other regions of the Soviet Union. This production was mostly based on imported concentrated (cereal) feed. At the same time, attention was focussed mainly on developing the central villages of large collective farms, whereas smaller villages were left to die out. A large part of small village schools were closed and the rural population concentrated to the centers of collective and state-owned farms.

Production went through a process of intensification and concentration. Despite plants' inability to use the increasing amount of minerals, more and more mineral fertilisers and plant protection products were used. By the year 1988, an abnormally high level of mineral fertilisers – 288.8 kg per hectare (according to 100% concentration of active ingredient) – was reached. Concentrated animal husbandry became a source of large-scale point pollution. As a result of such intensive and concentrated agriculture, ground water was polluted within large areas, especially in northern Estonia where soil layers are thin. By 1998, the production volumes in agriculture had largely decreased and the harmful impact of agriculture on the environment has significantly weakened.

There are direct and complex relationships between agricultural production and biological diversity. Activities which are related to intensive agricultural production (fertilisation, melioration, use of pesticides) has had a negative impact on the biological diversity, especially on open landscapes and the wildlife in the inland waters. Large-scale production with its large producing units has impoverished the general view on the agricultural landscape and in many places destroyed the traditional landscape patterns. However, in semi-natural areas, which are mostly situated in the western parts of Estonia, extensive agricultural production has had a favourable influence on the biological diversity. Here, examples of species-rich communities are alvars (limestone regions which are covered with thin soil and stunted vegetation) and coastal and floodplain meadows. Animal and plant breeding has increased the diversity of variations within one and the same species. The newest methods of animal and plant breeding, however, tend to decrease such diversity.

1. Semi-natural areas

In semi-natural areas, which are most widely spread in west and north Estonia, we can note the evidence of the positive influence of agricultural production on biological diversity. Let us hereby name alvar communities (limestone regions with thin soil), coastal and floodplain meadows, wooded meadows and pastures, which are extremely rich in different species of vegetation. The extinction of traditional methods (mowing with a scythe or a horse-driven mower, use of natural pastures for grazing) and changing to large-scale production has significantly decreased the area of semi-natural areas (so-called heritage cultivated lands) during the last decades. For example, according to L. Laasimer, the area covered by alvar communities was 44,000 ha in 1957; in 1983 this area was calculated to be approximately 16,000 ha, 25% of which was overgrown with bushes. According to M.Pärtel, there are still less than 10,000 hectares of meadows on limestone bed with its peculiar plant communities existing. Only 5,000 hectares of these meadows may be in a satisfactory condition and only less than 1,000 hectares are very well preserved. From 1953 to 1973 the area of natural grasslands in Estonia decreased by 435,000 hectares. One hundred thirty thousand (130,000) hectares of this area was cultivated, the rest either overgrew with bushes or was afforested. Over 120,000 hectares of former grasslands were handed over to forestry enterprises. According to Kukk and Kull since the 1950s the area of natural meadows has decreased on average by 20% for each five-year period. In the years 1995–1997 there were up to 5,000 hectares of wooded meadows which were in good condition. In addition to these, approximately 300 hectares of floodplain wooded meadows and species-poor wooded meadows in other parts of Estonia could be found. Most of the wooded meadows are small hayfields used by one family, less than 5 hectares in size. During the years 1995–1997 mowing was performed on approximately 200 hectares of wooded meadows. The area of wooded meadows reached its maximum size by the turn of the century – 850,000 hectares. About 800 hectares have survived up till today. So it can be said that the area of our wooded meadows has decreased 1000 times in 70 years.

Taking into consideration the uniqueness of many of the semi-natural plant communities on the world scale, and their high value from the position of environmental protection, biological sciences, recreation and natural heritage (numerous different plant species including rare species), additional measures should be taken immediately to preserve these values. According to the Estonian Red Data Book, the overgrowing of semi-natural plant communities appears to be a major threat factor for 7 species of fungi, 23 species of lichens, 80 species of vascular plants and 23 animal species.

In a situation like this, the only possible way of avoiding the extinction of semi-natural biotic

communities is to support farmers and other land-users who are interested in using and maintaining the woodlands. Taking the experience of Matsalu and other nature conservation areas as an example, it can be confirmed that contracts with farmers that provide state support for traditional use of an area is a system that works effectively. The compensation rates applied in Matsalu have, until the recent times, been sufficient, but now already require revision. A similar system should be applied on other areas with semi-natural communities. In most cases it requires making up programs for organising the protective measures. In some places, actual work can be started already in the course of drawing up such programs.

During the first years of introducing the program, the increase in expenses connected with performing and specifying inventories and including the lands into protection lists is understandable. Together with the application of the maintenance contracts (to the most part of semi-natural areas, which constantly have been taken care of, or the restoration of which is realistic) the general annual amount of compensations will stabilise and will need adjustment only to balance the influence of inflation.

2. Genetic diversity and agriculture

Biological diversity connected to agriculture may roughly be divided into the diversity related to agricultural plant production and that related to agricultural animal husbandry (breeding).

2.1. Plant production

Primitive land cultivation reached the territory of Estonia at the end of Stone Age and it went through a substantial development during the Bronze Age. Already in Iron Age, the growing of different crops in addition to animal husbandry became a leading branch of land cultivation. The oldest data about growing fruit trees dates back to the 13th century. No varieties, which can be considered as local from those earliest days, have reached our times. Seed growing of agricultural and vegetable crops were based for a long time on imported varieties which adapted under the local growing conditions. Often, directly imported commercial seeds were used. Most of Estonian fruit and berry varieties, which have survived until our days, were bred only in our century. One of these oldest Estonian varieties is a rye variety 'Sangaste,' which was bred by count Friedrich Berg (1845–1938), the owner of Sangaste landed estate.

The most prolific period in results regarding the breeding of agricultural crops and grasses started in Jõgeva in 1920, after the establishment of the Republic of Estonia. It was the beginning of the Jõgeva variety Breeding Institute. Until the present day, about 240 varieties have been bred in Jõgeva. More than one fourth of these varieties are the varieties of grains and leguminous crops, one fourth are the varieties of grasses, and in addition to these 45 potato varieties and 30 varieties of vegetables (garden peas, string beans, white cabbages, carrots, onions, radishes and tomatoes). Some varieties of fiber flax, hemp, poppy, fodder roots, strawberry, gooseberry, apple and black currant have been bred. By April 1996, the gene bank of Jõgeva contained the breeding material (seeds or tubers) of 965 different varieties or breeds.

In the Kuusiku Testing Station from 1924 to 1970 the following varieties were bred: 1 winter wheat, 1 melilot, 1 white cabbage, 1 radish and 2 swedes. Additionally, selection work to improve the existing vegetable varieties was performed.

Breeding of fruits and berries reached its peak during the period shortly after World War II, when

professional breeders started to work at Polli Horticultural Institute. They have bred 15 apple varieties, 1 pear variety, 14 plum varieties, 3 morello varieties, 2 strawberry varieties, 4 raspberry varieties, 8 black currant varieties and 1 gooseberry variety. Several good fruit and berry varieties have resulted from the work of hobby breeders.

Estonia does not have a central gene bank. Apart from ornamentals, genetic treasuries of main agricultural plants are located at the Jõgeva Plant Breeding Institute, Polli Agricultural Institute, the Research Centre of Plants' Biotechnology EVIKA and at the Institute of Experimental Biology. Seven hundred sixty (760) breeding forms of cranberries, which have been used for breeding new cranberry varieties, have been collected at Nigula Nature Reserve.

The corresponding research and testing institutions of Latvia and Lithuania are co-operating: many Estonian varieties are preserved in Latvian research centres. Within national aid programs, all Baltic states are in the sphere of interest of the Gene Bank of the Nordic Countries, but up to now it is not clear in what way our fruit and berry varieties should be preserved there. At the same time, it is clear that our varieties should be preserved as doubles i.e. in several places.

Simultaneously, databases of these materials should be formed in conformity with internationally recognised methods. Actually, activities in this field were started in 1996. Unfortunately, the progress has not been rapid enough. The already existing part of the databases should be doubled and kept in different places. Genetic treasuries and the information regarding the varieties have to be easily and quickly accessible to all breeders both in Estonia and in other countries. The uncertainty related to the conservation of the gene treasuries of agricultural plants is worrying the researchers of EVIKA, Polli, the Institute of Experimental Biology and Nigula Nature Reserve.

It is necessary to prepare and adopt legal acts on the protection of the collections of agricultural plants (genetic treasuries). These acts should guarantee that the liquidation as well as the fundamental restructuring of these collections would not depend on arbitrary decisions of any officials. The problems of funding and maintenance of such collections should also be legally guaranteed.

It has to be kept in mind that genetic diversity is essential for the survival of agriculture.

2.2. Breeding of farm animals

Two old Estonian local animal breeds – the Estonian cow (Estonian rural cattle) and the Estonian horse have been entered into the list of the most endangered animal breeds of the world ("World Watch List").

The Estonian cow has inhabited this area already from the ancient times and it has been an initial breed in breeding other local breeds (Estonian Black and White cattle, Estonian Red cattle). In the Soviet period, the number the animals of this small and lightweight (400–480 kg) breed decreased from 12,799 (1945) to 620 (1994), now the number is about 1000.

The Estonian Horse evidently reached our territories together with our forefathers. The ancestors of the horse breed were Asian-Mongolian horses, which had been mixed with North European wild horses. The Estonian Horse is a stout and undemanding animal, remarkably well adapted to the poor seaside pastures of West Estonia. Until the 18th century, it was the only widely spread horse breed in the whole Estonian territory. The Estonian Horse was used in the breeding of the famous Tori Horse and the Estonian Draught Horse. The number of all Estonian horses is small. The present situation of the most ancient Estonian horse breed is by far the most worrying.

Other Estonian original animal breeds are the Estonian White-headed sheep and Estonian Black-headed sheep, the Estonian Country-breed pig and the Estonian Large White pig.

Current Situation

In December, 1997 the Riigikogu (Estonian parliament) adopted the Amendment Act to the Farm Animals Breeding Act, in which the following issues of EU Directives included in the White Book are partly applied:

1) pure-bred breeding cattle;
2) zootechnical standards applied to the breeding of pigs;
3) pure-bred breeding sheep and goats;
4) zootechnical and genealogical conditions in connection with the trade of horses. In these legal acts, zootechnical and genealogical requirements for the marketing of pure-bred farm animals are set out, together with the principles which are applied to the import of animals, their semen, ovule or embryos from the third countries.

State supervision over farm animal breeding, according to the legislation, is performed by the Animal Breeding Inspection.

3. Organic Agriculture

Organic agriculture is defined as a self-acting, sustainable agro-ecological system, which uses local and renewing resources. Organic plant production is based on the conservation of the soil structure and fertility, together with crop rotation. Organic agriculture aims at improving the plants' natural resistance to pests and plant diseases. The use of mineral fertilisers and synthetic plant protection products is prohibited. The number of farm animals has to be in correlation with the area of land. Animal feed should originate from the same animal farm and manure has to be handled in a manner that is as harmless as possible to the surrounding environment.

Organic production is regulated by international standards (IFOAM Basic Standards) of IFOAM (International Federation of Organic Agriculture Movements). They apply to both plant production and animal husbandry. Most of the supervisory organisations of organic agriculture have based their activities on the above mentioned standards. More than 500 member organisations belong to IFOAM, including Estonian Union of Biodynamics. In the EU, organic agriculture is regulated by a EU Regulation (EEC) 2092/91. Until now, the regulation is applicable only to plant production. A corresponding regulation for animal husbandry is being prepared.

Organised activity in connection with organic agriculture started in Estonia in 1989 with the establishment of Estonian Union of Biodynamics (EUB). Despite its name, this union unites all people who are interested in organic agriculture. Different training courses and international seminars have been held, farmers have been sent to practical training to Finland, Sweden, Denmark and Germany to the farms which apply the principles of ecological or organic agriculture. The union has its regional representatives in several regions of Estonia: Harjumaa, Läänemaa, southeast Estonia, Pärnumaa, Raplamaa, Saaremaa and Viljandi. In addition to these, organisations such as the Association of Organic Producers of Läänemaa, the Saaremaa Union of Biodynamics, and the BIOS in southeast Estonia exist. All in all there are 120 organic farmers in Estonia (including the farmers who are passing the conversion period). However, many of these farmers have not applied for the eco-label in the recent few years, as the eco-label does not mean any premium prices at the market.

The organisation responsible for the information and development of projects regarding organic agriculture is a non-profit organisation called the Centre of Ecological Technologies. They have been issuing a quarterly newsletter "Organic Agriculture" since 1996, organise training courses, maintain

the database of organic farmers and carry out scientific research projects. On June 11, 1997 the Parliament adopted the Organic Agriculture Act which legitimises the main issues of the Regulation "Organic Agricultural Production and the Use of Relevant Labelling" included in the White Book. Since 1 January 1999, eco-label authorisation has been granted to the Estonian Union of Biodynamics and BIOS of southeast Estonia (pursuant to Regulation No.155 of Dec 14,1998 by the minister of Agriculture). State supervision over the compliance with the requirements is performed by the Plant Production Inspection and the Veterinary and Food Inspection.

A large-scale conversion to organic agriculture would help to reduce the distributed pollution caused by agricultural production, especially in connection with the use of biogenic substances and pesticides) and protect the fertility of soils.

4. The use of mineral and organic fertilisers

The excessive use of fertilisers, which did not conform to the requirements of Fertiliser Norms, brought along an extensive pollution of arable lands during the past few decades. In the 1950s, 5.7kg of N, 9.3 kg of P and 20 kg of K per hectare were applied. In addition to this, 4.2 t of organic fertilisers were applied. In the 1970s, the corresponding numbers were already 72.1 kg of N, 24.6 kg of P and 66.7 kg of K whereas the quantity of organic fertilisers had risen to 10.5 t. (Table 1).

Table 1. The application of fertilisers in 1910–1997

	Org. fertilis. t/ha	N	P	K	NPK
1910–1914	5	0	1	0.5	1.5
1940	7	1	5	3	9
1950	4	6	9	20	35
1960	5	12	18	32	62
1970	10.5	72	25	67	164
1976–1980	12	90	23	79	192
1986–1990	14.5	99	26	86	211
1995	10	22	4	5	32
1996	10	19	3	3	25
1997		20	3	4	27

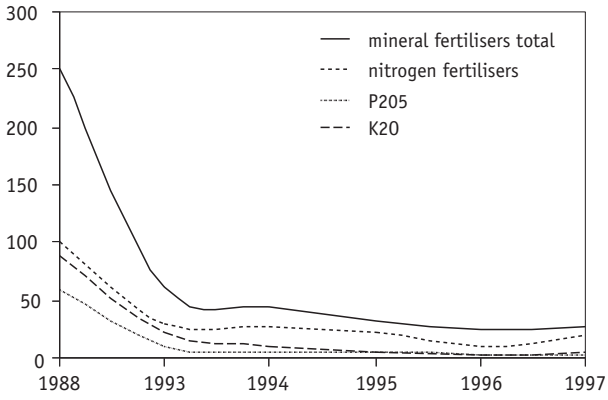

Figure 1. The use of fertilisers 1988–1997

The main reason for a dramatic decrease in the use of organic fertilisers in the 1990s was the decrease in the number of farm animals and the increase in the price of the peat used for bedding. Their comparatively high price and the limited possibilities for getting loans for investments cause the limited use of mineral fertilisers. Hence the use of fertilisers per one hectare of arable land by 1997 decreased more than 6 times as compared to 1988 (fig. 1). The extensive pollution of the last decade resulted in major eutrophication of inland waters and the pollution of ground waters; the latter being especially noticeable in north and central Estonia. The eutrophication of inland waters is, according to the Estonian Red Data Book, considered to be the main peril factor for 2 species of algae, 4 species of mosses, 4 species of tracheophytes and 58 animal species.

Starting from 1988, the use of both organic and mineral fertilisers started to decrease slowly; from 1993 the decrease was rapid. At present, the application rate is stable at a quite a low level.

Current Situation

The most important legal acts which regulate the use of fertilisers are "Modification and Amendment Act to the Water Act" (RT 1 1996, 13, 240), "Restrictions in the Use of Fertilises and Waste Water Sediments", Appendix 1 "Restrictions to Fertilization Arising from the Requirements for the Environment" (RTL 1994, 35) and the "Emission Tax Act" (RT 1 1999, 24, 361). Upon the use of fertilisers, the restrictions and precepts by HELCOM have to be followed. The "Nitrate Directive" and the "Accepted Agricultural Practices Guidelines" are being prepared.

5. Plant Protection Products

An integrated plant protection system which is intended to be effective and, at the same time save the environment, is being developed. This system combines the use of plant varieties which are resistant to plant diseases and pests and competitive as compared to weeds. It also includes the application of crop rotation, seed growing system and modern land cultivation methods. Chemical plant protection products and pesticides are still being used.

The peculiarity of Soviet agricultural technology was the unlimited use of herbicides and highly toxic and allergenic insecticides. The use of pesticides increased noticeably at the end of 1950s. The peak of the use of pesticides was the period 1981–1989 when chemical treatment was conducted on more than 500,000 hectares. Annual average application of pesticides was 900…1100 t (active ingredient), which means 900 – 1,100 grams per one square meter of sown fields. The "record" year was 1986, when 2,067 tons of pesticides (1 kg per hectare) were used. Due to the poor financial situation of the farmers the use of pesticides has rapidly decreased (Table 2).

Upon giving the evaluation, it has to be taken into account that since new and more effective products have come the rates of application per hectare are a lot lower. While in 1988, nine hundred eight (908) tons (active ingredient) of pesticides were used, then in 1991 only 484 tons, in 1993 202.5 and in 1995 two hundred sixteen (216) tons were used, respectively. During the last few years, the rate of use has stabilised. During the period of 1993–1997, two hundred five (205) grams of pesticides per hectare were used on average. These figures are a lot smaller than those of western Europe. Estonia has rejected several highly toxic insecticides and the use of some plant protection products will remain prohibited pursuant to the Plant Protection Act.

Among the pesticides which are used in Estonia 78–80% are herbicides, 10–12% are fungicides, 4–6% seed-treating chemicals and 2–5% insecticides. Most of the pesticides belong to the group of low toxicity substances the lethal dose (LD50) of which is over 1,000 mg/kg. Most of these pesticides are comparatively harmless to the environment.

Table 2. The use of pesticides

Pesticide	kg/ha 1993	1994	1995	1996
Fungicides	0.9	0.7	1.3	1.0
Herbicides	1.1	1.0	0.9	0.6
Chemical seeds treatment agents	0.2	0.3	0.4	0.5
Insecticides	0.4	0.3	0.3	0.1
Inhibitors	1.1	1.2	1.3	0.3
Desiccants	0.4	0.9	1.3	0.9

According to Estonian Red Data Book, pesticides are a main peril factor for 2 species of vascular plants and 2 animal species.

Current situation

The Plant Protection Act establishes only general principles. The approval of the "Procedures for the Importation and Marketing of Plant Protection Products" and

Regulation No.48 by the Government of the Republic, "The Approval of the Procedures for the Registration of Plant Protection Products," partially apply the requirements of the Directive 79/117/EEC (prohibition of marketing and use of plant protection products containing certain active ingredients).

Estonia has adopted the International Plant Protection Convention, the Convention of Helsinki, and follows other international agreements on international trade (FAO Code 3 of Conduct …, PIC Procedure etc.).

Supervision over the marketing and use of the plant protection products is performed by the Plant Production Inspection.

6. Animal farms and manure handling

There were 286 large animal farms with 566 cows in each on an average in Estonia in 1985. Two bigger "pig factories" (Viiratsi and Pärnu) produced 4,500 and 6,500 tons of meat per year. The concentration of animal husbandry into gigantic farms brought along big pollution problems. The reason for such pollution was mostly the absence of a requisite manure handling system. Until the 1970s, large cowsheds were constructed without manure silos. Afterwards, the silos were built but in most cases they did not meet the requirements for environmental protection. A serious problem was the handling of the big quantities of slurry from the gigantic "pig factories," as there was a huge number of animals compared to the limited area for spreading the slurry. It thus seriously polluted the surrounding environment. By 1995, the number of farm animals had decreased two times and their distribution was more even (table 3).

Table 3. The number of farm animals as of 01 January in thousands

	1980	1990	1995	1996	1997
Farm animals	819	758	420	370	343
incl. cows	314	281	211	185	172
Pigs	1086	960	460	449	298
Poultry	6843	6537	3130	2911	2325
Sheep	154	139	62	50	45

Current Situation

General principles have been set out by the "Modification and Amendment Act to Water Act" (RT 1 1996, 13, 240), the Regulation No.23 of 1994 by the Minister of the Environment "Restrictions in the Use of Fertilisers and Waste Water Sediments", Appendix 1 "Restrictions to Fertilisation Arising from the Requirements for the Environment" (RTL 1994, 35).

7. Land improvement and soil

7.1. Land improvement

The classical definition of land improvement describes it as a system for improving the cultivation value of soil. This was the goal of land improvement already at the times of Iron Age, and in the 17th century actual draining of lands began. A big step forward was made during the first half of the 19th century when ditches were replaced by pipe drainage. This influenced the biological diversity at much larger areas. A review of introducing new drainage systems by five-year periods is shown in Table 4.

Table 4. Constructed melioration

Years	(thousands of ha) Drainage total	Including pipeline drainage
Until 1950	4.9	1.5
1951–1955	70.5	8.0
1956–1960	95.7	56.6
1961–1965	131.7	100.5
1966–1970	190.7	168.5
1971–1975	205.0	177.2
1976–1980	150.0	135.0
1981–1985	88.4	79.5
1986–1990	80.5	69.2
1991–1995	26.0	12.5
1996–1998	1.8	0,3
Total	1045.2	800.8

Work on general drainage systems practically ceased in 1991, and instead work was started on farm lands. Together with the systems which were handed over from the ownership of Land Improvement State Bureaus, drainage systems owned by the farmers constituted 97,000 ha (13.2%). Hence, we may say that until the present day most land improvement systems are still owned by the state. Data concerning the evaluation of land improvement situation is available in the yearbook of 1990 of the Estonian Land Register. According to this data, the area with insufficient drainage is 132.2 thousand hectares (21.7%). On the basis of the research carried out by the Estonian Land Cultivation Institute, an additional 2.6% of the drained areas may drop out of the lands which are suitable for cultivation.

Land improvement is not considered to be the use of either the land or other natural resources. It is merely a measure to enable the optimal use of just one resource, the soil itself, or creates preliminary conditions for the use of such soil. Thus land improvement influences the biological diversity only via its direct result. Artificial bodies of water or building protection zones usually increases the biological diversity. Draining of a natural territory with an aim to grow crops on it may influence the biological diversity in two different ways: in most cases it decreases the diversity but, in some definite areas it can also have an opposite effect. This depends mainly on the biological diversity and the type of landscape in the certain territory. If there is uniform biotic community throughout the whole territory then introducing agricultural crops means an increase in the biological diversity. In the case of existing agricultural landscape, such introduction of crops means a decrease in the biological diversity in the territory. So we may draw a conclusion that land improvement changes the structure of the types of landscape alongside with the biological diversity. As a result of large-scale draining during the Soviet period the biggest harm was done to the wetlands and their typical plants: helophytes, *Cladium*, *Selaginella* etc. This large-scale draining has worsened the situation of the population of *Margaritifeera margaritifera*, an animal species of I category.

In most cases, draining decreases biological diversity. It is one of the main causes of the loss of wetlands. At the same time, draining is essential for land cultivation and we have to admit that in some cases it has a positive influence on biological diversity. Pipeline drainage as a rule, has a stronger impact on the biological diversity than simple ditching. Open draining ditches can even act as important microbiotopes.

Considering the present situation, it is unnecessary, and from the position of biological diversity absolutely inadmissible, to drain the areas which have not been drained yet and to rectify the existing natural brooks. Naturally, at least part of the drained lands has to be kept suitable for agriculture. Open drainage should by no means be replaced by pipeline drainage; in places, even restoring of open drains could be considered. The sluices of drainage systems under reconstruction (in the case of larger systems also inside the system) should be supplied with carrs or ponds. Control devices have to be built for the ditches which flow in limestone surface and trees and bushes have to be planted along the

main drains. Such measures help to keep off the pollution, which may come from the drainage system and also increase the biological diversity in the region.

Current Situation

The most important regulative acts regarding land improvement are the Land Improvement Act (RT 1 1994, 34, 534) and the Regulation by the Government of the Republic of Dec.29, 1994. Preparation of land improvement design work, approval of technological requirements for land improvement, issue of construction permits and the approval of the procedures related to the initiation and termination of the exclusive right for the use of water resources (RT 1 1995, 5, 46).

We can thus conclude that

- The area of extensively used land in Estonia is sufficient to ensure maximum biological diversity under the existing natural conditions.
- Orientation of the previous decades on large-scale agricultural production has made the structure of the landscape simpler from the standpoint of biological diversity (due to the concentrated nature of agricultural production), and practically liquidated the areas with natural plant communities, which had developed in the course of former extensive production. Under the conditions of free market economy this process can continue at an even bigger scale.
- In the course of present campaigns of preparation of plans, no attention is paid to the protection of biological diversity and modelling of such diversity outside the nature conservation areas.
- No scientifically proven ground exists for the protection and modelling of the different structures of landscape.
- No real legal or organisational power exists for the protection and modelling biological diversity outside the nature conservation areas.

7.2. Soil

Soil is the basis of agricultural production. The quality and fertility of Estonian soils is extremely different in different regions. The areas with fertile soils are very much limited. Most of them are already being used and the necessity of their protection and conservation has already been proven. Reasonable use of our national treasure, fertile soils, are one of the most important problems related to the protection of soils.

Socialist collectivisation caused substantial changes in the structure and technology of the use of land. One third of the existing arable land dropped out of use, in some regions (Haanja, Otepää uplands, Sõrve peninsula) even more than half of the former fields. These fields were replaced by new ones, mostly on the virgin lands, including drained wetlands. Cultivation of peat and light sandy soils on steep slopes brought along *intensive deflation* and *erosion* caused by water. There are about 105,800 ha of land which is endangered by *erosion,* which cannot be opened to the waters from either rainfall or spring thaws (uplands of south-east Estonia, Vooremaa) and 542,900 ha of land which is endangered by *deflation* (lowlands of West-Estonia and islands). Making large fields in these regions is out of question.

Current Situation

The legislative basis for the protection and use of soil is not complete. The Soil Act is being prepared at the moment. It should reach the Riigikogu in 1999.

The reasons for degrading of soils are the following:

- mechanical: heavy agricultural machinery have caused and are still causing the degradation of soils. This has a serious impact on the yield. The soils of southern Estonia are especially susceptible to compression;
- biological: this is the result of pollution (bad handling of manure and slurry, inadequate machinery which have a negative impact on the microbe balance in the soil). Another factor is incorrect crop rotation: monocultures and constant lack of organic substance in the soil.
- chemical: the result of excessive use of fertilisers and pesticides. This was an actual problem at the time of collective farms. Agro-chemicals, fuels and lubricants were cheap and thus easily accessible. Even now, it can be felt in the direct vicinity of old storehouses where fertilisers, agro-chemicals and fuels were kept.
- degradation caused by construction works: this is a serious problem both for Estonia and for other countries all over the world. One hundred thirty thousand (130,000) hectares of fertile soil is wasted under buildings and other constructions.
- degradation caused by lifestyle: pollution coming from villages, company constructions etc.; this is largely related to the previous cause.
- improper organisation of land cultivation can also cause erosion and aggravate problems which are caused by soil compression.

8. Common Agricultural Policy (CAP) and biological diversity

The common Agricultural Policy (CAP) was established in 1957. Now it is the most complex policy of the EU, which needs the biggest funding and which has always been extremely difficult to change. By the end of the 1980s, a common decision was taken about the necessity to reform CAP. As a result of the reforms of 1992, the subsidies for the producers were decreased and simultaneous unification of prices at the world market was started. The essence of the reform was that for the main branches of agriculture (grain production and animal husbandry), the system of production subsidies was changed for the direct subsidies to the farmers. These subsidies are based on the area of arable land and the number of farm animals.

Starting from 1992, the aspect of environmental protection has also been included in CAP. It means that subsidies can also be granted for the purpose of afforestation of agricultural lands or environmentally sustainable agricultural production. The latter is based on the so-called attending measures, which were elaborated in the course of the reform:

- Regulation 2078/92/EEC which regulates the connections between agriculture and environmental protection;
- Regulation 2080/92/EEC which regulates afforestation of agricultural lands.

The reforming of CAP has not ended yet – the European Commission has made a proposal to keep decreasing the subsidies for agricultural products within *Agenda 2000* and concentrate more on the protection of environment and landscape. This does not stimulate the growth of production but gives farmers an opportunity to have an extra income for environmentally friendly land cultivation.

Measures for agricultural-environmental protection are defined by the EU Commission regulation 2078/92 on Methods of Agricultural Production Consistent with the Requirements to the Environmental Protection and Conservation of Rural Districts. This regulation forms a framework for

most of the programs, which concern agriculture or environmental protection within EU. Differently from the previous code, the application of 2078/92/EU is compulsory for member states, but optional for farmers.

The agricultural and environmental protection policy of EU aims at:

- decreasing the pressure caused by intensive agricultural activity on the environment.
- diversification of the incomes of farmers and facilitating the development of rural districts.

Under the conditions of modern agricultural production it is often difficult for a farmer to comply with all requirements to the environmental protection, although EU has adopted several legislative acts for such purposes: directives on the use of pesticides and nitrates, the following of which is compulsory for all member states. Agro-environmental Regulation enables farmers to get an extra income for their activities in these fields of environmental protection, which are considered to be a priority in a corresponding member state and in accordance with preliminary measures elaborated by the member state.

The scope of these measures is designated by member states according to their possibilities and environmental conditions. Measures can be horizontal (applicable to the whole country) or zonal (considering the environment and traditional lifestyle of a certain area).

The application term is usually not less than 5 years. In the case land is dropped out from agricultural production for a long-term period, the term may be extended up to 20 years. Measures are co-financed by EU: in the amount of 75% in target regions, in the amount of 50% in other regions.

Subsidies can be applied to the farmers who:

- substantially decrease the use of fertilisers and pesticides or continue the process of decrease the use of such products, who convert their agricultural production into organic agriculture, or, who continue organic production;
- intensify plant production (including animal feed production), continue the intensification process, or convert their fields into extensively used pastures;
- decrease the number of sheep and cows per one hectare of pasture or grazing land;
- use other methods of agricultural production which conform to the requirements to environmental protection and the protection of natural resources; whose activities include the protection of rural areas and landscapes (the maintenance of field edges and shore lines) or, who breed local endangered plant varieties/animal breeds;
- maintain abandoned fields or forests;
- take their land out of production for at least 20 years for the purpose of environmental protection (conservation areas of biotopes, national parks or water conservation areas).

During the validity of the Regulation i.e. from 1992, the following measures of environmental protection have been applied in the areas with extensive agriculture via Regulation 2078/92:

- decrease of the use of chemical pesticides and fertilisers,
- long-term taking land out of agricultural production,
- conversion of arable lands into extensively used grasslands,
- facilitating organic agriculture,
- introduction of integrated production methods,
- protection and maintenance of landscapes,
- conservation of local endangered plant varieties and animal breeds,

- increase of biological diversity (formation of strips of biotic communities, conservation and maintenance of semi-natural communities etc.).

In connection with the protection of the agricultural environment, special attention is paid to the protection of biological diversity. The issue has gained importance both in Europe and in the whole world during the few past decades. The Agro-Environmental Regulation enables to support the conservation of semi-natural biotic communities on the agricultural lands by applying measures such as coppice, maintenance of valuable grasslands and pastures, prevention of improper use of pastures, seasonal restrictions in production activity (e.g. during nesting period).

Measures for the afforestation of agricultural lands are set out in EU Regulation 2080/92. Support programs for the measures of forestry applied in agriculture.
The aim of the Regulation is to facilitate the afforestation of agricultural land with a purpose to:
- protect the environment and soils,
- increase timber production,
- decrease agricultural production.

The Regulation is not compulsory to a member state. In order to comply with its requirements a member state may compile a national program of afforestation of lands for the period of 5 – 20 years with EU support in the amount of up to 75% in the target area. Member states may draw up plans for afforestating certain regions according to the diversity of the environment, natural conditions and the situation of agriculture. In case the member state has compiled such a program which conforms to the aforesaid Regulation, the participation of farmers in the program is optional.

The afforestation program for farm lands aims at compensating the losses in the farmers' income or the additional costs related to the application of the following attending measures:
- planting of forest,
- maintenance of forest plants during five years,
- investments into the forest lands – the establishment of protective strips, watering places and forest paths.

The main objective of the Estonian afforestation program for farmlands is to regulate the use of land in connection with the fact that a large part of agricultural land has dropped out of use in certain regions of Estonia and the maintenance of landscapes. Upon designing the program long-term impact on the landscapes and biological diversity has to be considered. The agro-environmental Program determines the scope of afforestation of abandoned agricultural lands.

- **Objectives**

1. Semi-natural communities
- Ensure the conservation of semi-natural communities inherent to Estonia.

2. Variety and animal breeding
- Ensure the conservation of species and varieties inherent to Estonia.
- Ensure the conservation of animal breeds inherent to Estonia.

3. Organic agriculture
- Support the development of organic agriculture in Estonia.

- Harmonise the legislation concerning organic agriculture in Estonia with the requirements of the corresponding legal acts of the EU.

4. Use of mineral and organic fertilisers

- Decrease the pollution caused by the use of organic and mineral fertilisers and improper manure handling.
- Introduce the requirements and recommendations by HELCOM and EU on the use of mineral fertilisers, manure and poisonous chemicals.
- Change the number of farm animals; bring the number into accordance with the area of arable land or field.

5. Plant protection products

- Minimise the use of plant protection products, introduce the principles of integrated plant protection system.
- Use plant protection products which are less harmful to the environment and humans, and which are in compliance with the established hygienic requirements for agricultural products and minimise the burden of contamination of the environment.
- Wider use of biological plant protection products, making information of such products available and introduction of environmentally sustainable programs.

6. Land improvement. Soil

- Ensure long-term use of improved lands taking into consideration the peculiarities of landscapes, their resistance to pressure and social needs of a region.
- Ensure the protection and sustainable use of soil.

4.8. TRANSPORT

1. Transport and biodiversity

Transport has both direct and indirect impact on biological diversity, from the physical destruction of biotopes by infrastructures to the greenhouse gases which are created by transport means. These, via the global climatic change, can in the most unpredictable way change biological diversity. The impact of transport on the environment has a far-reaching and often irreversible character. In most cases, the negative influence of transport is understood as the direct pollution, which is caused by the exhaust gases of vehicles. Air pollution, however, is only one part of the use of infrastructures and the long chain of production and consuming of the products of the automobile and oil industries. For that reason, equipping cars with catalytic converters, which reduce the amount of nitrogen oxides does not solve the problems related to the decrease of resources, the disasters connected to oil transport or the massive attack by the artificial environment.

Technical measures have, to some extent, helped to make vehicles more economical and reduce the amount of wastes, but these measures seem to be inadequate compared to the growth of traffic in general. Problems connected to the space taken up by transport means can be solved only through transport policy and through the regulation of the use of land. The higher the speed and the more cars involved, the more space is needed for organising traffic problems. In Estonia, the extension and construction plans of roads have been explained as a measure to decrease the exhausts, as at a low speed of vehicles the level of exhaust gases in the air is comparatively high. Such evaluation does not

take into account the fact that this kind of solution gives rise to the growth of the general amount of traffic, use of resources and use of space. These, in turn, impose a heavy load on the environment and natural diversity.

1.1. Impact of transport on natural diversity

Physical impact

- Biotopes are directly destroyed by transport-related infrastructure
- Biotopes are destroyed in the course of mining natural resources in quarries. The natural resources are used for the construction of infrastructure
- Fragmentation of biotopes, barrier effect
- Injuries and death of individuals in traffic
  Transport means and infrastructure spread certain species, they act as migration corridors
- Disturbance caused by increased noise and decreased visibility (lighting, cloudiness of water)
- Vibration and changes in streams

In addition to the direct use of land by transport infrastructure, the development of connections also facilitates the expansion of human settlements (especially sub-urbanisation and cities with dispersed structure) and the massive attack of the artificial environment on nature as a whole.

Chemical impact

1. **Local impact**

- Combustion of fuels produce carbon monoxide, nitrogen oxides, heavy metals, organic compounds and solid particles. At high concentration levels they influence the physiology of both plant and animal species and act as carcinogens.
- In connection with the maintenance of infrastructures salt and chemical compounds cause pollution (urea and acetates at the airports). By contaminating soil and ground water these compounds are capable of changing the biotic communities.
- Disasters related to hazardous cargo and filling stations cause the contamination of ground water. Big oil leakages destroy sensitive coastal biotopes and communities.
- The amount of hazardous waste produced by the transport sector is large (batteries, catalysts, waste of lubricants and solvents). In case they are not properly disposed of, the contamination of soil and ground water is inevitable.

2. **Regional impact**

- Nitrogen and sulphur oxides coming from transport have a role to play in the genesis of acid rains. In Estonia, due to the neutralising effect of limestone near the surface, acid rains have not had a hazardous impact. These chemical compounds, however, have played a major role in the eutrophication of the Baltic Sea.
- Nitrogen oxide, carbon monoxide and volatile organic compounds produced by transport means produce, by the agency of sunlight, extremely reactive photochemical compounds (ozone in particular) which cause extensive damages to plant life and health.

3. **Global impact**

- Transport is responsible for the rapid increase of the concentration of several greenhouse gases (CO_2, N^{20}, CFCs, vapor). Thirty percent (30%) of the waste CO_2 comes from transport.

Biological impact

Many foreign species are transferred to new areas by means of transport. Transport corridors of low

activity, as well as bridges, make it easier for some animal species to move around within larger areas, thus facilitating the inhabitation of new biotopes, genetic exchange between different populations and the rise of new populations.

1.2. Impact of different means of transport on natural diversity

If we take a closer look at different types of transport and their impact on natural diversity, we can say that railways and water transport are comparatively sustainable means of transport. This is because their need for resources, energy and space per unit (t/km passengers/km) is many times lower than that of car or air transport. **Air transport** can be characterised by a high rate of energy consumption and its direct negative impact on the ozone layer. Air transport is noisy, and flight corridors often cross birds' migration corridors. Chemicals used at airports often penetrate into the soil surface and ground water. **Water transport** has its own negative sides: dredging of harbours and steamer tracks, ice breaking, bilge water and accidents with hazardous cargo influence water organisms and sensitive coastal communities. The infrastructure of inland water transport (construction of canals, dredging and rectification of rivers, bank protection) causes the fragmentation and perishing of biotopes. The latter is often the result of the removal of large quantities of subsoil. **The infrastructure of car and railway transport** is responsible for the fragmentation and decrease of natural biotopes (see: the chart below). Additionally, it creates barriers, causes noise, and contaminates soil, air and water. At the same time, water and railway transport in particular, facilitate the spreading of new species. The bildge waters of large cargo ships carry exotic water organisms, the impact of which can be either good (another new species) or bad (some newcomers can became competitors to the local species) to the local biological diversity. **Railways** are the spreaders of seeds of foreign plants; they often act as migration corridors for some plant species.

As land transport, and car transport in particular, has the strongest impact on biological diversity, the following chapter will handle the problems related to this type of transport more explicitly.

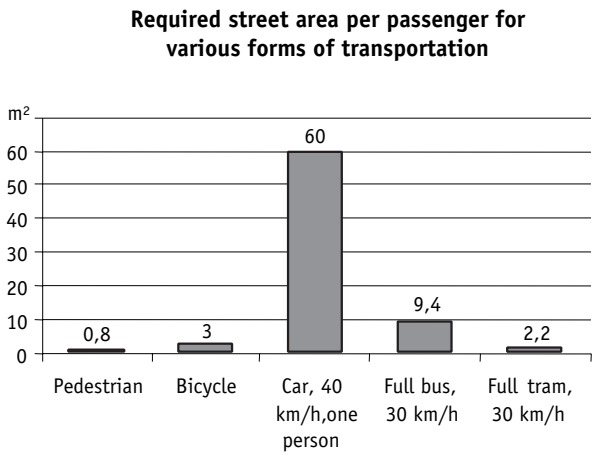

Fig. 1. Necessity of street area per one passenger of different types of transport

1.3. Influence of overland transport on biological diversity

Any linear infrastructure, either man-made (roads, forest tracks, electricity transmission lines, ditches etc.) or natural ones (rivers, coastline etc.) have undoubtedly a negative (rarely positive) impact on the biological diversity in the nature. Let us have a closer look at some of the types of impact.

Barrier effect

A linear infrastructure diffuses biotopes of different species and creates obstructions in free migration for individuals, both inside of a population as well as between the different parts of a biotope or a

population. Such an impact has its positive and negative features. Firstly, if barrier effect occurs too often, it splits the population up into smaller and smaller parts and through the prevention of its natural reproduction, finally the population perishes. We cannot talk about free development of the diversity of species if we prevent a species to migrate freely. Through creating barriers we cut some territories off from the possibility to "accommodate" certain species. In a wider sense, the prevention of migration within a population may bring about the emergence of a totally new species, but only on the condition that the barrier has been permanently set up between sufficiently large parts of the population during a sufficiently long period, and provided the parts of population have not been dispersed in some other manner.

In Estonia, we can mention the barrier effect only in connection with larger highways (Tallinn–Tartu, Tallinn–Narva, Tallinn–Pärnu). Smaller roads can also form a barrier, but only for the organisms whose spreading is already obstructed by some natural barrier. At the same time, the sensitivity of these organisms (several species of invertebrates) to major changes in the environment is usually higher than in larger organisms. The diversity of species among these groups of organisms is considerably greater.

The barrier effect will have an even greater impact when fences against animals will be put up at the most hazardous sections of the road along the new roads under construction (Tallinn–Tartu–Luhamaa).

Perishing of animals and birds in traffic accidents

The clearest destructive impact of linear infrastructures on wildlife species is the loss of animals that are trying to overcome the barrier. This happens to species with the most active migration, whose periods of migratory activity coincide with peaks in traffic. Species that perform massive invasions are also in danger; the worst thing is that the most active migratory part of these populations consists of younger animals. Another cause of perishing is when animals, which are seeking warmth at night on roads warmed up by the sun in the daytime, gather on the roadsides and are thus very vulnerable.

The density of traffic in Estonia, as compared to the corresponding numbers for other European countries, is comparatively low. The density reaches 10,000 – 15,000 vehicles a day in the busiest sections of the Tallinn–Tartu highway, but the density is growing from year to year. We do not have regular statistics about the number of animals who perish on the roads, in electricity transmission lines or ditches. Information is given mostly about animals that are killed by cars within Lahemaa National Park (Tallinn–Narva road) and in the road section between Kose and Mäo of the Tallinn–Tartu highway. This indicates clearly where the main migration areas of animals are. But there are no statistics whatsoever about the cases of massive perishing of smaller organisms. Neither is there any analysis of the possible reasons of such cases.

Disturbance

An area with a width of approximately one kilometre from each side of a road is considered to be the range of direct influence. The biggest range of influence, in the case of motorways, is to bird populations. Bigger animals usually keep a distance of 100–200 meters from the roads unless their instincts appear to be stronger than their fear during their activity periods. The factors of direct disturbance are noise, lighting at night, chemical compounds spilt on the roads and littering the roadsides.

Invasion of new species

The construction of every new linear structure brings along the appearance of new limiting areas,

new ecotones and thus the appearance of new biotopes. These new niches are first inhabited by invading species (ruderal plants, rodents, pests) which have arrived by transport. We could call it a positive impact on the biological diversity as the number of species grows. But usually these invading species, with their extreme vitality become strong competitors to the endemic species and in the end simply extract them.

Destruction of biotopes

The construction of linear infrastructure always means crossing biotopes and dividing them into smaller sections. Such fragmentation can often be hazardous to the diversity of natural species and biotopes. Therefore all linear infrastructures should be designed so that they followed the structures and borders of already existing natural biotopes. Smaller and more sensitive biotopes should not be cut off from their base biotope (for this reason it is not wise to construct a road between a forest and a swamp when on the other side of the swamp there is a field). In any case, the main rule is that an already existing semi-natural biotope is always more resistant to the results of fragmentation than a neighbouring natural biotope.

2. Main trends in the development of transport in Estonia

During the last 10 years, motorization has been very fast in Estonia (see the chart). Concerning passenger transportation, public transportation has largely been replaced by the use of private cars. While in 1990, inside Tallinn 90% trips were made by public transport, in 1997, the corresponding figure was 40%. Passenger carrying on trains has decreased by 75% during 7 years. Fortunately, railway has managed to keep its position in the transportation of goods – over 80% of transit traffic is done by railway.

The number of cars per 1000 inhabitants is equal to Europe's average.

By January 1, 1998 the total length of Estonian highways was 41,534 km with a density of

Motorcar rolling stock in Estonia 1980–1998

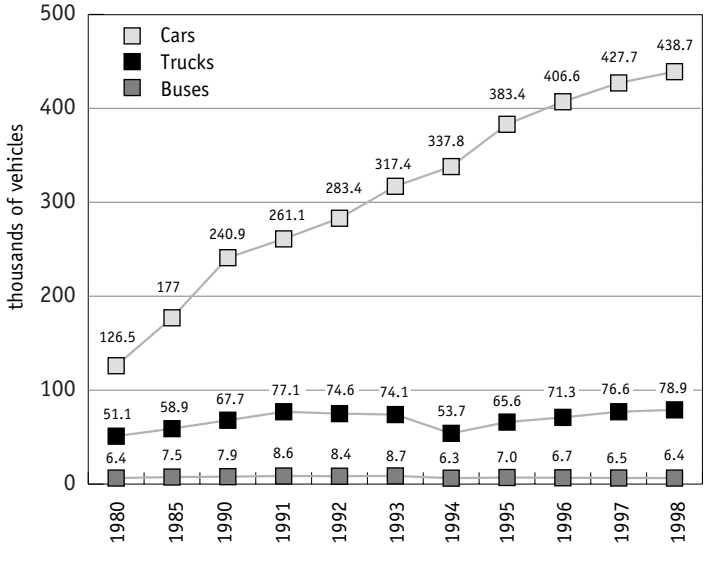

Fig. 2. Motorcar rolling stock in Estonia 1980–1998 (Source: Transport. Communications 1997, Statistics board, 1998, Car Register)

Division of labor in conveyance of passengers in Tallinn, 1991–1998

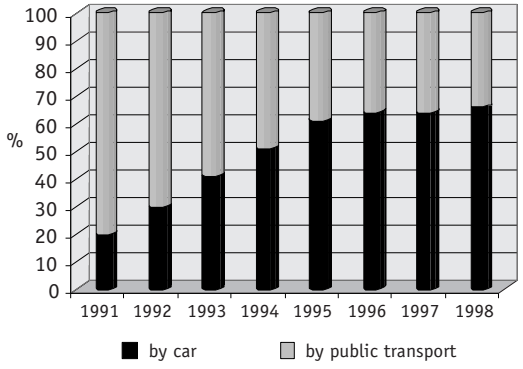

Fig. 3. Division of labor in transport of passengers in Tallinn, 1991–1998

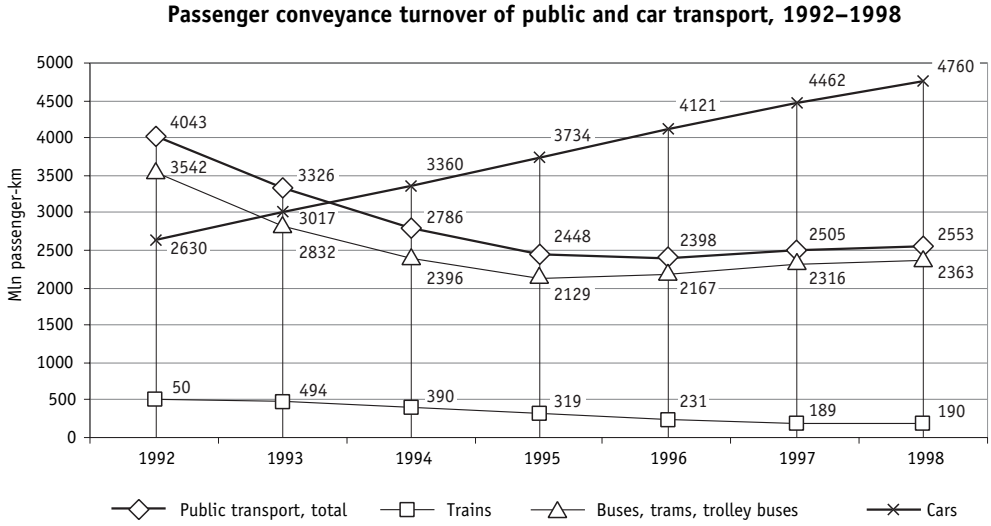

Fig. 4. Turnover of passenger conveyance 1992–1998 (According to the Ministry of Transport and Communications)

960 km/1000 km². The density of traffic was comparatively high near Tallinn exceeding 10,000 cars per day. Regarding the density of traffic flows and highway network, the fragmentation of biotopes is the most serious problem in the Tallinn–Rakvere–Tartu triangle.

If we analyse state transport assignments in real value, we can see that assignments for the maintenance of roads have increased 1.5 times while the revenue out of fuel excise and vehicle taxes has increased 5 times. At the same time, the subsidies for public transport have decreased three times within five years. We can see that not much has been done to reduce external costs caused by the growth of traffic, although the taxation of car users has grown considerably. No alternatives, such as public transport or environmentally friendly transport means have been considered.

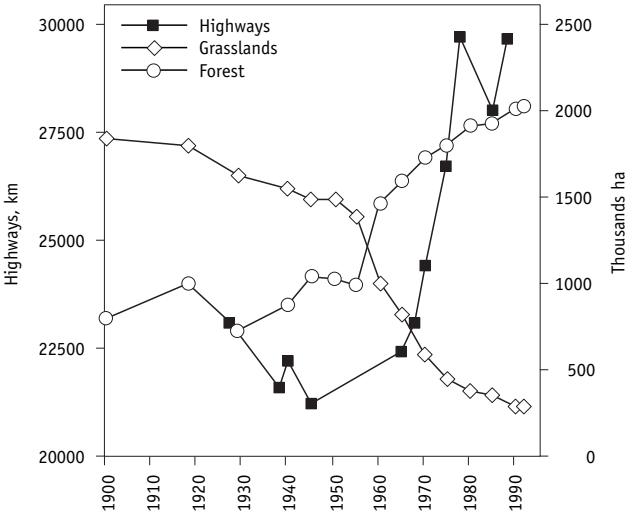

Fig. 5. Changes in (semi)natural areas and the length of highways (Palang et al, 1996)

The biggest transport-related problems are the growth trend of car use, the development of car-centred infrastructure as a priority, and the growth of demands for traffic services. Although the impact of transport on biological diversity is now comparatively small, it can, due to short-sighted transport and land use policy be much more serious in the future.

Another potential hazard for the environment is the development of transit trade, as the majority of the transit goods in the East-West direction belong to the group of risky freight (crude oil products) and the growth of the haulage industry requires significant road construction.

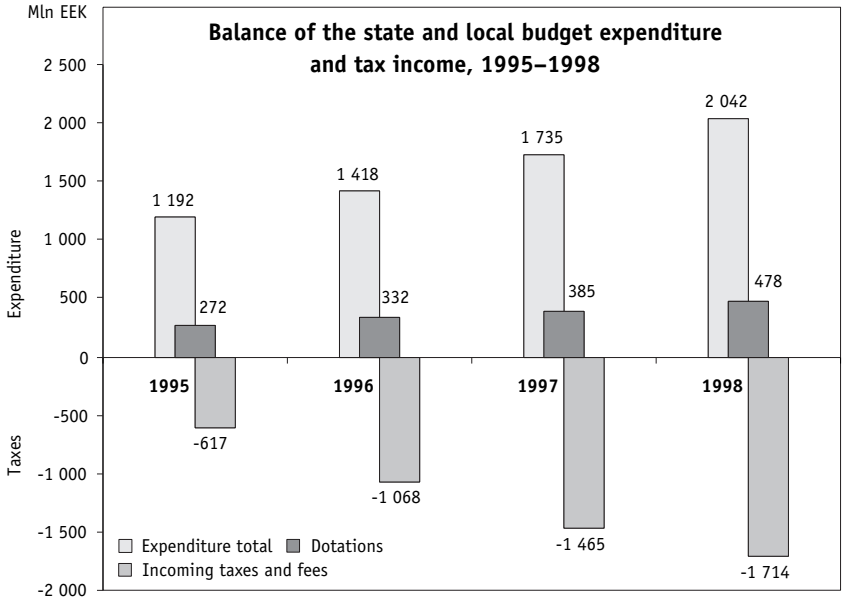

Fig. 6. Transport and Communications 1996

3. Examples of indicators in the transport sector which affect biological diversity

The present short review cannot give thorough statistics about the influence of transport on biological diversity in Estonia, as a system for monitoring, data collection and analysis does not exist. Information directly regarding transport as such is available, but for making comparisons, most of this information is suitable only starting from 1992. In order to understand how big the pressure of the transport sector on biological diversity is, and to evaluate the changes, the following factors should be observed:

3.1. Indicators of pressure

How big is the pressure caused by transport and what are the possible risks to biological diversity?

- area of lands and their density per 1,000 km which are under transport infrastructures
- total passenger and freight amount and distribution by means of transport
- traffic density on highways
- total amount of risky freight and disasters
- amount of energy used by transport by the sources of energy
- amount of natural resources needed for the construction and maintenance of vehicles and infrastructure
- amount of solid and hazardous waste from the transport sector
- amount of contaminating substances from vehicles which goes into the air, water and soil
- crossing of transport corridors with heavy traffic (over 2000 vehicles a day) and the migration corridors of animals and birds.
- range of territories where noise exceeds the acceptable rates (> 65dB in the daytime, > 55dB at night.

3.2. Indicators of state

Evaluation of the influence caused by transport; how does the pressure show in the state of the environment?

- number of animals and birds killed in traffic
- rate of plant and health damages caused by transport
- concentration of contaminants caused by transport in water, soil and air
- size of territories which are not fragmented by transport infrastructures, how many territories of 10, 50, 100 km² which are not fragmented
- spreading of foreign species by means of transport
- vitality of plant and animal populations in the vicinity of transport corridors

3.3. Indicators of counteraction

Which measures are taken to reduce, alleviate or prevent the impact of transport on natural diversity?

- amount of subsidies and investments into sustainable means of transport and rates compared to other means of transport
- projects of public transport and environmentally sustainable transport
- cost of public transport as compared to revenues
- traffic and speed limitations
- traffic calming programs
- programs to reduce the total amount and demand for transport
- regulating of land use and traffic, integrated transport development programs
- taxes imposed on transport services, vehicles and fuel; their purpose-orientation to reduce external costs
- telecommuting; its proportion in total working hours
- sales of goods and services via Internet
- regulating of risky freights
- use of recycled raw materials in the construction of infrastructures
- rate of use of environmentally sustainable construction technologies
- inspection of vehicles, exhaust control
- handling and reducing of waste produced in transport sector
- drawing up of EIA and SEA for transport projects
- ecoducts, ecotunnels, noise screens, protection zones
- logistic programs
- environmental audits of logistics and transport in companies
- education and science programs, campaigns for sustainable transport

• Summary, conclusions and objectives

The basis for transport management is not to satisfy the transportation needs of people and goods, but to guarantee the effective access to homes, schools, service and business establishments, places of employment and social interaction, and other necessities for life. In Estonia, the transport sector and

institutional structure should develop in such a way that the everyday needs of people are satisfied with the least amount of possible travel and goods transportation, and while consuming the least amount of natural resources.

To decrease the impact on biological diversity, **the whole scope of the transportation sector should be considered** – from the production and development of fuel, vehicles, and infrastructure, and the related consumption of resources, to the global effects of transportation pollution.

Anticipation and prevention of the negative effects of transport

In solving the problems of transport, attention is paid to the causes for the increase in traffic and other problems. Solutions to problems dealing with the influence of transport on biological diversity are sought also outside of the transport and environmental protection sectors. Existing and unavoidable effects are dealt with and alleviated.

Employment of integrated transport policy – co-ordination and analysis among the types of transport, and integrated implementation of human settlement and transport planning and environmental protection.

Following the principles of "polluter pays" and "consumer pays." All the external costs, including the impact on biological diversity, must be reflected in the cost of transport service.

Preferential development of environmentally sustainable transportation types and improving the level of transport service. Promotion of use of clean and economical vehicles and fuel with the help of new tax policy and standards.

Scientific and educational work will be used to help explain the effects of transport on biological diversity and offer environmentally sustainable solutions to transport problems.

Development of co-operation with neighbouring countries, Baltic Sea countries, and the European Union with the strategies and action plans.

The main objectives are:

1. Sustainable development of transport's institutional system – by using spatial planning, the need for transportation of people and goods is minimised, and effects of transport on biological diversity is reduced. The amount of land under transport infrastructure is not significantly increased. The land space presently under existing transportation infrastructure is redistributed to more effective transportation means in terms of land use (rail transport, public transport, bicycle and walking).
2. In the internal distribution of transport means, environmentally sustainable types of transportation and movement such as public transportation, light transport, railway and ship transport are predominant. For the carrying out of daily activities, people are not dependent on the ownership or use of a private car. The indirect promotion of private cars over public transportation is ceased.
3. In the planning, development and co-ordination of projects in the transportation system, damaging effects on the environment are considered and precluded. The existing and unavoidable harmful effects of the transportation system are alleviated by the development of an ecological network.

4.9. TOURISM

1. Responsibilities in the field of tourism arising from the Convention on Biological Diversity and other acts of law

The Convention on Biological Diversity (CBD) (art.6) requires the development of national strategies, plans, or programmes for the protection and sustainable use of biological diversity, or the adaptation of existing strategies, plans or programmes for this purpose. At the same time, the protection and sustainable use of biological diversity must be integrated into relevant sectoral or cross-sectoral plans, programmes or policies. These responsibilities tie in directly with the responsibility placed on the Tourism Board to support the sustainable development of the national economy and the conservation of cultural and environmental treasures through the planned development of tourism. At the same time, according to its charter, the Tourism Board participates in the working out of tourism policy and programmes.

Tourism, as an economic and business sector, has had less attention paid to it in Estonian legislation than biological diversity. However the CBD also places specific responsibilities on tourism for ensuring the protection of biological diversity.

The state has stated that forests have an essential role to play for the tourism and leisure industries from two aspects: hunting, and other leisure activities (the gathering of berries and mushrooms, hiking, etc.). At the same time, the state must promote the education of the public in environmental and nature protection issues and must support the creation of suitable infrastructure for this. The responsibility for these tasks and their development lies within the forestry and nature protection sectors.

There are therefore two departments directly responsible for ensuring the national planning of the protection of biological diversity and sustainable development in the field of tourism (in the sense of article 6 of the CBD) – the Ministry of Economic Affairs, and the Ministry of the Environment. They both operate in conjunction with their subordinate offices. The ministries of agriculture and culture also have a hand in these processes although this has not been specified directly.

When planning tourism, one must first of all determine the processes and activities that damage or may damage biological diversity and assess and monitor the possible effects of these processes. These are, of course, normal planning procedures.

The Act on Sustainable Development supports the above, considering tourism to be an economic sector which directly affects the balance of nature and the conservation of biological diversity, and one whose development must therefore be regulated by state initiated programmes. These programmes must include a projection of the use of natural resources and of the condition of the environment. The development programme is such an important document that the Government of the Republic must approve its goals and completion date, and the parliament must ratify the programme itself. This process has been followed in the case of the Estonian Forestry Policy document.

Biological diversity was neither overlooked in the Planning and Building Act (1995), according to which a national planning policy statement must integrate the principles of long-term sustainable development and physical and economic development. The national planning policy statement must also make suggestions to ensure the conservation of various types of ecosystems and landscapes and

create a system of natural and semi-natural communities to balance and compensate for the effects of human settlement and economic activities.[8] The national planning policy statement must also designate recreation areas of national significance and determine the conditions for their use. Similar principles hold for county and comprehensive plans. This means that, in addition to the above-mentioned institutions, two more groups of public administrators are included, by law, in the planning process – county councils and local governments.

Two different types of planning are described above: the formulation of strategies, plans, programmes; and physical planning. All the above is related directly to the implementation of articles 6 and 7 of the BDS.

What then is the provision of biodiversity protection in the field of tourism? The CBD is our only guide in this question since practically no national documents about this exist.

Biological diversity protection must be included in both domestic and international tourism planning. *In situ* protection must on the one hand organise and promote sustainable management and nature utilisation, and on the other, provide information that will help people protect and preserve biological diversity in protected areas, but also especially outside protected areas. This means that tourism has an essential role to play in promoting public education and awareness in this field.

Estonian tourists (true, an insignificant number on a world scale) also have a responsibility to preserve natural diversity when travelling abroad; this, however, requires a greater awareness on the part of travel operators who must pass on and emphasise the relevant information to their clients. This also demands closer co-operation with the tourism and nature protection organisations of the countries of destination. Since Estonian tourists also visit developing countries and small island states, which are mentioned separately in the CBD, then the points referring to them must also be addressed. At the same time, tourism to developing countries gives these countries an opportunity to use the money thus earned, including money from Estonian tourists, for the conservation of biological diversity.

Many of our laws refer indirectly to, or are connected with, the issue of biological diversity in the field of tourism, but none deal directly with this. Most attention has been focused on the regulation of planning but no specific action plans have been drawn up. Nevertheless, a legal basis for their creation now exists.

If the need for ensuring the protection of biological diversity from and through tourism in Estonia is little acknowledged and its regulation is in its early stages, then the role of our tourists and travel operators in the same processes abroad is totally unrecognised.

2. About Estonian tourism policy and its possibilities to fulfil the responsibilities arising from the CBD

An inescapable precondition for co-ordination of activities of different sectors in the field of tourism is the unified interpretation of its fundamental notions and the precise definition of the roles of the public and private sectors.

The notion of the tourism industry

One of the problems of tourism as an economic sector in Estonia, and to some extent in the rest of the world, is that tourism concepts are not used consistently. In the Tourism bill (of Nov. 1998), the

tourism industry sectors are presented according to the conventions used by leading international tourism organisations and by the Tourism Board.

The following are distinguished as tourism industry sectors (§2, sec.2.):
1. Accommodation, from hotels, motels, and farm accommodation to caravan and camp sites;
2. Holiday transport – air, sea, road and rail transport;
3. Tourist attractions – both natural and man-made;
4. Travel service providers – nationally licensed travel agencies and travel operators;
5. Travel destination operators – public, private and non-governmental organisations and institutions.

National tourism policy in the accommodation, transport, tourist attractions, and travel services sectors is expressed through regulations concerning standards, consumer protection, taxation policy, and licensing, international regulations, and through the marketing of the country as a travel destination. Nature, rural, sea, hunting, cultural, farm, and ecological tourism are all primarily product and marketing categories which contain product-specific accommodation, catering, transport, tourist attraction viewing and, travel operator services.

One must also take into account the proprietary rights pertaining to the tourism sector and the fact that some activities extend beyond the field of tourism. In the case of accommodation, catering, and transport businesses and tourist attractions, only a part of their activities are concerned with tourism.

- Holiday transport businesses do not own or control the sea, air or road transport networks, airports, car parks, or the activities of petrol companies or traffic regulation agreements.
- In the case of tourist attractions, resources are more often in state or local authority ownership than in private hands; the money raised from tourism will always cover only a fraction of the cost of maintaining the attractions. If the income from admission charges exceeds 10–15% of the total budget for the upkeep of the attraction then the object is under-financed. Tourist attractions with an annual number of fee-paying visitors exceeding 150,000 are an exception.

The role of the public sector in the tourism industry

The Tourist Board, according to its charter, is the state's representative in the field of tourism. The Tourist Board employs 41 full-time staff, 18 of whom deal with questions of tourism policy, legislation, licenses and standards, European integration, international projects, product development, tourism surveys, marketing, and information technology. Nineteen (19) work in county tourist information centres, and 4 in the regional offices of the Tourist Board in Tartu, Pärnu, and Paide.

Very many institutions in the Estonian public sector are involved in tourism. For instance, it is within the competence of the Ministry of Agriculture to deal with product development, standards, training, preparation of development plans, and marketing, acting thereby also as an enterprise and travel operator (licensed and unlicensed). The Hunting and Recreation Department of the Forest Economics and Information Centre acts as an enterprise, possessing a travel operator's license. National parks and protected areas have their own tourism projects and programmes. Museum staff, school teachers, and commune and county council officials work as certified and uncertified guides; tourists are offered accommodation in state financed sports and education centres and in buildings belonging to public institutions. Nevertheless, most public sector institutions, including county councils and local governments, do not employ anyone whose duties are solely concerned with the public

service aspects of tourism. Usually, responsibility for the regional development of tourism, as well as other sectors, rests with the development department of the respective county council or local government.

In conclusion, we can say that in the field of tourism the public sector in Estonia acts to a certain extent as the public sector and to a certain extent as an enterprise. The public sector competes strongly with private enterprises, using budgetary resources to finance a considerable proportion of its production costs, marketing and training costs and investments. This is primarily the case in rural areas and less popular tourist regions – regions that are therefore most sensitive in regard to biological diversity conservation. This must be borne in mind when preparing the tourism development plans and environmental regulation mechanisms for these regions.

If we add the fact that, except for regular passenger transport, the ca. 200 licensed travel operators and travel agencies, and the activities of certified hotels, the income arising from tourism often changes hands without being properly accounted for, we can see that a regrettably large part of the tourism in Estonia today belongs to the shadow economy, and in the absence of mechanisms and channels of influence, does not respond to strategy decisions.

The above demonstrates to how small an extent we can control the actual effects of tourism on the living conditions and on the natural environment of Estonia, and on the conservation of biological diversity, through the preparation and execution of national tourism strategies and action plans. The controllable portion of the Estonian tourism industry serves tourists in regions that are not so environmentally sensitive. Gaining control of the shadow economy in tourism requires the concerted efforts of the Estonian National Tax Board, the Consumer Protection Board, the Rescue Service Administration, the Public Health Protection Board, the Competition Board, licensing monitoring commissions, and the travel agencies.

3. The development of tourism as an economic sector and its effect on biological diversity

The effect of tourism on biological diversity depends primarily on the intensity of tourism as an economic sector and on its management. The number of tourists and the importance of tourism as an economic sector in Estonia is rising each year. Therefore, the planning and practical management of tourism on a regional, county and commune level, and the co-operation between the different institutions, is becoming more and more important.

We should not underestimate the importance of tourism for the Estonian economy and the role of tourism services export in balancing the foreign trade deficit. For instance, in the first quarter of 1997 the export of tourism services together with passenger transport revenues amounted to 1.283 billion Kroons and covered 45% of the foreign trade deficit.

Since the beginning of the 1990s, Estonia has been a country with a rapidly growing tourist industry. Statistical data published by the Tourist Board[12] shows that while in 1991, Estonian travel operators catered to 341,520 tourists, in 1997, the number of tourists visiting Estonia had risen to 1,099,448. The number of visitors requiring overnight accommodation had reached 730,000, and for the second year running exceeded the record level of overnight visitors reached at the end of the 1980s. According to statistics produced by the Border Guard Administration, 2.62 million foreigners

[12] A distinction between domestic and foreign tourism is made in tourism statistics. Domestic tourism is defined as travel in Estonia by Estonian residents, arranged through travel operators. Foreign tourism is split between incoming and outgoing tourists (ESA, 1997).

arrived in Estonia in 1997, which is 7% more than the previous year. The Statistics Bureau reported that accommodation provided for foreign tourists in Estonian hotels, motels, guesthouses and other lodgings grew by 15% in 1997. Hence, the overnight accommodation of foreign tourists has grown faster than the number of arrivals. In 1997, for the first time in many years, the number of holiday packages sold by Estonian travel operators to foreign tourists grew appreciably, on average by 45%; 50% more were sold to Finland and 25% more to the rest of the world. In the first half of 1998, domestic tourists accounted for 31% of the number of guests staying in overnight accommodation, and foreign tourists for 69% (Table 1).

Table 1. A regional breakdown of domestic and foreign tourism

	domestic tourism	foreign tourism
Tallinn	14%	86%
North-Estonia	20%	78%
Pärnu	32%	68%
West-Estonia	44%	56%
Tartu	48%	52%
South-Estonia	63%	37%
Estonia total	31%	69%

The development trend, which appeared in Estonian tourism in 1996 continued in 1997; namely, the number of overnight visitors in larger towns grew more rapidly. The number of foreigners staying in overnight accommodation grew, on average, by 15% during the year and in Tallinn, Pärnu, and Tartu by about 20%. We should not view this as the development of towns at the expense of other regions but as the rapid development of city tourism (short-term holiday and shopping trips, attractions and cultural events in Hanseatic towns, combined travel packages including other Baltic or Scandinavian cities, business trips, conferences). As a result, the average level of bookings in hotels has risen to over 60%.

Alongside the frequently visited Tallinn, a rising interest in other regions has been noted. Hence the number of visitors has grown not only in the main tourist centres of Pärnu, Tartu, Saaremaa, and Haapsalu but also in other regions (Otepää, southeast Estonia, the northern coast). We must note, however, that the main growth in the regions has been occasioned by domestic tourism: rural tourism, active holiday opportunities (canoe trips, horse riding, skiing) and cultural events. The number of holidays booked by Estonian residents and the number of nights accommodation they required rose in 1997 by 25% and 20% respectively. Due to the low volumes of business, we can occasionally see a many-fold increase in the number of nights accommodation (national accommodation statistics do not include data about farm accommodation and other small guesthouses).

Foreign tourists arrived in Estonia in 1997 mainly by sea (68%); the next most popular methods of arriving were by road (27%) and by air (5%). Seventy-four percent (74%) of tourists arriving in Estonia do so in Tallinn, mostly via the Passenger and Muuga harbour terminals.

There were 199 licensed travel agencies and travel operators active in Estonia in June, 1998. New establishments offering overnight accommodation and new active-holiday operators have appeared in the regions. Catering establishments too have improved remarkably. At the same time, the export service sales of regional travel operators have grown significantly.

The Tourist Board predicts that, on the basis of initial estimates, the number of foreign visitors to Estonia may double between 1995 and 2005, reaching 4.2 million by the year 2005. The doubling of tourism services export in the next five years (1998–2002) compared to 1997 figures (calculated in current prices) has been set as a target. This would give a tourism-services export of 17,000 million Kroons in the year 2002. In estimating the average spending of tourists staying in Estonia, it has been assumed that in the year 2002 tourists here will spend the same amount of money per day as they would have done on a European holiday in 1996; it has also been assumed that the average

duration of their stay will lengthen by 0.5 nights each subsequent year. Taking into account the number of one-day tourists (72% of all Estonia's foreign visitors) the average length of stay for foreign visitors was 2.4 days; the average for those staying overnight was 6 days.

The Ministry of Economic Affairs has set the following economic policy goals for the development of tourism export in the years 1998 to 2002:

- to balancing the foreign trade deficit;
- to significantly increase the level of value addition;
  According to the 1996 PHARE analysis, the amplification effect for goods and services consumed by foreigners in Estonia was 1.246 and the effect for services used on Estonian ships and planes was 1.015;
- the stimulation and balancing of regional development – the creation of new sources of income and/or new jobs by the development of rural tourism.

The current city-orientated tourism services will spread rapidly to include rural regions. In addition to farm holidays, hunting and bird watching holidays will also rise in popularity.

The forecasts made by the Tourist Board for the next five years clearly predict that with the growth in the number of foreign tourists, a movement away from towns will occur and the tourism value of the attractions there will rise significantly. A rise in the significance of rural tourism has already been noted by the Tourist Board since 1997. The number of domestic tourists has also risen each year. Small islands and nature reserves are also objects of growing interest. How well are the counties prepared for this?

According to the Planning and Building Act (1995), counties prepare the county comprehensive plan, which must also take into consideration the tourism development opportunities of the region. Many county councils or local governments have prepared, or are preparing, tourism development plans, since they have recognised the value of the role of tourism in raising the level of employment and of the income base. At the same time, there is often a lack of co-operation in the field of tourism planning and management, between counties and communes but also between the protected areas within them.

4. Tourism and protected areas

Protected areas are high up on the list of tourist attractions. How have protected areas, which should, according to their charter, have as one of their aims the introduction of the protected area to tourists, organised their tourism-related work (primarily national parks, nature parks, landscape reserves, and not so much nature reserves)?

Protected areas have to a large extent gone about introducing their aims and values according to their own best judgement. The sample contents list for protected area protection management plans, established by a decree by the Minister of the Environment (RTL 1998, 287/288, 1176) is too general and does not directly state the necessity for a tourism management plan. The Management Plan for Matsalu Nature Reserve (1996) is one of the first documents of its kind, which also includes a tourism management plan. The implementation of the tourism management plan, however, requires broader co-operation with local governments.

The situation with the so-called passive distribution of information is better. Visitors to protected

areas (including national parks, nature reserves, landscape reserves, and biosphere protection areas) can get information about the protected area and about tourist attractions, hiking trails, etc. either as an individual or standard service. The latter may be provided by an unmanned information stand or house, or by a manned visitor's centre. No uniform criteria of what constitutes an "information point" or a "visitors centre" have been defined yet. There are no universal rules concerning the registration of visitors, so each protected area does so according to its own rules. The Estonian Association of Protected Areas (EKAL) collects information every year from its members about the services they offer and the numbers of visitors they receive and posts this information on its Internet home page. However, since the information is not gathered using uniform methods it should be treated with caution.

Some idea of what the favourite places for tourists are can be obtained by viewing the visitor figures for the 1998 summer season (April to October).

- Vilsandi National Park 16,000
- Lahemaa National Park visitors centre 282
- Soomaa National Park 2,900
- Karula National Park 2,500
- Endla Nature Reserve 2,277
- Matsalu Nature Reserve 3,688
- Haanja Nature Park 300 [13]

The number of visitors to Vilsandi National Park is based on the number of passengers passing through the port at Jaagarahu. There is no information from Nigula Nature Reserve and from Haanja landscape reserve, which are both relatively popular protected areas.

Despite the fact that the development of tourism is not one of the main functions of the Matsalu Nature Reserve, and the protection rules (RTI, 1997, 36546) impose restrictions on tourism development and the organisation of public events, Matsalu Nature Reserve is the only protected area which has gathered information on the number of visitors for the last five years running.

Year	Number of visitors of Matsalu Nature Reserve
1994	1000
1995	2415
1996	2951
1997	4077
1998	3688

May, which is the most interesting time regarding birds, is also the busiest month for visitors at Matsalu Nature Reserve; for instance in 1998, 52% of the total number of visitors during 7 months visited the reserve in this month. The role of protected areas in the nature education of school children is hard to overestimate. For instance, 70% of the visitors to Matsalu Nature Reserve are school pupils.

Since data collection methods are not uniform, comparison of different protected areas is impossible. Nevertheless, the figures quoted generally represent the number of people who have used the visitors' services, and not the total number of people who have visited the protected area.

Certainly the human load arising from tourism is not significant in Estonia as a whole, at least at present, but this does not rule out the possibility of certain popular attractions and their surround-

[13] In addition to them a further 35 000 people visited the viewing tower on Suur Munamägi.

ings being trampled, littered or ransacked.

It is also difficult for the public to get any information about the hiking trails in protected areas and their users, since uniform definitions and statistical criteria do not exist. Books and databases describing various hiking trails do not differentiate between descriptions of planned trails and existing ones. For example, the Tartu Student Nature Protection Circle database, which is the newest and most up-to-date, contains 100 entries, of which 24 have either never been marked out in nature or are now no longer physically passable. Twelve (12) trails also appear without detailed information and 12 are reported to be in poor condition or only partially passable. To this, we can add a further 6 so-called Euro-trails, the condition of which is also occasionally doubtful, but which it is planned to reconstruct to some extent in the near future. Consequently, only about half of the trails entered in the database are physically marked-out and usable. Forty-eight (48) trails are, however, situated in protected areas.

"Tourism and protected areas" has been an actual topic in the 1990s in both tourism and nature protection circles. Discussions have produced an indisputable fundamental principle: tourism in protected areas must follow the principles of sustainable use.

On the tourist industry side we should mention the World Travel and Tourism Council's environmental recommendations for tourism (1992) and the guidelines "Development of national parks and protection areas in tourism" produced by the WTO, UNEP and IUCN (1992). At the world conference on sustainable tourism (1995), the World Charter for Sustainable Tourism was adopted.

In the European Union, the European Commission DG XI is responsible for the integrated management of tourism and nature protection, financing the relevant projects through the LIFE programme. The activities of the EU in this field are based on the recommendations of Agenda 21, adopted in 1992, and the EU's 5th action programme for managing sustainable development.

In 1994 the IUCN commission on protected areas (together with partner organisations) produced "Parks for Life – an action plan for European protected areas" which also formulates proposals for governments, in the field of tourism, including the following:

1. Develop the concept of sustainable tourism in such a way as to maximise the potential benefit from tourism and to minimise the damage to the environment.
2. To formulate and implement sustainable tourism management plans: both national and for individual protected areas.
3. Legislate to strengthen the regulation of tourism in protected areas.
4. Support sustainable tourism projects.
5. Sign the European Charter for Sustainable Tourism.

Sustainable tourism is defined in the Charter as all the forms of developing and managing tourism which guarantee the long-term protection and conservation of natural, cultural, and social resources, which support positive and fair ways of operating in the local economy, and further the well-being of the people who live, work or visit the protected area. The Charter contains the principles for managing sustainable tourism in protected areas and principles of practice for protected area administrators, local tourism service providers, travel operators, and transport companies.

Signing the Charter gives the above-mentioned parties a symbolic Europe-wide quality label – tourists may be sure that the enterprise or protected area will provide a quality service based on sustainable development principles.

If Estonia decided to sign the Charter this would presuppose:
1. that protected areas had formulated long-term tourism strategies and management plans in co-operation with tourism firms and local inhabitants;
2. that tourism firms incorporate the aforementioned plan in their business plan;
3. that travel operators and transport enterprises take the interests of the local population and protected area into consideration when advertising their tourism product.

To summarise the above:
- The tourism management plans of protected areas would significantly help to regulate the movements of visitors in the protected area, and would enable a common information system and an operating system for information/visitors centres, both in the protected areas as well as between them, to be worked out.
- In order to assess human loads and establish the tolerances of areas it is essential to establish a unified methodology for the registration of visitors. Tourism management plans should be a part of the protection management plan of the protected area.
- The signing of the European Charter for Sustainable Tourism is of utmost importance for Estonia.

Therefore the following initial decisions by the state are necessary:
- prepare a national sustainable-tourism strategy and action plan;
- prepare tourism management plans for protected areas;
- prepare nature education programmes for protected areas;
- declare the provision of information and the organisation of nature education in protected areas to be state financed activities (information network, visitors centres + nature education, study and hiking trails, information publications, public relations);
- strengthen with legislation the mechanisms for regulating tourism in protected areas;
- regulate in law the allocation of tourism revenues;
- make the governors of protected areas responsible by law for the regulation and planning of tourism and make them the co-ordinating link between tourism companies and local tourism service providers.

5. Ecological tourism, the protection of biological diversity, and sustainable usage

The concepts of ecological tourism and biological diversity emerged in the world at almost the same time. This undoubtedly did not occur by chance – ecological tourism was a natural counter-response the massive rise in ordinary tourism which caused negative social and cultural effects and had become one of the main culprits for the degradation of the natural environment, including the loss of biological diversity, in tourist regions.

In Estonia, the concepts came into use at the same time, but independently and in a completely different way: "Biological diversity" in connection with the signing of the Convention on Biological Diversity, i.e. from the top down, and "Ecological tourism" as a new local-development-biased trend in tourism, which was influenced by the activation of the village movement, i.e. from the bottom up.

The Estonian Ecological Tourism Association defines ecological tourism as follows: "Ecological tourism is responsible travelling and travel management, which supports the conservation of the destina-

tion area's local culture and natural heritage, and the economic welfare of the local inhabitants."

The term "ecological tourism" is not included in any current Estonian legal act. The only exception is a fresh document – The Estonian Environmental Action Plan (EEAP, 1998), which establishes the preparation of an ecological tourism action plan (9.1.5) as an essential action for the conservation of landscape and biological diversity (main goal 9). The environmental action plan also establishes the "promotion and development of national ecological tourism" (1.4.4.) as a necessary activity for the development of environmental awareness and environmentally conservative consumption.

Ecological tourism in Estonia, until now, has been a phenomenon, the idea and beginnings of which have come from below. In comparison to nature protection, including the protection of biological diversity, and sustainable use, tourism generally has also been a relatively little broached subject in Estonian legislation. There is still no legislative support for the idea of integrating nature protection and the development of the local economy, an idea which was first clearly stated and worded at the Congress of Protected Areas in Caracas in 1992 and which is also being increasingly understood and applied in Estonia.

The CBD (sub section b) requires that contracting parties, "Develop guidelines for the selection, establishment and management of protected areas..." and "Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use" (sub section c). Ecological tourism is the preferred method of tourism management in protected areas since it:

- takes into consideration natural restrictions and tolerances
- integrates nature protection goals and the development of the local economy
- gives biological diversity an (economic) value, which motivates local enterprises to protect this (natural) resource.

The responsibilities ensuing from the sustainable use of the components of biological diversity (art.10) and those imposed by the CBD – to protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements (sub section c), and encourage co-operation between governmental authorities and the private sector in developing methods for sustainable use of biological resources (sub section e) – provide a clear objective to develop ecological tourism, in as much as ecological tourism is a method for the balanced, profitable but sustainable use of natural resources in tourism. The partnership and co-operation of the public and private sectors on a local level is necessary in order to achieve a balance.

In order to promote public education and awareness (art. 13) ecological tourism can:

- propagate responsible travelling and travel management, and
- provide information about both the positive and the negative effects of tourism on the natural and social environment.

The Estonian Environmental Action Plan also requires the "propagation and development of national ecological tourism" (1.4.4.) as a necessary activity for the promotion of environmental awareness and environmentally conservative consumption (main goal 1). This ties in well with the responsibilities imposed by the CBD "Co-operate with other States and international organisations in developing educational and public awareness programmes, with respect to conservation and sustainable use of

biological diversity" (b).

Tourism is a global phenomenon and an international economic sector, which is not contained by national borders. Ecological tourism could become a forerunner of environmental awareness in the tourism industry.

• Summary, assessment and objectives

The loss of biological diversity is not caused by biological factors but by social and economic ones. The tourism industry is one of the main consumers of biological diversity. Tourism needs biological diversity as a resource. However, as the volume of tourism (both domestic and international) increases, biological diversity is increasingly threatened, and the direct and indirect adverse impacts on it grow.

The role of ordinary tourism in the conservation of biological diversity is passive – to reduce the adverse impacts on biological diversity. However, the role of ecological tourism is active – to influence positively, or directly support, the conservation of biological diversity. The realisation of this opportunity and the harnessing of ecological tourism as an instrument of sustainable development require, above all, the integration of tourism development and nature protection with the economic interests of the local population.

In **conclusion** we can say that:

1. The effects on biological diversity arising from tourism and associated with activities in the field are, on a whole, not significantly negative in Estonia at the moment. The number of tourists travelling outside Tallinn is small – the Tourist Board for instance estimates around 20% of all foreign tourists. At the same time, the number and concentration of tourists may be a problem locally and seasonally.
2. The working group found that the Estonian Biological Diversity Strategy offers good opportunities for the development of tourism, as an economic sector and as a means of relieving social problems (primarily unemployment), on a regional and local scale.
3. At the same time, we must be prepared for an increase in the number of tourists on a national and local level, and for the need to relieve the effects which accompany developments in tourism infrastructure. The main effects on biological diversity that arise from tourism are mostly of a local nature. These threats are soil erosion, air pollution, damage to landscapes, damage to ecosystems, noise pollution, etc. A rise in the number of tourists and the construction of infrastructure connected with tourism precipitates many negative effects that could significantly damage biological diversity (trampling, scaring, picking, polluting, building in naturally beautiful and diverse sites, etc.).
4. In response to the above, it must be said that some landscapes, e.g. semi-natural ones (including traditional cultural landscapes), can be preserved through tourism. Financial means for preserving these communities can be earned primarily through promotional work and the provision of services.
5. Estonia does not have a tourist and recreation development plan on a national level. At the same time, the tourist development plans being prepared on a local level need to be co-ordinated in order to improve the planning of tourism and recreation related activities and spread the tourist load. Greater co-operation between local governments and the governors of protected areas in tourism planning and management is essential.

6. The actions of those involved in the field of tourism (the state, local governments, tourism firms, NGOs) are uncoordinated and duplicate one another.

Objectives

On the basis of the above, one objective was formulated: to plan and manage tourism and recreation in a manner that does not damage biological diversity and supports its conservation and sustainable use.

4.10. INDUSTRY (including the energy industry and mining)

Industry influences biological diversity directly – e.g. by destroying the habitats of rare species in the process of mining – and indirectly. Very indirect effects, e.g. through climate change, are dealt with only briefly here. The total contribution of our industry to global problems, despite a relatively high CO^2 emission per capita, is relatively small. The impact of industry on biological diversity is mostly negative.

Everything associated with industrial pollution affects biological diversity in one way or another. Industrial gases, liquid, and solid wastes affect the biota in different ways, from direct damage through to accumulation in the food chain. In the case of the latter it is often unimportant whether the toxin was released into the biosphere as an airborne, waterborne, or solid substance. In such cases different emission sources are viewed integrally, in the following analysis too.

Since Estonian industry is quite localised, its effects on biological diversity are more slight than one would expect considering the contribution of the industrial sector to Estonia's gross national product. The situation is also eased by the fact that the raw-material intensive and environmentally "dirty" industries bequeathed by the former Soviet Union have mostly folded and the predicted moderate industrial growth in Estonia will be built on more modern technology. Mining is in steady decline – especially oil shale mining, which has the greatest environmental impact.

Occasionally, the indirect impact of industry on biological diversity may be positive. For instance the existence of small food or textile manufacturers may support agriculture which is essential for the maintenance of traditional landscapes and communities.

The preparation of "The interconnection between industry and the strategy for the protection of biological diversity" was based on the guidelines and programme of work issued by the project leaders, the Estonian Environmental Strategy and its action plan, and the industry and energy industries action plans. Protection of biological diversity in industry primarily means the reduction of the negative effects of industry but also support for the positive effects. Industry's relatively slight impact earns it a lower priority than agriculture for instance.

1. The situation in different industrial sectors and their effect on biological diversity

The sales structure of the total output of the manufacturing industry (food industry, light industries, timber industry, chemical industry, building materials industry, and engineering industries) constitutes more than 4/5^{ths} of the Estonian industry total, and the industry provides around one quarter of Estonia's employment.

In 1998, **the food industry** accounted for around 29% of total industrial output, making it Estonia's most important industrial sector. The dairy industry accounts for over 30% of food industry sales, and together with the fish processing industry is one of the largest and most promising industry subsectors. Food industry enterprises are distributed relatively evenly throughout the country although the twelve largest manufacturers, which are located in towns, produce around 50% of the total food industry output and the 30 largest manufacturers produce 75% of the total output. Biological diversity is adversely affected by the wastewater produced by the food industry, which contributes to the eutrophication of water bodies. According to the Estonian Red Data Book the eutrophication of water bodies is the main risk factor for 10 plant and 58 animal species. At the same time it is evident that the food industry is not the only culprit. A strong food industry may also essentially support agriculture which is necessary for the maintenance of traditional landscapes and communities (see the chapter on agriculture in the biological diversity protection strategy and action plan). A good example is the cheese factory on Vormsi Island, which ensures a market for the dairy farmers still operating on the island. Without this industry the plight of the traditional communities on Vormsi would be even more critical than it is. Therefore, an optimal solution from a biological diversity point of view would be for the food industry to reduce the amount of pollution while maintaining their level of production. In places, decentralised small-scale production, which tends to die out due to the difficult market situation, should be supported in outlying areas. According to the Estonian Environmental Strategy, the biological, and where necessary chemical, treatment of all wastewater released into the environment will be ensured in the next few years. Work to meet this objective has so far progressed relatively successfully.

The largest branch of **light industry** is the textile industry, which is mainly concentrated in the large factories in Tallinn, Narva, and Sindi. This is followed by clothes manufacturing, leather processing, and footwear manufacturing. Mostly the poisonous waste produced by the (box calf) chrome leather tanning industry adversely affects biological diversity. An indirect positive effect is the creation of a market for the products of livestock (including sheep) farming, which is necessary for the conservation of traditional communities and landscapes. A good example is the manufacturing of sheep's wool products on Hiiumaa Island.

The **timber industry** is one of the country's leading industrial sectors regarding the proportion of exports. Its development is promoted by the existence of local raw material, an extensive network of manufacturers and wide range of products, long-term experience and traditions in industrial and hand-made production, the completion of the privatisation of state enterprises, and the existence of a high level of expertise. The trend towards the more systematic use of timber is becoming more evident; sawdust is now being used as a fuel. At the same time the local timber industry does not make use of a significant amount of brushwood.

The negative impact of the timber industry on biological diversity may be considerable since logging disturbs the populations of many endangered species. According to Estonian forestry policy, the maximum possible timber output of Estonian forests is 7.8 million cubic metres per annum. In 1996, 4.0 million cubic metres of liquid timber was harvested. Between the years 2001 and 2005 the quantity of harvested liquid timber will probably rise by a factor of 1.8. Since the effects of logging on biological diversity are dealt with in the forestry sector review it is not discussed in detail here.

Of the negative effects associated with timber processing, the most important is probably the danger of air and water pollution arising from cellulose production. Possible pollutants are SO_2, NO_X,

CH_4, CO, H_2S, merkaptanes, and in the case of chlorine bleaching of paper, chlorine compounds including polychlorodibensodioxins and polychlorodibensofuranes (PCDD/PCDF). The latter are extremely toxic and accumulate in the food chain, thus potentially posing a serious threat to biodiversity. Therefore the development of cellulose production is permitted only subject to the observance of strict environmental requirements. To the best of our knowledge, chlorine bleaching has never been used in Estonia; this should be kept so. (See also "Chemical Industry" below)

The adoption of the extensive use of brushwood in the timber industry would be a positive influence on biodiversity in many ways: competition with wood being harvested from older forests would develop, which would lessen the pressure on the habitats of forest biota; the overgrowing of the habitats of open terrain species would be slowed down or stopped; since brushwood regrows rapidly its use does not pose a serious threat to the brushwood species especially if harvesting is carried out in autumn and winter so that wildlife is left undisturbed in the spring and summer seasons.

The different pollutants produced by the **chemical industry** pose a considerable threat to biological diversity. Waste from the chemical industry may for instance contain the chemicals being manufactured, as dust particles. The emission of nitrogen oxides is probably lower in the chemical industry than in the energy industry. Nitrogen oxides, apart from causing acidification, also promote eutrophication. Nevertheless industry, including the chemical industry, is, in addition to transport and agriculture, just one of those to blame for this problem. It is also worth noting that Estonia imports more nitrogen oxides than it exports. Hydrogen sulphide and carbon monoxide are toxic substances, which, whether emitted from the chemical industry or elsewhere, have a largely local impact. The release of freons, which deplete the ozone in the stratosphere, poses a grave threat to global biodiversity; Estonia's share in this global problem is, however, small. Estonia has also signed the Vienna Convention and the Montreal Protocol but controls concerning their implementation seem to be rather lax. Limited information is available about organic pollutants, especially PCBs, in food chains. The current data does not indicate an acute problem. On the contrary, the relatively good condition of the populations of the highest predators implies a moderate level of pollution. The same is true for heavy metals. However, since chemical industry waste is potentially a serious threat, monitoring must be continued on at least the current level and more detailed studies should preferably be carried out. Currently the need to protect biological diversity has not led to the imposition of any additional environmental protection measures on the chemical industry over and above those already imposed by existing environmental protection programmes and Estonia's international commitments.

The engineering, electronics and metal industries may pollute the environment with substances such as: SO_2, NOx, CO, H_2S, HF, HCI, the organic compounds of lead, arsenic, cadmium, chrome, copper, mercury, nickel, selenium, zinc (HC, PAH, PCDD/PCDF, PCB etc.), and dust, tar and oil, ammonia, cyanide, tio-cyanides, tio-sulphates, fluorine, and many others. The effects of this branch of industry on biological diversity are difficult to distinguish in Estonia from those of the chemical industry, and hence what was said above about the chemical industry applies here also.

The building materials industry developed very rapidly in 1998. A growth in annual sales turnover of up to 10% is forecast for the years 1998–2000 and of up to 5% for 2001–2002.

The development of this industrial sector is linked to the mining and quarrying of Estonian oil shale, limestone, sand, gravel, and clay. The effects of these activities on biodiversity are dealt with in

a later section. The emissions of this sector may contain: dust, NO?, CO, SO_2, chrome, lead, arsenic, vanadium, hydrofluoric acid, calcinated soda, etc. There is no data to the effect that the Estonian building materials industry has released quantities of any of these substances into the environment sufficient to affect biological diversity.

An exception to some extent is the cement factory at Kunda. However, an environmental protection programme was successfully carried out there between 1993 and 1996. Whereas in 1992, 82 thousand tonnes of dust were released into the air, in 1996 this was down to 13 thousand tons, and in 1997 only 2 thousand tonnes were released. The detrimental effects of the cement dust on the natural environment formerly extended to a 10–15 km radius and the strong effects to a radius of 2–3 km. The dust emitted by cement factories is classed as a weakly toxic pollutant, which has an adverse impact on soil characteristics and on the biological processes in plants (especially conifers), only when present in large quantities. Since the dust is alkaline it may damage naturally acidic communities such as bogs. This branch of the industry no longer has a significant impact on biological diversity.

The building materials industry could potentially have a positive effect on biological diversity if it took reeds into widespread use as a building material. In earlier times there was a factory in Lihula, which made thermal insulation mats out of reeds. If demand for reeds grew this would promote their more intensive harvesting which would prevent the piling up of dead biomass in reed beds and would help preserve the diversity of reed bed biota.

The environmental impact of **the energy industry** in Estonia is without doubt greater than that of the industrial sectors described above. A still unresolved problem is the treatment of the residual water from the ash removal systems of oil shale-fired power stations (pH 12 and over with a large concentration of heavy metals), which is discharged into natural water bodies. The energy industry's second largest impact on biological diversity is caused by sulphur and ash emissions into the atmosphere. On the basis mainly of oil shale fired power stations, 1.4 times more sulphur pollution leaves Estonia via the atmosphere than enters from outside. Hence Estonia makes a significant contribution to acid rains in Fennoscandia. At the same time the alkaline ash has strongly influenced the bog communities of Virumaa, the original plant life of which has, in places, been seriously damaged. The emissions of PCDD/PCDF from the burning of oil shale are unknown, but, considering the large quantity of aromatic hydrocarbons and chlorite found in oil shale, this may be greater than for other fossil fuels. Unfortunately we do not have any reliable information about the quantities of these highly toxic compounds in our natural environment. Although the healthy populations of the highest order predators prove indirectly that the problem can not be very acute.

The long-term (until the year 2018) fuel and energy management programme for sees a significant reduction in the pollution load through changes in the proportions of different primary energy sources and through energy savings. By the year 2010 an increase of 2/3 in the use of renewable energy sources and peat, compared to the level in 1996, is projected. In the interests of biological diversity protection it is necessary to abandon some of the existing district heating systems and some of those parts of the electricity transmission system which break up the landscape, and increasingly harness effective local combined heat and power generation methods. The reduction of oil shale production volumes through the increasing use of alternative and more efficient energy sources is certainly necessary in order to lessen this industrial sector's negative impact on the environment and on biological diversity.

The impact of different types of alternative energy sources on bio-diversity varies. The direct impact

of *wind energy* is weakly negative. Wind turbines may disturb birds and other flora and fauna, which means that they should not be positioned on busy migratory routes. The aesthetic impact of wind turbines on the landscape should also be considered. If these conditions are taken into account then the total impact of wind energy (considering the reduction in the use of fossil fuels) is positive.

The impact of *hydroelectric energy* depends strongly on the size of the reservoir created. Large reservoirs can undoubtedly be considered to be significantly damaging to biological diversity. It is fundamentally unacceptable, from a biodiversity-protection, to change the water regime of hitherto untouched natural stretches of river. In the case of straightened, dredged or otherwise altered stretches of river and of canals, the building of small dams may potentially increase biological diversity so long as the migratory movements of fish are not impeded. Hence, the development of small-scale hydroelectric power generation may be consistent with the protection of biological diversity. To avoid possible conflicts, all hydroelectric power generation projects should undergo an environmental impact assessment.

The environmental impact of *power generation from waste* depends essentially on the technology used. In the case of incineration the danger of PCDD/PCDF emissions is very great, although the emission of these and other pollutants can be considerably reduced with suitable technology, i.e. flue gas wet scrubbing. Landfill gas extraction causes less environmental problems.

The use of biomass as an energy source may affect biological diversity in many ways. The creation of large monocultural areas may in places reduce biological diversity, with the added problems caused by herbicide use. Nevertheless, the negative effects of energy plant cultivation on biotic diversity have not been known to cause any major problems anywhere. The articulation of large tracts of field with energy plantations would most likely lead to an increase in diversity. Considering the reduction in emissions from fossil fuels the overall effect on bio-diversity is undoubtedly positive.

Even more promising for us is the use of naturally growing biomass as an energy source. At present our resources of brushwood, reeds and natural hay have not been accurately determined but initial estimates in the counties of Pärnumaa and southern Läänemaa have demonstrated the large potential of this resource. The intensive utilisation of this resource would directly serve the interests of the protection of the biological and landscape diversity of our traditional landscapes and communities. Therefore, investments directed at the utilisation of these resources, i.e. SEIGA reed harvesters, furnaces suitable for biological fuel, etc., should be considered a priority.

The widespread use of peat as an energy source can not be recommended either from a biological diversity or from a more general environmental protection point of view. Peat cutting is dealt with in the following section.

Mining is an essential destroyer of biological diversity. In the open-cast mining of oil shale, vegetation cover and animal habitats are destroyed completely; conventional mining seriously affects the water regime of the upper soil layers, which leads to the impoverishment of the vegetation. The vegetation is also completely destroyed in peat cutting fields.

Most of Estonia's mineral resources, including all the commercial oil shale occurrences and the most abundant and best phosphorite occurrences, are found in Northeast Estonia. Although only 19% of the country's population live in this region, 40% of the country's core industries are concentrated here. Oil shale mining and processing represent massive and concentrated energy and chemical in-

dustries in Northeast Estonia; these have caused new and extremely complex interactions between society and nature and have reduced biological diversity over huge areas. The effect of mining on the natural environment is not just limited to the removal of material from beneath the earth's surface. Any kind of mining significantly changes the relief of the land surface, the surface and ground water regimes, the water chemistry, and hence the whole living environment. For instance land subsidence above mine shafts which affects an area of 15,000 hectares essentially hampers the economic management of the land in oil shale mining regions. In many places the hollows created by subsidence have filled with water and paludification has begun. In areas near Lake Peipsi, where the soil layer is thick, the regression of bogs can in many places be observed. With the fall in mining output (in 1999 the Tammiku, Sompa and Kohtla mines will probably be closed) the acuteness of this problem is declining.

In Estonia man-made surface forms tend to overshadow the natural ones in size. These are mainly residue-mounds and quarries. The waste mounds, of which about 10 have reached at least 50m in height, have become an inseparable part of the mining and industrial region of Northeast Estonia. Of these the most well known are the Kiviõli (relative height 115m) and Kohtla-Järve (over 50m) mounds which are lifeless ash hills made up of oil shale processing industry retorting and burning residues. Closely spaced mounds have been joined together to form massive undulating land forms from which the wind disperses fine and often poisonous dust particles into the surrounding landscape. Rain, snowmelt water, and ash quenching water leach out the soluble elements, destroying the area's wildlife and, due to the area's karst fields, polluting also the ground water. The oil shale remaining in the gangue may spontaneously ignite in the waste mounds, triggering a fracturing process which releases additional pollution into the environment. At Kukruse the waste mound has been covered with a layer of turf and in Kiviõli with bushes. Such work is expensive and time consuming but enables the negative impact of the mining and energy industries on bio-diversity to be reduced.

The phosphorite quarries around Maardu and the Oktoobri, Narva, Sirgala and Viivikonna opencast oil shale mines in the county of Ida-Virumaa are hundreds, and sometimes kilometres, long and tens of metres wide valley-like land forms. These are created by the removal of the overburden, which may be tens of metres thick. When this material is piled up and levelled it forms the stony and undulating banks of the valley-like and gradually deepening excavation along which the excavated ore is transported. The loose-debris-covered slopes can be a hazard for animals.

After the war limestone quarries were dug wherever a suitable site could be found. These are usually square or rectangular in shape and steep or often vertical sided, which makes them especially dangerous for animals. The base of the quarry is usually flat, sometimes stepped at its edges. In larger quarries there may be occasional low heaps of leftover material. The less steep slopes around the perimeter of the quarry are often covered in loose rocky debris. The depth of the quarry depended on the thickness of the sheared limestone layer and in some places exceeded 10m. The diameter of quarries varies from tens of metres to hundreds of metres and their surface area from hundreds of square metres to tens of hectares. The largest quarries are in Tallinn on the limestone promontory at Lasnamäe; in Väo, Padise and Harku in the county of Harjumaa; in Tamsalu and Rakke in the county of Lääne-Virumaa; and in Jaagurahu, Kaarma and other places on Saaremaa. Some abandoned quarries have filled with water, at Lasnamäe and Jaagurahu for instance. The proliferation of disused quarries without legal owners is a particular cause for concern. Limestone quarries support very specific flora which is absent or rare elsewhere in Estonia.

Clay quarries are similar to limestone quarries. Their sides are steep, often vertical; their shape is irregular with a flat bottom and they are not permanently flooded. Usually they are full of rubbish

and overgrown with brushwood. Old clay quarries are often used as waste dumps. Large clay quarries can be found in the Kopli district of Tallinn, in Kunda, Aseri, Loksa, and in Joosu in the county of Põlvamaa, also in Sangaste in the county of Valgamaa. Their re-cultivation is difficult and they are usually unsightly.

Sand and gravel quarries are less of a threat to nature. Large sand and gravel quarries are located at Palivere in the county of Läänemaa, at Vooremägi in the county of Tartumaa, at Pannijärve in the county of Ida-Virumaa, at Piusa in the county of Põlvamaa, and elsewhere. With the quarrying of sand and gravel man has occasionally created suitable habitats for many species some of which are endangered. For instance in places in West Estonia unforested quarries with shallow pools provide spawning grounds for frogs. Old quarries on level ground are often permanently flooded and host large numbers of waterfowl. Nevertheless, due to the extensive loss of habitat that it entails, large-scale quarrying is still a threat to diversity. One possibility for the economic rehabilitation of disused quarries is their afforestation. Depending on the situation, this may either assist the restoration of biological diversity or hinder it (see above example about frogs).

There are numerous peat quarries in Estonia, which were mainly excavated before the war to supply peat for fuel. These are hundreds of metres and sometimes even kilometres long but only 4 to 5 metres wide. Their sides can be gently sloping or vertical. Their depth depends on the thickness of the peat layer but usually is around 3 to 4 metres. Peat quarries were excavated in-groups as more or less parallel rows separated by mounds of leftover peat. Peat quarries are flooded throughout the year. Biological diversity is destroyed over extensive areas by peat milling fields. Peat production should not be stepped up in the future since the natural regrowth of peat (0.9mm p.a.) already lags behind current production output. It is, however, possible to reduce losses in the production process, which currently run at around 40%. One possibility for achieving this is to replace peat milling with less energy intensive peat cutting (into blocks) which has considerably lower losses associated with it. Peat cutting is also less damaging to the bog surface and allows the area to be restored to some extent later.

A set of serious problems in their own right have developed in the disused 6.36 km^2 Maardu phosphorite quarry, in which excavation was concluded in 1991. The quarrying deposits left here contain 73 million tonnes of dictyonema shale; if the minimum uranium content of this shale was assumed to be just 30g per tonne, this would give us a total of 2.19 million kilogrammes of environmentally hazardous uranium. It has been estimated that from every square kilometre of the Maardu quarry 4.15 to 23.54 kg U and up to 1.95 kg Th are washed into Maardu Lake every year. Maardu is a warning to those who want to start phosphorite quarrying at Toolse where the uranium content of the shale is much higher – 98 to 383 g/t and an average of 13 g/t of Th. At the same time we can not overlook the fact that Estonia's phosphorite reserves are the largest in Europe and the question of their mining will without doubt arise again and again in the near future. It has not been possible to tap the currently known and thoroughly investigated deposits (Toolse, Aseri the Lääne-Kabala seam in the Rakvere giant deposit) for a number of reasons, mainly environmental ones. Some deposits (Iru, Narva) have been built upon. From a biological diversity point of view phosphorite mining is more harmful than oil shale mining since recultivation work is more complex and the direct environmental damage greater.

The use of dictyonema shale, the reserves of which are very large – up to 60 000 million tonnes, would pose a great threat to the Estonian environment and species diversity. This shale has a high uranium, vanadium and molybdenum content. In addition to the extraction of useful components there have been plans to use the shale in the chemical industry (for producing oil and domestic gas

with equipment using a solid heat transfer medium, also for the production of alums, etc.), in the energy industry (to be burnt in special furnaces as a so called boiling layer) for the generation of heat and electricity, in the building materials industry (for the production of decorative silica-concrete mouldings), and in agriculture (use of the shale ash as a source of potassium fertiliser and many other micro-elements essential for plant growth). So far all these plans have been rejected due to their environmental risks. They may, however, resurface with plans for phosphorite mining. From a biological-diversity-protection point of view the mining of dictyonema shale is impermissible.

2. Strategic levers for the protection of biological diversity in the industrial sector

As became apparent from the above analysis the impact of industry on biological diversity is at present relatively light. Therefore, there is generally no need to implement specific bio-diversity protection measures. Usually general measures for the reduction of pollution will suffice. Here the main lever is the implementation of the existing Estonian environmental legislation.

An essential **political** lever is the need to satisfy European standards and directives in this field. The economic lever should be the principle that the polluter pays, however, in reality, at the present levels of compensation levied for damage caused by pollution, this does not work.

A more effective lever at the moment is the **economisation** imposed on manufacturers by the market, which does not allow the industry to carry out expensive experiments on nature. The rates of compensation for damage caused by pollution and resource tax rates need to be updated so that they amplify the environmentally positive effect of the free market and prevent the possibility that with changes in the economic situation someone may profit from polluting the environment.

Planning, as a means of reducing the negative effects of industry on the environment and on biological diversity, does not function well enough yet. One of the reasons for this is an insufficient level of environmental awareness. The main instrument for raising this is environmental education. The impact of industry on biological diversity is of course just a small topic at the intersection of the topics of "industrial pollution issues" and "aspects of biological diversity". Both environmental education and informed decision making in the preparation of area plans and development plans can only be based on the availability of reliable information. The research priority in the current field would be the monitoring of the levels of the poisons released by industry in the highest ranks of the food chain.

The main lever for supporting the positive effects of industry would be the integration of **regional policy** and biological diversity protection. On the whole both bio-diversity and local development can be supported with the same investments. Investment concessions, either as direct subsidies or subsidised loans, and the implementation of a well thought out system of trademarks, can be used as **economic levers**. Direct subsidies would have to be met from the national budget and associated funds and from foreign aid. Capital to finance low interest-rate loans would have to be sought from international banks. An effective goods labelling system would help encourage the flow of more private capital into environmentally friendly investments.

Objectives

1. A gradual reduction in the use of oil shale as an energy source
2. The development of renewable energy sources, particularly those which support biological diversity by using natural biomass
3. A reduction in the pollution released by the manufacturing industry

4. The development of manufacturing industries that support the protection of traditional landscapes and communities
5. A reduction in mining volumes and the stopping of the excavation of mines which are dangerous to the environment
6. The creation of diverse habitats suitable for endangered species, in disused quarries.

V STRATEGY

Based on the results of sectoral works, Aleksei Lotman compiled the Estonian strategy for biodiversity protection.

1. Genetic resources and biotechnology

1.1. The *in situ* conservation of Estonian genetic resources

1.2. The management of the development of biotechnology in such a way that biological diversity is not threatened

2. Education

2.1. The systematic management of nature education and the securing of the necessary funding

2.2. The integration of the topic of biological diversity into curricula at all levels

2.3. The promotion of including structures outside the education system in activities to introduce the need for biological diversity protection

3. Landscape protection aspects in planning and land management

3.1. The integration of biological and landscape diversity into all spatial and land use plans

4. Agriculture

4.1. Conservation of semi-natural communities and landscapes

4.2. Conservation of species, variety and breeds characteristic of Estonia

4.3. Development of organic agriculture

4.4. Minimising pollution resulting from intensive agriculture

4.5. Conservation of biological and landscape diversity in amelioration

5. Forestry

5.1. Protection of primeval forests

5.2. Protection of biological diversity in utilisation of forest

6. Hunting

6.1. The protection of biological diversity is integrated into the system of hunting management

7. Fishery

7.1. Utilisation of natural fish stocks while sustaining the biological diversity of water bodies

7.2. Mitigation and avoidance of negative impact of fish farming

7.3. Application of fish farming for protection of endangered fish species and biotopes

8. National defence

8.1. The principles for protecting biodiversity are integrated to national defence policy

9. Border control

9.1. Encourage the co-operation of the border guard and customs authorities in the protection of biological diversity

10. Industry

10.1. A gradual reduction in the use of oil shale as an energy source

10.2. The implementation of methods of power generation which support biological diversity

10.3. A reduction in the pollution released by the manufacturing industry

10.4. The development of manufacturing industries that support the protection of traditional landscapes and communities

10.5. A reduction in mining volumes and the stopping of the excavation of mines which are dangerous to the environment

11. Transport

11.1. Minimisation and avoidance of negative influence of transport infrastructure

11.2. Replacement of environmentally dangerous types of transport with environmentally friendly alternatives

12. Tourism

12.1. Plan and manage tourism and recreation in a way which does not adversely affect biological diversity, supports its conservation and its sustainable use

13. Nature conservation

13.1. Utilisation of inter-sectoral measures for the protection of biological diversity

VI ACTION PLAN

6.1. THE PRINCIPLE AND METHODOLOGY OF THE ACTION PLAN

The action plan has been compiled by different teams with the help of economic consultant Lybov Gornaya. Activities in all fields are divided into five types:

1. Legislation and institutional measures
2. Economic measures
3. Technological measures (include. investments)
4. Education, information, awareness raising
5. Applied research

Every activity has a 4-digit code number where the first digit identifies the field, the second the aim, the third the type of activity, and the fourth the number of order within the type of activity.

For every activity, indication is given of its connection with other aims, the time schedule, the institution responsible for implementation (underlined) and other institution(s) participating in implementation, labour consumption (number of people annually), cost, status of financing, and possible sources of financing. All activities are prioritised according to three categories: I) very important; II) important; and III) relatively less important. The action plan has subsequently been unified and restructured by Aleksei Lotman (13 fields have been used instead of 10).

Abbreviations in action plan

Responsible organisation:	Abbr.
West-Estonian Archipelago Biosphere Reserve	BKA
Centre Of Ecological Technologies	CEET
Estonian Agrobiocentre	EABK
Estonian Bio-centre	EBK
Estonian Society Of Organic Agriculture	EBÜ
Estonian Energy	EE
Union Of Protected Areas Of Estonia	EKAL
Estonian Melioration Society	EMS
Estonian Oil Shale Company	EP
Estonian Agricultural University	EPMÜ
Department Of Statistics	ESA
Department Of Statistics	ESA
Estonian Science Foundation	ETF
Union Of Estonian Plant Producers	ETKL
National Standards Board Of Estonia	EVS
Estonian Eco-tourism Society	EÖÜ
Institute Of Geology	GI
Ministry Of Education	HM
Information Centre Of The Ministry Of Environment	ITK
Ministry Of Justice	JM
Societies Of Hunters	JS
Protection Areas	Ka
Ministry Of Defence	KaM
Institute Of Chemical Physics And Biophysics	KBFI
Environmental Inspection	KI
Ministry Of Environment	KKM
Department Of Fishery In Ministry Of Environment	KKM KO
Ministry Of Culture	KM
Local Municipalities	KOV
Nature Centre	LM-d

Land-board	MaA
County Government	Mav
Forestry Dept. Of The Ministry Of The Environment	MeA
Estonian Marine Institute	MEI
Institute Of Economy	MI
Estonian Heritage Society	MKS
Ministry Of Economy Affairs	MM
Melioration Bureau	MPB
Melioration Co-operatives	MPÜ
Union Of Local Municipalities	OL
Not Determined	pm
Ministry Of Agriculture	PM
Firms Of Public Relations	PR-d
Ministry Of Finance	RM
State Marine Inspection	RMI
Commission Of Sustainable Development	SAK
Ministry Of Internal Affairs	SIM
Ministry Of Social Affairs	SM
Customs	T
Department Of Tourism	TA
Animal Breeding Inspection	TAI
Plant Protection Inspection	TKI
Estonian Academy Of Arts	TKÜ
Union Of Farmers	TL
Tallinn Pedagogical University	TPÜ
Ministry Of Transport And Communications	TSM
Inspection Of Plant Production	TTI
Tallinn Technical University	TTÜ
Tartu University (Tu)	TÜ
Institute Of Molecular And Cell Biology Of Tu	TÜMRI
Ministry Of Foreign Affairs	VM
Non-governmental Organisations	VVO-d
Institute Of Ecology	ÖI

Sources Of Funding:	Abbr.
Estonian Innovation Foundation	EIF
Estonian Science Foundation	ETF
Private Capital	EK
Fishery Capital	KK
Estonian Environmental Fund	KF
Local Budgets	KE
Loan	L
Lahemaa National Park Foundation	LRPF
Forestry Capital	MK
Not Determined	pm
State Budget	RE
State Investments Program	RIP
Foreign Aid	VA
Foreign Projects	VP

Activity priorities:
I – very important II – important III – comparatively important

1. GENETIC RESOURCES AND BIOTECHNOLOGY. ACTION PLAN UP TO THE YEAR 2005

Objective 1.1. The in-situ preservation of Estonian genetic resources

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
1.1.1.	**Legislative and institutional changes**								
1.1.1.1.	Prepare legal acts on the creation, preservation and maintenance of collections of genetic resources and on the provision of access to and exchange of genetic resources with third parties, including foreign parties	1.2.	2000	KKM,KM,PM	1	150	not covered	RE	**II**
1.1.1.2.	Establish a National Information Centre for Genetic Resources and Biotechnology (Clearing House Mechanism)	1.2.	2000–2005	KKM, SM, PM, HM	4	3600	not covered	RE	**II**
1.1.1.3.	Establish a National Micro-organism (bacteria and micro-fungi) Collection	1.2.	2000–2005	KKM, KM,PM	1	2400	50% likely	RE, KF	**III**
1.1.1.4.	Establish a National Plant and Animal Cell Culture Collection	1.2.	2000–2005	KKM, KM,PM	1	2400	50% likely	RE, KF, EK	**III**
1.1.1.5.	Establish a National Gene-bank	1.2.	2000–2005	KKM, PM,KM	1	3000	not covered	RE, KF	**II**
1.1.1.6.	Establish a National Forest Genetic Resource Collection	1.2.	2000–2005	KKM, HM, SM	1	4200	20% likely	RE, KF, MK, VP	**III**
1.1.1.7.	Create a fund of plant genetic material for unforeseen events	4.2.	2001–2005	KKM, SM, VM	1	1000	not covered	RE, NIB, VP	**III**
1.1.1.8.	Work out (a) and implement (b) research and development programmes for the updating of collections with necessary new genetic material	4.2.	a)2000–2001 b)2001–2005	a) KKM,HM,SM, b) VM,PM	a) 1 b) 2	a) 400 b) 7500	a) not covered b) not covered	a)EIF, RE,VP b) RE, EK, VP	**II**
1.1.2.	**Economic measures**								
1.1.2.1.	Support the preservation of private collections which are valuable for biological diversity	1.2.	2000–2005	KKM	1	3600	not covered	RE,KE, VP	**III**
1.1.2.2.	Provide state support for the bringing of samples of genetic material of Estonian origin, which are held abroad, back to Estonia	1.2.	2000–2005	PM, KM, VM	0,5	9000	not covered	RE, VP	**II**
1.1.2.3.	Provide state support for the cloning of wild specimens of protected plant species, their ex-situ preservation and reintroduction into the wild	1.2.	2000–2005	KKM, PM	2	15000	50% likely	RE, KF, VP	**III**
1.1.2.4.	Provide state support for the preservation of Estonian threatened animal breeds as a museum herd at the C.R.Jakobson Farm Museum	4.2.	2000–2005	PM, KM	1	600	partly covered	RE	**I**
1.1.2.5.	Provide state support for the exposition and documentation of Estonian animal breeds at the Ülenurme Agricultural Museum	4.2.	2000–2005	PM, KM	1	600	partly covered	RE	**I**
1.1.2.6.	Provide state support for the European-Mink Preservation Programme at Tallinn Zoo	13.1.	2000–2005	PM, KM	pm	pm	partly covered	RE	**I**
1.1.2.7	Support the creation of the ex-situ frog preservation programme	13.1.	2000–2005		pm	pm	not covered	RE, VP	**I**
1.1.3.	**Technical measures (incl. investments)**								
1.1.3.1.	Create ex-situ gene-banks for endangered Estonian animal breeds and plant varieties	4.2.	2000–2005	PM, HM	1	2100	15% likely	RE, VT	**II**

(continued on p. 128)

1. GENETIC RESOURCES AND BIOTECHNOLOGY. ACTION PLAN UP TO THE YEAR 2005

Objective 1.1. The in-situ preservation of Estonian genetic resources

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
1.1.4.	**Education, information, raising awareness**								
1.1.4.1.	Strengthen co-operation with the Baltic Sea Region countries concerning the exchange of information	9.1.	2000–2005	HM, KKM,SM,PM	1	3600	40% likely	VP	**III**
1.1.4.2.	Strengthen co-operation with EU member states and associated member states concerning the exchange of information about genetic resources	1.2.	2000–2005	HM, KKM,SM, PM	1	4200	40% likely	VP	**III**
1.1.4.3.	Provide collection maintenance training for the personnel of genetic collections	1.2.	2000–2005	HM, SM, KKM, PM	2	1800	20% likely	RE, VP	**II**
1.1.4.4.	Develop existing and prepare new programmes as required for the breeding and preservation of agricultural livestock	4.2.	2000–2005	PM, EPMÜ	2	7200	20% likely	RE	**II**
1.1.4.5.	Prepare and publish a work on plant and animal genetic collections	4.2.	2001–2003	HM, KKM, PM	2	3000	not covered	ETF, VP	**II**
1.1.4.6.	Prepare a database of objects in plant genetic collections	4.2.	2000–2005	KKM, PM	1	12000	30% likely	RE	**II**
1.1.4.7.	Continuously update the FAO International Agricultural Livestock and Cultivated Plant Genetic Resource databases	4.2.	2000–2005	KKM, PM	2	2100	30% likely	RE, VP	**I**
1.1.4.8.	Continuously update the European Association of Animal Producers (EAAP) animal genetic database	4.2.	2000–2005	PM, EPMÜ	0.5	810	20% likely	RE	**I**
1.1.4.9.	Develop information and data communication systems during the compilation and maintenance of genetic resource collections and make available information about these resources for scientific research purposes and for the general public	1.2.	2000–2005	KKM, PM	1	3600	not covered	RE, VA, EIF	**II**
1.1.5.	**Applied research**								
1.1.5.1.	Carry out a survey of the condition of existing genetic resource collections in Estonia and of the means required to preserve them	1.2.	2000	KM, PM,KKM	1	200	not covered	RE	**I**
1.1.5.2.	Begin the complex inventory of protected parks with the aim of compiling a database of introduced tree species		2000–2005	KKM, HM, PM	1	900	not covered	RE, MK	**III**
1.1.5.3.	Begin and complete the inventory and national registration of private collections of cultivated and wild plants		2000–2005	PM, KKM	0.7	600	not covered	RF	**III**
1.1.5.4.	The use of In-vitro methods for preserving genetic resources	1.2.	2000–2005	KKM, PM	2	15000	50% likely	RE, ETF, VP	**II**
1.1.5.5.	Place the cultivars and varieties of indigenous Estonian cultivated plants into tissue culture and preserve them in vitro	1.2.	2000–2005	HM, PM,KKM	3	18000	50% likely	RE, ETF	**II**
									30
								I	7
								II	13
								III	10

1. GENETIC RESOURCES AND BIOTECHNOLOGY. ACTION PLAN UP TO THE YEAR 2005

Objective 1.2. Management of biotechnology development in such a way that biological diversity is not threatened

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
1.2.1.	**Legislative and institutional changes**								
1.2.1.1.	Prepare act on the use of GMOs in closed conditions		2000–2001	SM, KKM	1	300	not covered	RE	**II**
1.2.1.2.	Prepare regulations arising from the act on the introduction of GMOs into the environment		2000–2001	KKM, SM	0.3	90	not covered	RE	**I**
1.2.1.3.	Establish the National GMO Register		2000	KKM, SM	0.5	100	not covered	RE	**I**
1.2.1.4.	Form the Genetic Technology Commission (on the basis of the act on the introduction of GMOs into the environment)		2000–2005	KKM, SM, PM, HM, TÜ, TTÜ, EPMÜ	1	1200	not covered	RE	**I**
1.2.2.	**Economic measures**								
1.2.2.1.	Provide state support for the participation of Estonian specialists in international projects on genetic diversity		2000–2005	HM, TÜ, TTÜ, KBFI, EBK, EABK, EPMÜ	pm	1200	not covered	RE	**III**
1.2.3.	**Technical measures (incl. investments)**								
1.2.4.	**Education, information, raising awareness**								
1.2.4.1.	Training in genetic resources and biotechnology for specialists in biological diversity (incl. abroad)		2000–2005	HM, KKM,	pm	900	not covered	RE, KF	**II**
1.2.4.2.	Establish and maintain a database on biotechnologies and their environmental risks, create an information system and make it accessible to the general public		2000–2005	KKM, SM, PM, HM, MM	1	1200	not covered	RE, KF	**II**
1.2.4.3.	Promote the creation of Internet home-pages which introduce biotechnology and contain educational material on this topic	2.3.	2000–2003	KKM, HM, TÜ, EPMÜ,TTÜ	1	600	not covered	RE, KF, VA	**III**
1.2.4.4.	Ensure Estonia's participation in international research on the development of safe biotechnologies		2000–2005	MM, KKM, SM, TTÜ, TÜ, EPMÜ	1	1200	not covered	RE	**III**
1.2.4.5.	Compile a national overview of the status of biotechnology and its development avenues		2000	MM, HM, KKM	0.5	200	not covered	RE	**III**
1.2.5.	**Applied research**								
1.2.5.1.	The impact of currently used biotechnologies on biological diversity		2001–2005	HM, KKM, TÜ, EABK	2	1500	not covered	RE, ETF, EIF	**III**
1.2.5.2.	The application of biotechnologies for the treatment of industrial pollution		2000–2005	HM, KKM, MM, PM, TÜ, EPMÜ, TTÜ, SM	3	3000	not covered	RE, VA, KF	**III**
									12
								I	3
								II	3
								III	6

2. EDUCATION. ACTION PLAN UP TO THE YEAR 2005

Objective 2.1. The systematic management of nature education and the securing of the necessary funding

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
2.1.1.	**Legislative and institutional changes**								
2.1.1.1.	A legal act on the national nature education system and its financing	2.2., 2.3.	2000–2001	HM, LM	2	400	not covered	RE, KF, VA	**II**
2.1.1.2.	The creation of a national system of nature centres and regional environmental education centres	2.2., 2.3.	a) 2000 b) 2000–2005	HM, KKM	0.2	a) 30 b) 4800	not covered	RE, KF	**I**
2.1.1.3	The founding of a national environmental education centre	2.2., 2.3.	2000–2005	HM, KKM	3	18000	not covered	RE, KF	**II**
2.1.2.	**Economic measures**								
2.1.3.	**Technical measures (incl. investments)**								
2.1.3.1.	Production of teaching aids for nature conservation education and their procurement and retention by schools	2.2.	2001–2005	HM, KKM	5	30000	not covered	RE, KF	**I**
2.1.4.	**Education, information, raising awareness**								
2.1.4.1.	Prepare an overview and create and update a database of individuals and projects dealing with environmental education	2.2., 2.3.	2000–2005	HM, KKM, KOV	1.2	1050	not covered	RE, KF, RE, VA	**III**
2.1.4.2.	Make local governments and school administrations aware of the need to preserve school collections	2.2.	2000-2005	HM, KOV	pm	pm	pm	pm	**II**
2.1.4.3.	Prepare popular literature introducing the Convention on Biological Diversity	2.2., 2.3., 13.1.	2000–2005	KKM, KOV	0.5	900	not covered	KP, KF	**II**
2.1.4.4.	Establish and award a prize for "The best school biological collection"	2.2.	2000–2005	HM, KKM, KOV	0.5	1200	not covered	RE, KE, KF	**III**
2.1.5.	**Applied research**								
2.1.5.1.	Inventory of the condition of teaching aids and their correspondence with school syllabi	2.2.	2000–2005	HM, KOV	0.5	900	not covered	RE, KE	**II**
									9
								I	2
								II	5
								III	2

2. EDUCATION. ACTION PLAN UP TO THE YEAR 2005

Objective 2.2. The integration of the topic of biological diversity into curricula at all levels

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
2.2.1.	**Legislative and institutional changes**								
2.2.1.1.	The establishment of rules of assessment of nature education programmes during the licensing and periodic attestation of schools and higher education establishments	2.1.	2000–2001	HM, TPÜ, TÜ, TTÜ	0.1	40	not covered	RE	**II**
2.2.1.2.	National education requirement for post-graduate studies of biological diversity	2.1.	2000	HM, KKM	0.5	100	not covered	RE	**II**
2.2.1.3.	An act which would require that nature protection be taught as a component of all courses taught at universities and institutions of applied higher education	2.1.	2000	HM, KKM	0.5	100	not covered	RE	**II**
2.2.2.	**Economic measures**								
2.2.2.1	Support for nature conferences and nature field trips for school children	2.1., 2.3.	2000–2005	KKM, HM	0.5	1800	partly covered	RE	**I**
2.2.2.2.	Support for the organisation of competitions and olympics for school pupils on environmental topics	2.1., 2.3., KTK 1.1.2.	2000–2005	HM, KKM, LM, KOV	0.5	2400	partly covered	KE, KF, RE	**II**
2.2.3.	**Technical measures (incl. investments)**								
2.2.3.1.	Production of study aids which introduce issues concerned with the preservation of biological diversity (incl. CDs)	2.1., 2.3., KTK 1.1.10.	2000–2005	HM, KKM	2	6000	not covered	RE, KF, EK	**II**
2.2.4.	**Education, information, raising awareness**								
2.2.4.1.	The further training of teachers in biological diversity	2.3.	2000–2005	HM, KKM, TPÜ	0.7	600	partly covered	RE	**II**
2.2.4.2.	The establishment of a distance learning system for environmental subjects	2.3.	2000–2005	HM, TTÜ, TÜ	1	1500	partly covered	RE, VP	**III**
2.2.4.3.	The inclusion of nature studies in the curricula of general education schools and vocational schools	2.1.	2000–2005	HM, TPÜ, TÜ, TTÜ	1	900	not covered	RE, VP	**II**
2.2.4.4.	Teaching method guides for different subject teachers which describe how to approach the issues of nature protection within different subjects	2.1., 2.3., KTK 1.1.11.	2000–2003	HM, TPÜ, TÜ, TTÜ	0.8	750	not covered	RE	**II**
2.2.4.5.	Promotion of pupils' research work on nature protection		2000–2005	HM, KKM, LM	0.5	450	partly covered	RE, KF	**II**
2.2.4.6.	Nature protection courses at universities and institutions of applied higher education - compulsory for future teachers, as a core subject in all degree courses, as a special subject, as a further training course, and as an open university course	2.1.	2001–2005	HM	2	5000	not covered	RE	**I**
2.2.4.7.	The training of the lecturers who are to read the nature protection courses at the universities and institutions of applied higher education (mainly abroad)	2.1.	2000–2005	HM, KKM	0.2	3000	not covered	RE, KF, VP	**II**
2.2.5.	**Applied research**								
2.2.5.1.	The level and possibilities of environmental education in general and higher education	2.1., 2.4., 2.5.	2000	HM, KKM, TPÜ, TÜ, TTÜ	2	300	not covered	RE, VP	**III**
									14
								I	2
								II	10
								III	2

2. EDUCATION. ACTION PLAN UP TO THE YEAR 2005

Objective 2.3. To promote the inclusion of structures outside the educational system in activities to introduce the need for biological diversity protection

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
2.3.1.	**Legislative and institutional changes**								
2.3.1.1. **(1.4.2.) (1.4.7.)**	The creation of a public relations office at the Ministry of the Environment	13.1.	2000–2005	KKM, VVO	2	1800	not covered	RE	**I**
2.3.1.2.	The establishment of procedures for access to information about nature protection issues	13.1.	2000	KKM, JM	0.5	60	not covered	RE, VP	**I**
2.3.1.3.	Changes in tax laws to encourage enterprises to support and donate funds to NGOs and education establishments dealing with nature education		2001	RM, MM, VVO	0.3	30	not covered	RE	**II**
2.3.1.4. **(1.2.4.)**	A national media policy which ensures that environmental priorities are considered when programme schedules for national T.V. and radio stations are drawn up		2000–2001	KM, KKM, HM, VVO	1	300	not covered	RE	**I**
2.3.2.	**Economic measures**								
2.3.2.1.	Support local governments to help set up nature centres and environmental education centres	2.1., KTK 1.4.3.	2000–2005	HM, KKM	pm	9000	not covered	RE, KE	**I**
2.3.2.2.	Support child care establishments which deal with nature education as a subsidiary activity in order to promote awareness of the principles of biological diversity and the need to preserve it	2.1.	2000–2005	HM, KKM	pm	3000	not covered	RE, KE	**I**
2.3.2.3.	Support the co-operation of non-profit-making organisations which provide nature education, with protected areas, e.g. for the building of nature trails and the compiling of information materials	13.1.	2000–2005	KKM, VVO, Ka	pm	1200	not covered	KF, KE, MK, VP	**II**
2.3.2.4.	TProvide financial support for NGOs for the implementation of international projects promoting environmental protection and nature education	13.1., KTK 1.3.6.	2000–2005	HM, KKM	pm	600	not covered	KF, RE, KK, MK	**III**
2.3.2.5.	Support environmental media publications	13.1.	2000–2005	KM, HM, KKM, VVO	0.5	450	not covered	RE	**II**
2.3.2.6.	Support the participation of environmental journalists in environmental education programmes	13.1.	2000–2005	KKM, HM	0.2	300	not covered	KF, VP	**III**
2.3.3.	**Technical measures (incl. investments)**								
2.3.3.1.	Create new and renovate existing nature study paths	13.1.	2000–2005	KKM, HM, LM,	2	3600	not covered	RE, KE, KF	**II**
2.3.3.2.	Improve the technical and material standing of nature centres and environmental education centres	2.1.	2000–2005	HM, KKM	pm	1800	not covered	RE, KE, KF, VA	**II**
2.3.4.	**Education, information, raising awareness**								
2.3.4.1. **(1.4.5.) (1.4.10.)**	The maintenance and updating of an environmental video library		1999–2005	KKM, VVO	0.9	840	partly covered	KF, KE	**I**
2.3.4.2.	Produce and distribute video films which introduce Estonian nature		2000–2005	HM, KKM, KM	pm	1800	not covered	RE, KF, VA	**III**
2.3.4.3.	Add the chapter "Environmental education and its financing", in Estonian and English, to the year book "Environment" of the Ministry of the Environment		2000–2005	KKM, ITK	0.2	180	not covered	RE, KF	**I**

2.3.4.4.	Organise national and regional nature camps and study days for schoolchildren and adults to provide practical nature education	2000–2005	HM, KKM, LM	1	900	not covered	RE, KE, KF	**II**
2.3.4.5.	Support nation-wide nature protection and education projects aimed at school pupils and the participation of pupils in international environmental projects	2000–2005	HM, KKM, LM	pm	3000	not covered	RE, KF	**II**
2.3.4.6.	Support courses, seminars, and study days on topics associated with biological diversity for pupils of different ages	2000–2005	HM, KKM, LM, Ka	pm	3000	not covered	RE, KE, KF	**II**
2.3.4.7.	Work out interactive study aids and ensure that they reach the target audience (teachers, students, the public)	2000–2005	HM, KKM,LM	1	1200	not covered	RE, KF	**III**
2.3.4.8.	Support the compilation and publishing of literature which introduces Estonian nature (handbooks, hiking guide books, etc.)	2000–2005	KKM, HM	pm	3000	not covered	RE, KF,VA	**II**
2.3.4.9.	Regular television programmes which promote nature protection and environmental news broadcasts on state television	1999–2005	KM, KKM, HM	2	3500	partly covered	KF	**I**
2.3.4.9.	The broadcasting of Estonian-centered educational television and radio programmes on the environment and nature	1999–2005	KM, HM,KKM	1	3500	partly covered	KF	**III**
2.3.4.10.	Organise educational courses and campaigns to introduce protected areas	2000–2005	KKM, VVO, Ka	1.5	2400	not covered	RE, KE, VA	**I**
(9.3.2.) (9.3.16.)								
2.3.4.11.	Promote co-operation between children's establishments offering extramural activities and protected areas	2000–2005	HM, KKM,LM	0.5	900	not covered	RE, KF	**II**
2.3.4.12.	Support the study trips, lectures and quizzes associated with CBD issues organised by env. protection organisations for school pupils of different ages and for various social groups (school administrators, teachers, env. protection dept. officials, etc)	2000–2005	HM, VVO	0.8	600	not covered	RE, KF	**III**
2.3.4.13.	Organise events and training for non-profit-making organisations on landscape maintenance and design	2000–2005	HM, TKÜ, EPMÜ, VVO	1	1200	not covered	VP	**III**
2.3.4.14.	Promote and publish the BMST through the media	2000–2005	KKM, KM	0.2	1200	not covered	KF	**I**
2.3.4.15.	Media campaigns for protection of biological diversity	2000–2005	KKM, HM, Ka	0.5	3000	not covered	KF	**III**
2.3.5.	**Applied research**							
2.3.5.1.	Ascertain the training requirements of nature journalists 2.2.	2000	KKM, HM	0.3	50	not covered	KF	**III**
								29
							I	10
							II	10
							III	9

3. LANDSCAPE ASPECTS IN PLANNING AND LAND MANAGEMENT. ACTION PLAN UP TO THE YEAR 2005

Objective 3.1. The integration of biological and landscape diversity into all spatial and land use plans

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
3.1.1.	**Legislative and institutional changes**								
3.1.1.1.	Compulsory consideration of landscape and biological diversity in the environmental impact assessment of all spatial and development plans		2000–2001	KKM, EPMÜ, TÜ, ITK	1	280	partly covered	RE, KF, VT	**I**
3.1.1.2.	The inclusion of an ecological network in national, regional and local planning	KTK 9.5.1.	1999–2001	KKM, EPMÜ, TÜ, MAV, KOV	5	2 250	partly covered	VT, RE, KF	**I**
3.1.1.3.	The adaptation and implementation of regulation 2080/92 EEC	4.4., 4.5.	2000–2005	KKM	pm	pm	not covered	VT, RE, KF	**II**
3.1.1.4	The participation of all the interested parties and local inhabitants in the decision making processes from the start of the planning process		2000–2005	VVO, KOV	pm	pm			**I**
3.1.1.5.	The Landscape Act	KTK 9.2.1.	1999–2000	KKM	0.5	120	covered	RE, KF	**II**
3.1.2.	**Economic measures**								
3.1.2.1.	Support the preservation of open landscapes under 100 hectares		2000–2005	PM, KOV, KKM	pm	12 000	not covered	RE	**III**
3.1.2.2.	Implementation of land tax benefits with regulation/change in land use practice	KTK 9.2.34.	2000–2005	KKM, RM, MaM	pm	6 000	not covered	RE, KF	**III**
3.1.3.	**Technical measures (incl. investments)**								
3.1.3.1.	Creation and use of environmental geographical info system (GIS) at different levels	KTK 9.5.7.	1999–2001	KKM, KOV, MAV	3	15 000	partly covered	RE	**III**
3.1.3.2.	Joining of large agriculture land expanses with forest strips		2000–2005	PM, MAV, KOV, KKM	pm	12 000	not covered	RE, VT	**II**
3.1.3.3.	Regular supplying of local governments with base and supplemented map layers		2000–2005	KKM, KK, ITK, KOV	pm	18 000	not covered	RE	**III**
3.1.3.4.	Preservation of buildings considering regional historical values		2002–2005	PM, KKM, MAV, KOV, MKS	pm	6 000	not covered	RE, VT	**III**
3.1.4.	**Education, information, raising awareness**								
3.1.4.1.	Preparation of instructional material for landscape planning		2000–2001	KKM, HM, EPMÜ, TÜ, MAV	1.5	450	not covered	RE, KF, VT	**II**
3.1.4.2.	Preparation of sample planning schemes for areas of high nature conservation value, and implementation of EIA for the planning		2000–2003	KKM, MAV, KOV	3	2 800	partly covered	RE, KF, VT	**III**
3.1.4.3.	Preparation of methodilogical material for the implementation of ecological network at national, regional, and local level, and training in this field	KTK 9.5.8.	2001–2005	KKM, HM, EPMÜ, TÜ	0.5	1 000	not covered	RE, KF	**II**
3.1.4.4.	Organisation of meetings and seminars on the theme of introduction to valuable landscapes		2000–2005	KKM, HM, KM, MV, EPMÜ, TÜ, MKS	0.4	600	not covered	RE, VT	**I**
3.1.4.5.	Preparation and distribution of educational publications and films for introduction of valuable landscapes		2000–2005	KKM, HM, MAV	0.5	300	not covered	RE, VT	**I**

3.1.4.6.	Compilation of multi-media program addressing landscape and biological diversity	KTK 9.3.13.	2000–2001	HM, KKM	0.6	800	not covered	RE, KF	**II**
3.1.4.7.	Establishment of Chair of Planning at Tartu University		2000–2001	HM, KKM, TÜ	1.5	750	partly covered	RE	**III**
3.1.5.	**Applied research**								
3.1.5.1.	Preparation of state-wide general plan on "Management of Biological and Landscape Diversity Protection"		2001–2002	KKM, MAV	5	1 800	not covered	RE, KF, VT	**I**
3.1.5.2.	Assessment of impact on the land use establishment from changes coming from EU directives and regulations	KTK 9.1.12.	2000–2002	KKM, HM, EPMÜ, TÜ	1.3	900	not covered	RE, KF, VT	**II**
3.1.5.3.	Analysis and optimisation of the development of an ecological network	KTK 9.5.11.	2001–2003	KKM, PM, MM, MI, TÜ, EPMÜ	1	600	not covered	RE, KF	**II**
3.1.5.4.	Creation of a map of Estonian "places"		1999–2000	KKM, TÜ	1	300	partly covered	RE, KF	**II**
3.1.5.5.	Compilation of landscape ecology maps for planning	KTK 9.3.21.	2001–2005	KKM, MV	6	12 000	not covered	RE, KF, VT	**III**
3.1.5.6.	Working out of methodilogical criteria for the protection, shaping, and economic optimisation of landscape and biological diversity		2001–2003	KKM, HM	1	360	not covered	RE, KF	**II**
3.1.5.7.	Study of the connections between the structure of land use and biological and landscape diversity		2001–2003	KKM, HM, TÜ, EPMÜ	0.8	375	not covered	RE, KF	**II**
3.1.5.8.	Working out of indicators for and monitoring of landscape diversity		1999–2005	KKM, PM	5	7 000	partly covered	RE, VT	**I**
									26
								I	7
								II	11
								III	8

4. AGRICULTURE. ACTION PLAN UP TO THE YEAR 2005

Objective 4.1. Conservation of semi-natural (heritage) communities and landscapes

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
4.1.1.	**Legislative and institutional changes**								
4.1.1.1.	Elaboration and adoption of protection regulations for semi-natural communities where such regulations do not exist	13.	1999–2000	KKM, ITK	4	1 200	partly covered	RE, KF	**I**
4.1.1.2.	Elaboration and adoption of management plans for the semi-natural communities where such plans do not exist	13.	1999–2001	KKM, PM, ITK	20	12 000	partly covered	RE, KF	**I**
4.1.1.3	Formulation of obligation for semi-natural community protection in the draft of Modification and Amendment Act to the Act of Coast and Shore Protection	13.	1999	KKM	0.1	10	covered	RE	**I**
4.1.1.4.	Take under protection non-protected semi-natural communities and landscapes, elaborate and adopt protection regulations and management plans for them	13.	2000–2002	KKM, PM, ITK	3	1 500	not covered	RE, KF	**I**
4.1.1.5.	Elaboration and adoption of respective legislation and programs to correspond to EEC Regulation 2078/92	4.2., 4.3., 4.4., 4.5.	1999–2001	PM, KKM, MAV	2	1 800	covered	RE, VA	**I**
4.1.1.6.	Amendment to the Organic Agriculture Act with respect to semi-natural communities	4.3.	1999–2000	KKM, PM	1	300	not covered	RE	**II**
4.1.2.	**Economic measures**								
4.1.2.1.	Payment of mowing compensation in accordance with management plans		a) 1999 b) 2000 c) 2001 d) 2002 e) 2003 f) 2004 g) 2005	KKM, PM, Ka, MAV	pm	a) 1000 b) 2000 c) 3000 d) 5000 e) 5400 f) 5700 g) 5900	partly covered	RE	**I**
4.1.2.2.	Payment of grazing compensation in accordance with management plans		a) 1999 b) 2000 c) 2001 d) 2002 e) 2003 f) 2004 g) 2005	KKM, PM, Ka, MAV	pm	a) 800 b) 1000 c) 2700 d) 4000 e) 5400 f) 5700 g) 5900	partly covered	RE	**I**
4.1.2.3.	Subsidies for purchase of undemanding farm animals, to increase grazing pressure in Estonian semi-natural communities by 10,000 animal units	1.1.	2000–2003	PM, KKM	pm	4 000	not covered	RE, VT	**I**
4.1.2.4.	Facilitation of marketing products related to semi-natural communities (meat, milk, wool handicraft, juniper souvenirs)	10.4.	2000–2005	PM, KMM, MM	pm	2 400	not covered	RE, VT	**II**
4.1.3.	**Technical measures (incl. investments)**								
4.1.3.1.	Improvement of technical equipment of staff active in maintenance of semi-natural communities		2000–2005	KKM, PM, MM, Ka, MAV	pm	18 000	not covered	RE, VT, KF	**I**
4.1.3.2.	Clearing of bush and overgrowth to restore semi-natural communities and landscapes		2000–2005	KKM, PM, Ka, MAV	pm	2 400	not covered	RE, KF	**III**

4.1.4.	**Education, information, raising awareness**							
4.1.4.1.	Dissemination of publications about semi-natural communities	1999–2000	KKM, HM, MAV, KOV	0.3	400	partly covered	RE, KF	**II**
4.1.4.2.	Production and dissemination of illustrated books, postcards and films	1999–2005	HM, KKM, MAV	3	3 850	partly covered	RE, KF	**II**
4.1.4.3.	Organisation of seminars and meetings concerning semi-natural communities	2000–2005	KKM, HM, EPMÜ	2	1 500	partly covered	RE, KF	**I**
4.1.5.	**Applied research**							
4.1.5.1.	Continuation of existing monitoring, especially in the case of indicator plant and animal species	1999–2005	KKM, ITK, EPMÜ	2	2 100	partly covered	RE	**I**
4.1.5.2.	Continuation of inventory works of semi-natural communities	1999–2001	KKM, PM, ITK, EPMÜ	3	1 200	partly covered	RE, KF, TF	**I**
								17
							I	12
							II	4
							III	1

4. AGRICULTURE. ACTION PLAN UP TO THE YEAR 2005

Objective 4.2. Conservation of species, variety and breeds characteristic of Estonia

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
4.2.1.	**Legislative and institutional changes**								
4.2.1.1.	Legislative provision for protection of varieties and breeds of Estonian origin in accordance with EU requirements	4.1.1.5.	1999–2005	PM, EPMÜ	2	2 100	covered	RE, VT	**I**
4.2.1.2.	Harmonisation of the Breeding Inspection system with EU requirements		1999–2001	PM, TAI	pm	pm	partly covered	RE, VT	**II**
4.2.1.3.	Harmonisation of the Plant Production Inspection system with EU requirements		1999–2001	PM, TTI	pm	pm	partly covered	RE, VT	**II**
4.2.1.4.	Harmonisation of Variety Register with EU requirements		1999–2001	PM,SR	pm	pm	partly covered	RE, VT	**II**
4.2.2.	**Economic measures**								
4.2.2.1.	Implementation of a subsidy system for stimulation of producers of breeds and varieties characteristic of Estonia	1.1., 4.1.	2000–2005	PM, MM, KKM	pm	27 000	50% likely	RE, VT	**I**
4.2.2.2.	Creation of a market niche for the high-fat milk of Estonian rural cattle	1.1., 4.1.	2000–2005	PM, MM	pm	2 400	not covered	RE, VT	**I**
4.2.2.3.	Creation of a market niche for the Estonian horse	1.1., 4.1.	2000–2005	PM, MM	pm	2 400	not covered	RE, VT	**I**
4.2.2.4.	Creation of a market niche for Torii horse and Estonian draught horse	1.1., 4.1.	2000–2005	PM, MM	pm	2 400	not covered	RE, VT	**II**
4.2.2.5.	Creation of a market niche for sheep farming products	4.1., 1.1.	2000–2005	PM, MM	pm	2 400	not covered	RE, VT	**I**
4.2.3.	**Technical measures (incl. investments)**								
4.2.3.1.	Identification of farm animals in accordance with EU requirements	1.1.	2000–2005	PM, EPMÜ	2	12 000	50% likely	RE	**II**
4.2.4.	**Education, information, raising awareness**								
4.2.4.1.	Production and dissemination of material introducing breeds and varieties characteristic of Estonia	1.1.	2000–2005	PM, KKM, MAV	1	1 800	partly covered	RE	**I**
4.2.5.	**Applied research**								
4.2.5.1.	Research necessary for preservation of breeds and varieties characteristic of Estonia	1.1.	2000–2005	HM, PM, KKM	2.5	3 400	partly covered	RE	**II**
4.2.5.2.	Monitoring of the status of Estonian horse and Estonian rural cattle		2000–2005	PM, HM	1.5	1 350	not covered	RE	**I**
									13
								I	7
								II	6
								III	0

4. AGRICULTURE. ACTION PLAN UP TO THE YEAR 2005

Objective 4.3. Development of organic agriculture

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
4.3.1.	**Legislative and institutional changes**								
4.3.1.1.	Supplementation of legislative acts regulating organic agriculture in accordance with EU requirements (I stage of White Paper)	4.1.1.5.	1999–2003	PM, KKM	3	2 250	partly covered	RE, VT	**I**
4.3.1.2.	Elaboration of national development plan for organic agriculture	KTK 10.1.2.	2000–2001	PM, KMM, EBÜ, TL	4	1 200	not covered	RE, VT	**I**
4.3.1.3.	Submission of National Organic Product Logo to IFOAM for accreditation		1999	PM, VM	pm	80	covered	RE	**II**
4.3.1.4.	Development of the system for control and designation of ecological products		1999–2002	PM, MM	2	1 200	partly covered	RE	**II**
4.3.2.	**Economic measures**								
4.3.2.1.	Subsidies during the period of transition to organic agriculture (2 years) and during its further practice		2000–2005	PM	pm	60 000	not covered	RE, VT	**I**
4.3.2.2.	Creation of favourable credit opportunities for organic agriculture		2000–2005	PM, MM, RM	pm	18 000	not covered	VL, RE, L	**II**
4.3.2.3.	State support to organisations issuing licenses for the use of Organic Product Logo		2000–2005	PM, MAV	pm	1 200	not covered	RE	**II**
4.3.3.	**Technical measures (incl. investments)**								
4.3.3.1.	Creation of database containing all existing data about technologies of organic agriculture and ecological agricultural practices		1999–2000	PM	0.3	450	partly covered	RE	**II**
4.3.3.2.	Creation of model farms using organic agriculture		2000–2003	PM, MM, MAV	pm	2 000	not covered	RE, VT	**II**
4.3.3.3.	State support for creation of processing and marketing cooperatives		2000–2005	PM, MM, RM	pm	1 500	not covered	RE	**II**
4.3.4.	**Education, information, raising awareness**								
4.3.4.1.	Training of consultants and controllers of organic agriculture	KTK 2.3.4.	2000–2005	PM, HM, EPMÜ, EBÜ	2	2 400	partly covered	RE, VT	**I**
4.3.4.2.	Organisation of training in organic agriculture for agricultural producers and processors		2000–2005	PM, HM, EPMÜ, EBÜ	2	3 600	not covered	RE, VT	**I**
4.3.4.3.	Informing the public about organic agriculture and related trademarks		1999–2005	PM, HM, PR	1	1 400	not covered	RE, VT	**II**
4.3.4.4.	Creation and operation of a homepage introducing organic agriculture		2000–2005	PM, EBÜ, CEET	0.5	1 200	not covered	PM, VT	**I**
4.3.4.5.	Production and dissemination of printed material and study films about organic agriculture		1999–2005	PM, HM, EBÜ, CEET	1.5	3 500	not covered	PM, VT	**I**
4.3.4.6.	Compilation of a study module about organic agriculture and the use of it for teaching in Estonian Agricultural University and agricultural schools		2000–2005	HM, PM, KKM, EPMÜ	3.5	4 500	partly covered	HM, PM	**II**
4.3.5.	**Applied research**								
4.3.5.1.	Study of influence of organic agriculture on biological diversity		2000–2005	HM, KKM	2	1 800	not covered	RE, VT	**I**
4.3.5.2.	Comparative tests of agricultural cultivation practices suitable for Estonia		2000–2005	PM, HM, KKM	pm	4 800	not covered	RE, VT	**II**
4.3.5.3.	Market research and development of marketing strategies		1999–2005	PM, MM, MAV	1.8	2 100	not covered	RE, EK	**II**
									19
								I	8
								II	11
								III	0

4. AGRICULTURE. ACTION PLAN UP TO THE YEAR 2005

Objective 4.4. Minimise pollution resulting from intensive agriculture

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
4.4.1.	**Legislative and institutional changes**								
4.4.1.1.	Harmonisation of restrictions on the use of fertilisers provided in the decree of the Minister of the En1vironment with the EU directive "Protection of Water from Agricultural Nitrate Pollution"	KTK 7.1.1.	1999	KKM, PM	0.8	150	covered	RE, VT	**II**
4.4.1.2.	Elaboration of integrated water protection plans for tributaries, taking into account the aims of protection of biological and landscape diversity		2000–2005	KKM, PM, MAV	10	12 000	partly covered	RE	**II**
4.4.1.3.	Compilation of guidelines "Good Agricultural Practices" and "Strategy of Sustainable Agriculture", incl. addition of a chapter on biological diversity on agricultural lands	KTK 8.1.7.	1999	PM, KKM	1.5	200	covered	RE, VA	**II**
4.4.1.4.	Development of plant protection legislation and its harmonisation with EU requirements, especially the directive prohibiting marketing and use of plant protection agents containing certain active components		1999–2005	PM, TKI	2	2 100	covered	RE, VT	**II**
4.4.1.5.	Bringing the work of the Plant Protection Inspection and other controlling agencies into correspondence with international requirements		1999–2003	PM, TTI	0.3	1 050	covered	RE, VT	**III**
4.4.1.6.	Elaboration and implementation of the draft act on pesticide excise tax		2000–2001	PM	0.5	4 500	covered	RE	**II**
4.4.1.7.	Elaboration and implementation of the draft act on mineral fertiliser excise tax		2000	KKM, MM, RM	1	150	not covered	RE, VT	**III**
4.4.2.	**Economic measures**								
4.4.2.1.	Application of economic measures (subsidies, tax deductions) for limitation of agricultural non-point pollution	KTK 8.1.24.	2001–2005	PM, KKM	pm	25 000	not covered	RE, VT, KF,	**III**
4.4.3.	**Technical measures (incl. investments)**								
4.4.3.1.	Support of purchase of environmentally friendly fertiliser and plant protection (incl. Manure spreaders) equipment	KTK 8.1.31.	2000–2005	PM	pm	12 000	not covered	RE, VT, KF, L	**III**
4.4.3.2.	Support for the building of new, and repairing of old manure silos		2000–2005	PM, MAV, MM, RM	pm	15 000	not covered	RE, KF, VT	**III**
4.4.3.3.	Liquidation of dilapidated agricultural chemicals storage facilities	KTK 6.2.7.	1999–2000	PM, MAV, KOV	pm	20 000	partly covered	RE, VT	**III**
4.4.4.	**Education, information, raising awareness**								
4.4.4.1.	Education and consultation to minimise drainage of NPK compounds		2001–2005	HM, PM, EPMÜ, MAV	6	4 000	partly covered	RE, KF, VT	**III**
4.4.4.2.	Introduction of EU plant protection legislation and Nitrate Directive		2000–2005	PM, MAV, KOV, TL	0.4	480	partly covered	RE, KF, VT	**III**
4.4.5.	**Applied research**								
4.4.5.1.	Connections between biological diversity and agricultural pollution		2000–2005	HM, KKM, PM	6	12 000	partly covered	RE, VT	**III**
4.4.5.2.	Inventory (incl. mapping) and evaluation of agricultural point pollution sources	KTK 7.1.10.	2000–2002	KKM, PM	3	1 500	partly covered	VT, RE	**II**
									15
								I	0
								II	6
								III	9

4. AGRICULTURE. ACTION PLAN UP TO THE YEAR 2005

Objective 4.5. Conservation of biological and landscape diversity in amelioration

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
4.5.1.	**Legislative and institutional changes**								
4.5.1.1.	Amendment of Amelioration Act with provisions about protection of biological diversity (incl. protection of existing open drainage)		2000	PM, KKM	1.5	200	not covered	RE, VT	**III**
4.5.1.2.	Inclusion of measures for protection of biological diversity into amelioration plans		2000–2005	PM, KKM	1.5	1 200	not covered	RE, VT	**I**
4.5.1.3.	Enhancement of environmental control over amelioration		2000–2005	KKM	1.5	1 200	not covered	RE, VT	**II**
4.5.2.	**Economic measures**								
4.5.2.1.	Support to agricultural producers for purchasing of equipment suitable for sustainable exploitation of water bodies		2000–2005	PM, TL	pm	9 000	not covered	RT, RE, L, VT	**III**
4.5.3.	**Technical measures (incl. investments)**								
4.5.3.1.	Creation of buffer zones for feed currents of amelioration		2000–2005	PM, KKM, MPÜ, MAV, KOV	pm	pm	not covered	RE, VT, KF	**I**
4.5.3.2.	Creation of water protection zones on shores of water bodies and creation of supplementary compensation zones on intensely used agricultural lands	3.1.	2000–2005	PM, KKM, MPÜ, MAV, KOV	pm	pm	not covered	RE, VT, KF, VT	**II**
4.5.4.	**Education, information, raising awareness**								
4.5.4.1.	Organisation of further education in biological diversity for amelioration specialists and agricultural producers		2000–2005	HM, KMM, PM, EMS	3	2 700	partly covered	RE, KF, VT	**III**
4.5.5.	**Applied research**								
4.5.5.1.	Study of influence of non-maintained amelioration systems on biological and landscape diversity		2000–2005	HM, PM, EPMÜ	2	2 400	partly covered	HM, KF, PM	**II**
4.5.5.2.	Study of influence of different maintenance work of water ducts on biological and landscape diversity		2000–2005	KKM, PM, HM, EPMÜ, EMS	2	2 400	not covered	RE, TF, KF, VT	**II**
4.5.5.3.	Establishing of influence on biological diversity of unused drainage areas, incl. influence caused by flooding of these areas	KTK 8.1.35.	2001–2005	KKM, PM, EPMÜ	1	750	not covered	RE, TF, KF, VT	**III**
4.5.5.4.	Study of influence of agricultural production and amelioration on biological diversity of soil		2000–2005	HM, PM, EPMÜ	2	2 400	partly covered	HM, KF, PM	**II**
4.5.5.5.	Modernisation and implementation of methodology for soil monitoring work		1999–2005	KKM, PM, ITK	1.5	2 450	partly covered	HM, KF, PM	**II**
4.5.5.6.	Monitoring of status of amelioration objects		2000–2005	PM, MPB	1.5	2 100	not covered	PM, VT	**III**
4.5.5.7.	Inventory and evaluation of the status of amelioration objects	KTK 10.1.9.	2000–2001	PM, EMS	2	600	not covered	RE, MK	**III**
4.5.5.8.	Formulation of recommendations for application of optimal technology for maintenance and preservation of amelioration objects		2000–2001	PM, EPMÜ, EMS	1	400	not covered	PM, VT	**III**
									15
								I	2
								II	6
								III	7

5. FORESTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 5.1. Protection of primeval forests

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
5.1.1.	**Legislative and institutional changes**								
5.1.1.1.	Bringing of Forest Act into correspondence with KLOS	13.1.	2000	KKM,MeA	0.2	30	not covered	RE	**I**
5.1.1.2.	Application of protection to presently unprotected primeval forests	13.1.	2003–2004	KKM,MeA	2	1 000	partly likely	MK, KF, RE	**I**
5.1.1.3.	Elaboration and adoption of protection regulations and management plans for all protected primeval forests	13.1.	2000–2002	KKM,MeA	2	900	not covered	VP, MK, KF	**II**
5.1.1.4.	Enhancement of control with the aim of fighting illegal felling (incl. organised crime which has entered forestry)	5.2., 13.1.	2000–2005	KI, SiM, Ka	pm	pm	partly likely	RE	**I**
5.1.2.	**Economic measures**								
5.1.2.1.	Compensation for economic restrictions and obligations following from the protection of biological diversity of forests		2000–2005	MeA, KKM	1	1 800	partly likely	MK, KF, VP	**II**
5.1.3.	**Technical measures (incl. investments)**								
5.1.3.1.	Exchange of real estate and implementation of state purchase privilege in protected forests		2000–2005	MeA, KKM	pm	6 000	partly likely	RE, VP	**I**
5.1.4.	**Education, information, raising awareness**								
5.1.4.1.	Introduction of value of primeval forests		2000–2005	MeA, KKM	1	1 200	not covered	VP, MK, KF, RE	**III**
5.1.4.2.	Improvement of cooperation with Baltic and Scandinavian countries in the field of information exchange		2000–2005	KKM, EKAL	0.3	600	not covered	EE, VP	**III**
5.1.5.	**Applied research**								
5.1.5.1.	Determination of needs, methods and ways of protection of biological diversity in protected forests		2000–2001	MeA, KKM	2	600	not covered	VP, MK, KF, RE	**II**
5.1.5.2.	Evaluation of role of protected forests in achieving the general aim of protection of biological diversity (BD strategy)		2000–2001	MeA, KKM	1	300	not covered	VP, MK, KF, RE	**III**
5.1.5.3.	Evaluation of ecological rationality of the 4% volume of strictly protected forests determined in the forest policy (EC-1)		2002	MeA, KKM	1	150	not covered	VP, MK, KF, RE	**II**
5.1.5.4.	Analysis of location of forest protection areas from the point of view of nature conservation representativity (EC-1)		a) 2000 b) 2001 c) 2002	MeA, KKM	4	a) 700 b) 700 c) 600	90 covered	VP, RE	**II**
5.1.5.5.	Study of the number of visitors of protected forests and the use of the results for formulation of an appropriate development program		2000	MeA, KKM	1	150	not covered	VP, MK, KF, RE	**II**
5.1.5.8.	Analysis of concurrent effect of KLOS and Forest Act and elaboration of approaches for substantial harmonisation of respective concepts and requirements		2000	MeA, KKM	1	150	not covered	RE, KF	**II**
5.1.5.9.	Analysis of alternatives of administrative management of protected forests and formulation of an optimal economically rational solution		2000–2001	MeA, KKM	1	300	90 not covered	KF, RE	**III**
5.1.5.10.	Analysis of possible uses of economic measures (instruments) for improving the protection of biological diversity in protected forests and protection of the interests of the owners; elaboration of appropriate guidelines		2000–2001	MeA, KKM	1	300	not covered	VP, MK, KF	**III**

	16
I	4
II	7
III	5

5. FORESTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 5.2. Protection of biological diversity in utilisation of forest

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
5.2.1.	**Legislative and institutional changes**								
5.2.1.1.	To establish the maximum ecologically permissible felling volume and optimal forestation percentage		2003	MeA, KKM	0.1	20	partly	RE, MK	**II**
5.2.1.2.	To adopt inventory methodology for forests concerning the evaluation of biological diversity		2002	MeA, KKM	0.1	15	partly	RE, MK	**II**
5.2.1.3.	To adopt guidelines for the use of practices for protection, preservation and facilitation of biological diversity of forests (retainable trees, preservation of fallen trees, use of natural regeneration, controlled and limited forest fires, etc.)	13.1.	2001	MeA, KKM	pm	pm	pm	RE, MK	**II**
5.2.1.4.	To establish a forest register cross-usable with registers storing data about biological diversity (mainly Nature Protection Register)	13.1.	2000–2001	MeA, KKM	1	350	not covered	RE	**II**
5.2.1.5.	To introduce indicators (criteria) of sustainable forestry into existing legislation		2000–2003	MeA, KKM	0.1	60	likely	RE	**III**
5.2.1.6.	To introduce efficient mechanisms for protection of biological diversity in private forests into existing legislation		2000–2001	MeA	0.3	100	partly likely	RE, MK	**II**
5.2.1.7.	Conclusion of agreements on protection of key biotopes and control of implementation of these agreements	KTK 9.4.2.	2000–2005	MeA	3	30 000	not covered	MK, RE	**II**
5.2.2.	**Economic measures**								
5.2.2.1.	Tax deductions on the use of practices for protection of biological diversity of forests (retainable trees, preservation of fallen trees, etc.)		2000–2003	MeA, KKM, MM	1	600	not covered	MK	**II**
5.2.2.2.	A national wood standard which takes into account the protection of biological diversity		2000–2003	MeA	1	600	not covered	MK	**I**
5.2.2.3.	Encouragement of grazing and mowing in forests	4.1., 6.1.	2000–2005	KKM, PM	pm	pm	not covered	RE	**I**
5.2.3.	**Technical measures (incl. investments)**								
5.2.3.1.	Improvement of technological basis of environmental control	13.1., 5.1.	2000–2005	KKM, MeA	pm	3 000	partly likely	KF, MK, RE	**II**
5.2.4.	**Education, information, raising awareness**								
5.2.4.1.	Handbook of sustainable forestry	13.1., 5.1.	2000–2001	MeA	1	700	not covered	KF	**II**
5.2.4.2.	Annual consciousness raising campaigns for promotion of sustainable forestry		2000–2005	MeA, KKM	1	1 200	not covered	KF	**II**
5.2.4.3.	Creation of a forestry monitoring database containing nationally and internationally comparable indicators of biological diversity		2000–2002	MeA, KKM	1	525	not covered	RE, MK	**II**
5.2.4.4.	Making biological diversity a part of forestry consultation		2000–2005	MeA	0.2	480	partly likely	MK	**II**
5.2.5.	**Applied research**								
5.2.5.1.	Inventory of key biotopes	13.1.	2000–2004	MeA	5	4 000	partly likely	MK, RE	**II**
5.2.5.2.	Determination of influence of different felling types, felling volumes and felling areas on biological diversity		2000–2005	MeA, HM, EPMÜ	3	3 000	not covered	RE, TF, MK	**I**
5.2.5.3.	Definition of maximum ecologically permissible felling volume and optimal forestation		2000–2002	MeA, EPMÜ	1	450	not covered	MK	**I**

5.2.5.4.	To determine maturity ages of forest stands appropriate from the point of view of biological diversity (proceeding from Art. 13 of Forest Act)	2000–2001	MeA, EPMÜ	1	400	not covered	MK	**II**
5.2.5.5.	Specification of forest inventory methodology with a view to biological diversity	2000–2001	MeA, EPMÜ	1	360	not covered	MK	**II**
5.2.5.6.	Consideration of biological diversity in definition of indicators of sustainable forestry	2000–2002	MeA, EPMÜ	2	900	not covered	MK, TF, KF	**I**
								21
							I	5
							II	15
							III	1

6. HUNTING. ACTION PLAN UP TO THE YEAR 2005

Objective 6.1. The protection biological diversity is integrated into the system of hunting management

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
6.1.1.	**Legislative and institutional changes**								
6.1.1.1.	Integrate the requirements and goals of sustainable use and protection of biological diversity into the hunting law (under preparation)		2001	KKM, MeA	0.5	70	partly covered	RE, KF, MK	**II**
6.1.1.2.	Approval and implementation of management plans for large carvivores		2000	KKM, MeA, RMO	2	300	partly covered	RE	**I**
6.1.2.	**Economic measures**								
6.1.2.1.	Differentiation of hunting permits based on size of large predator populations		2000–2005	KKM, MeA, RMO	pm	pm	not covered	RE	**II**
6.1.2.2.	Economic incentives to stimulate the hunting of racoons and American mink		2000–2005	KKM, MeA, RMO	pm	pm	not covered	RE	**I**
6.1.3.	**Technical measures (incl. investments)**								
6.1.3.1.	Biotechnological work which is beneficial for biological diversity (for example using hay and shrub from wooded meadows)		2000–2005	JS	pm	pm	not covered	RE	**II**
6.1.4.	**Education, information, raising awareness**								
6.1.4.1.	Training in the field of biological diversity for hunting specialists		2000–2005	KKM, MeA	0.2	900	not covered	MK	**III**
6.1.5.	**Applied research**								
6.1.5.1.	Identify indicators by which hunting's effect on biological diversity can be measured	KTK 9.1.14.	2000–2002	MeA	1	450	not covered	MK	**II**
6.1.5.2.	Identify the effect of hunting measures (incl. over- and under-hunting) on the biodiveristy of the forest ecosystem as a whole		2000–2005	MeA	0.5	450	not covered	MK	**II**
6.1.5.3.	Large predator ecology, management and protection		2000–2005	TÜ, EPMÜ	2	1 800	partly	RE, KF	**I**
									9
								I	3
								II	5
								III	1

7. FISHERY. ACTION PLAN UP TO THE YEAR 2005

Objective 7.1. Utilisation of natural fish stocks while sustaining the biological diversity of water bodies

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
7.1.1.	**Legislative and institutional changes**								
7.1.1.1.	Consideration of biological diversity in the development plan of fishing and the new Fishing Act		2000	KO, TÜ	0.35	55	50% not covered	RE, KF, KK	**I**
7.1.1.2.	Organisation of certification of fishermen		2000–2001	KO, MEI	1.2	550	25% not covered	KK, RE	**III**
7.1.1.3.	Modernisation of the format(s) of fishing journals		2000	KO, MRI, TÜ	0.25	150	covered	KK	**II**
7.1.1.4.	Turning of fishing license fees into measure for regulation of fishing intensity		1999	KO, MEI, TÜ	0.5	75	not covered	RE, KF, KK	**II**
7.1.1.5.	Modernisation of the system for compensation of damage caused by illegal fishing and the amounts of penalty fines		2000	KO, MEI, TÜ	0.25	40	not covered	RE, KF, KK	**III**
7.1.1.6.	Enhancement of control over observance of fishing regulations		1999 –2005	RMI	pm	pm	covered	RE, KK	**I**
7.1.2.	**Economic measures**								
7.1.2.1.	Changing of the fishing license fee system, reallocation of part of fees for biodiversity protection		1999–2001	KO, MEI, TÜ	0.2	90	50% kaetud	RE, KK	**II**
7.1.2.2.	Subsidies/compensations to encourage the use of sustainable fishing methods		2000–2005	KO	0.25	2 100	not covered	RE	**II**
7.1.3.	**Technical measures (incl. investments)**								
7.1.3.1.	Application of sustainable fishing methods		2000–2005	MEI, TÜ	pm	pm	pm	EK, VP, RE, KK	**I**
7.1.4.	**Education, information, raising awareness**								
7.1.4.1.	Printed materials introducing water biotopes and their protection		2000–2002	KKM	0.2	750	not covered	RE, KF, VA	**II**
7.1.4.2.	Handbook/guide about Estonian fishes, in Estonian and Russian		2000	TÜ	pm	100	50% not covered	KK, KF	**II**
7.1.4.3.	Publication of a fishing magasine		1999–2005	MEI, KO	1.5	4 200	15% covered, 85% likely	KK	**II**
7.1.5.	**Applied research**								
7.1.5.1.	Death rates of rare and protected fish, mammal and bird species for different fishing methods in different conditions	13.1.	2000–2002	TÜ, MEI	0.25	750	not covered	RE, KK	**I**
7.1.5.2.	Impact of bottom trawling on euryhaline community in Lake Peipsi		2000–2002	TÜ	0.25	2 250	90% not covered	KK, VP	**II**
7.1.5.3.	Compilation of a fishing gear atlas and determination of gear selectivity		2000–2005	KO, MEI, TÜ	1	1 800	not covered	RE, KK	**II**
7.1.5.4.	Elaboration of biological diversity considerations applicable in the certification of fishermen		2000	TÜ, MEI	0.1	50	not covered	RE, KK	**II**
7.1.5.5.	Elaboration of a system of monitoring indicators of biological diversity of water bodies and inclusion of it into the national monitoring program		1999–2001	KKM, TÜ, MEI, EPMÜ	0.8	360	not covered	RE, KF	**I**
7.1.5.6.	Development of sustainable fishing methods		2000–2005	MEI, TÜ	2	3 000	25% not covered	VP, RE, KK	**I**
									18
								I	6
								II	10
								III	2

7. FISHERY. ACTION PLAN UP TO THE YEAR 2005

Objective 7.2. Mitigation and avoidance of negative impact of fish farming

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
7.2.1.	**Legislative and institutional changes**								
7.2.1.1.	Sanctions and penalty fines for introduction of alien species and forms		2000	KKM	0.25	40	not covered	RE	**II**
7.2.2.	**Economic measures**								
7.2.3.	**Technical measures (incl. investments)**								
7.2.3.1.	Modernisation of fish farming to avoid the escape of reared specimens		2000–2005	PM	pm	pm	not covered	EK	**II**
7.2.4.	**Education, information, raising awareness**								
7.2.4.1.	A publication about alien species in Estonian waters		2000	TÜ, MEI, EPMÜ	0.5	200	50% likely	RE	**II**
7.2.5.	**Applied research**								
7.2.5.1.	Spread of alien species in Estonian water bodies and their impact on local ecosystems		1999–2005	MEI, EPMÜ, TÜ	2	3 500	50% not covered	RE, VP	**II**
									4
								I	0
								II	4
								III	0

7. FISHERY. ACTION PLAN UP TO THE YEAR 2005

Objective 7.3. Application of fish farming for protection of endangered fish species and biotopes

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
7.3.1.	**Legislative and institutional changes**								
7.3.1.1.	Elaboration of national program for renewal of fish stocks considering biological diversity, incl. intra-species variations		1999	KKM	0.25	150	covered	KK	**I**
7.3.2.	**Economic measures**								
7.3.2.1.	Support of renewal considering intra-species diversity of endangered and protected species		1999–2005	KKM	1	5 600	75% not covered	RE, KK, KF	**I**
7.3.2.2.	Support of preservation of local fish species and forms		2000–2005	PM	pm	pm	not covered	RE	**II**
7.3.3.	**Technical measures (incl. investments)**								
7.3.4.	**Education, information, raising awareness**								
7.3.4.1.	Explanation to the public of the importance of intra-species variation		2000–2005	HM, KKM	pm	pm	not covered	RE	**III**
7.3.5.	**Applied research**								
7.3.5.1.	Genetic research related to organisation of renewal of fish stocks		1999–2005	EPMÜ	1	1400	67% not covered	RE, VP, KK	**II**
7.3.5.2.	Creation of a database concerning introduction of species into water bodies		1999	KKM	1	100	50 not covered	KK, RE	**II**
									6
								I	2
								II	3
								III	1

8. NATIONAL DEFENCE. ACTION PLAN UP TO THE YEAR 2005

Objective 8.1. Integration of biological diversity protection with national defence

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
8.1.1.	**Legislative and institutional changes**								
8.1.1.1.	Adoption of guidelines for biological diversity protection management in forested areas connected with national defence	KTK 9.1.5., 6.1.1.1.	2001	KKM, MeA, KaM	0.1	5	likely	RE	**I**
8.1.1.2.	Introduction of biological diversity protection principles into use regulations for Ministry of Defence training areas	KTK 9.1.5., 6.1.1.1.	2002-2003	KaM, KKM, MeA	0.2	30	partly likely	RE	**II**
8.1.1.3.	Adoption of a system of compensation for damage to biological diversity in forested areas connected with national defence		2001	KaM, KKM, MeA	0.2	15	not covered	RE	**III**
8.1.1.4.	Guaranteeing of environmental control in areas connected with national defence		2000	KKM, MeA, KaM	4	600	not covered	RE	**I**
8.1.2.	**Economic measures**								
8.1.3.	**Technical measures (incl. investments)**								
8.1.3.1.	Use of trainings in protection of open habitats		2000–2005	KaM, MeA, KKM	pm	300	not covered	RE, KF	**II**
8.1.4.	**Education, information, raising awareness**								
8.1.4.1.	Participation of specialists of respective fields in international training programs and further education		2000–2005	KKM, MeA	pm	900	not covered	MK	**II**
8.1.4.2.	Organisation of a public joint information day of institutions of environmental protection and national defence about the protection of biological diversity		2001	KKM, KaM, MeA	0.1	80	not covered	KF, MK	**III**
8.1.5.	**Applied research**								
8.1.5.1.	Inventory of biological diversity in areas connected with national defence	KTK 9.1.5., 6.1.1.1.	2000	KKM, MeA, KaM	1	150	not covered	KF, MK	**I**
									8
								I	3
								II	3
								III	2

9. BORDER CONTROL. ACTION PLAN UP TO THE YEAR 2005

Objective 9.1. Encourage the cooperation of the border guard and customs authorities in the protection of biological diversity

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
9.1.1.	**Legislative and institutional changes**								
9.1.1.1.	Increase the effectiveness of control over wood export	5.1., 5.2.	2000–2002	T, KKM, KaM	pm	pm	not covered	RE	**I**
9.1.1.2.	Increase the effectiveness of control over fulfillment of CITES	13.1.	2000	T, KKM, KaM	pm	pm	partly covered	KF, RE, VP	**II**
9.1.2.	**Economic measures**								
9.1.3.	**Technical measures (incl. investments)**								
9.1.4.	**Education, information, raising awareness**								
9.1.4.1.	Nature protection education and training to border guard and customs workers	KTK 9.4.5.	2000–2005	KKM, T, KaM	0.5	1 800	not covered	KF, RE, VP	**II**
9.1.5.	**Applied research**								
9.1.5.1.	Involvement of border guard authorities in surveys of wild animals in the border zones	6.1., 13.1.	1999–2005	KKM, KaM	1	1 400	partly covered	KF, RE, VP	**II**
									4
								I	1
								II	3
								III	0

10. INDUSTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 10.1. A gradual reduction in the use of oil shale as an energy source

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
10.1.1.	**Legislative and institutional changes**								
10.1.1.1.	More stringent monitoring of the implementation of the air, water and solid waste acts		1999–2005	KKM	pm	pm	pm	RE	**II**
10.1.1.2.	Prepare a detailed plan for the reduction of the negative environmental impact of the energy sector		1999–2000	MM	8	3 000	likely	RE, EK, VA	**II**
10.1.2.	**Economic measures**	KTK 7.3., KTK 7.2.							
10.1.2.1.	Bring the rates of compensation for damage caused by pollution up to date	10.2., 10.3., KTK 2.1.12.	2001–2002	KKM,RM	0.5	160	not covered	RE	**II**
10.1.3.	**Technical measures (incl. investments)**								
10.1.3.1. **(3.2.3.) (3.2.11.)**	Implementation of an energy conservation programme		1999–2005	MM, KOV	pm	630 000	partly likely	RE, RIP, KE, L	**II**
10.1.3.2. **(3.1.16.)**	Installation of electric separators in power stations	10.2.	1999	MM, EE	pm	54 200	covered	EE, L	**III**
10.1.4.	**Education, information, raising awareness**	KTK 7.1., KTK 7.9.							
10.1.4.1.	Make known the negative effects of oil shale power generation		2000–2005	KKM, HM	0.5	1 200	not covered	RE	**II**
10.1.5.	**Applied research**	KTK 7.9.							
10.1.5.1.	Monitoring of the effects of alkaline pollution in NE Estonia	10.3.	2000–2005	KKM, HM	2	2 400	not covered	RE, KF, VP, VA	**II**
10.1.5.2.	Research into possible PCDD/PCDF emissions and their effects	10.3.	2000–2005	KKM, MM, HM	2	2 400	not covered	RE, KF, VP, VA	**III**
10.1.5.3. **(3.1.13.)**	Research into the possibilities and effects of establishing energy taxes		2000	KKM,MM,RM	2	500	not covered	RE, VA	**II**

	9
I	0
II	7
III	2

10. INDUSTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 10.2. The implementation of methods of power generation which support biological diversity

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
10.2.1.	**Legislative and institutional changes**								
10.2.2.	**Economic measures**	KTK 7.3., KTK 7.2.							
10.2.2.1.	The formulation and implementation of a national system to promote environmentally friendly energy production and use (including income tax and VAT concessions)	KTK 3.3.1., KTK 3.3.2.	a)2000 b)2001–2005	MM, KKM, RM	0.5	a) 200 b)12000	not covered	RE, VA	**II**
10.2.3	**Technical measures (incl. investments)**	KTK 7.2., KTK 7.3.							
10.2.3.1.	Take natural biomass into use as an energy source	KTK 3.3.3.,10.1.	2000–2005	MM, KKM	pm	60 000	not covered	VT, VL, RIP, EK, EIF	**I**
10.2.3.2.	Small-scale hydroelectric generation (with fish canals or weirs)	KTK 3.3.3.,10.1.	2000–2005	MM, KKM	pm	30 000	not covered	VT, VL, RIP, EK, EIF	**II**
10.2.3.3.	Wind energy (taking into consideration nature protection requirements)	KTK 3.3.3.,10.1.	2000–2005	MM, KKM	pm	30 000	not covered	VT, VL, RIP, EK, EIF	**II**
10.2.4	**Education, information, raising awareness**								
10.2.4.1.	Publicise more environmentally-friendly power generation methods		2000–2005	KKM, HM	1	2 400	not covered	RE	**I**
10.2.5.	**Applied research**								
10.2.5.1.	Preparation of a plan for the harnessing of natural biomass	KTK 3.3.3., 10.1.	1999–2000	KKM, MM	2	600	not covered	VA, RE	**I**
10.2.5.2.	Research into the effect of small-scale hydroelectric generation on aquatic biota	KTK 3.3.3., 10.1.	1999–2000	KKM, MM	1	400	not covered	ETF, KF, VP	**II**
10.2.5.3.	Research into the effects of wind generation on the migration of birds	KTK 3.3.3., 10.1.	1999–2000	KKM, MM	1	400	not covered	ETF, KF, VP	**II**
									8
								I	3
								II	5
								III	0

10. INDUSTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 10.3. A reduction in pollution released by the manufacturing industry

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
10.3.1.	**Legislative and institutional changes**								
10.3.1.1. **(4.1.11.)**	Preparation of the national programme "Reduction of the emission of air-borne organic compounds"	10.1.1.	2000	KKM	0.5	75	likely	RE	**I**
10.3.1.2.	Application of the law of debt for the establishment of the civil and administrative responsibility for causing residual pollution	10.5.	2000	KKM, JM	0.6	90	likely	RE	**II**
10.3.2.	**Economic measures**								
10.3.3.	**Technical measures (incl. investments)**	KTK 7.2., KTK 7.4.							
10.3.3.1. **(5.3.4.)**	Completion of the construction of the Vaivara hazardous waste repository and collection centre		1999	KKM	pm	20 600	covered	RIP, VT, KF	**II**
10.3.3.2	The construction of waste water treatment plants for industry	KTK 8.3.2., KTK 8.3.2., KTK 8.3.13., KTK 8.3.14.	1999–2005	KKM, MM	pm	210 000	partly likely	EK, L	**II**
10.3.3.3. **(4.1.9.) (4.1.30.)**	The implementation of the national programme "Reduction in the atmospheric emission of SO_2, NO_x, heavy metals and dust" in manufacturing industry enterprises		2000–2005	KKM, MM	pm	60 000	not covered	EK, L	**II**
10.3.3.4 **(4.1.19.) (4.1.35.)**	The implementation of the national programme "Reduction of the emission of air-borne organic compounds" in manufacturing industry enterprises		2001–2005	KKM, MM	pm	50 000	not covered	EK, L	**II**
10.3.4.	**Education, information, raising awareness**	KTK 7.1., KTK 7.9.							
10.3.4.1.	Explanation of the effects of industrial pollution		2000–2005	KKM, HM	1	600	not covered	RE, KF	**III**
10.3.5.	**Applied research**	KTK 7.9.							
10.3.5.1.	Monitoring of organic chlorine compounds, heavy metals and other environmental poisons		2000–2005	KKM	1	1 500	partly likely	RE	**II**
10.3.5.2.	Monitoring of industrial waste water		2000–2005	KKM	1	1 500	partly likely	EK, RE	**II**
									9
								I	1
								II	7
								III	1

10. INDUSTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 10.4 The development of manufacturing industries that support the protection of traditional landscapes and communities

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
10.4.1.	**Legislative and institutional changes**								
10.4.2.	**Economic measures**	4.1., 4.2., 4.3.							
10.4.2.1.	The implementation of the "environmentally-friendly industry" labelling system		1999–2000	MM, PM, KKM	1	600	not covered	RE, KF, EK	**II**
10.4.2.2.	'The formulation and implementation of a system to support environmentally-friendly industry (direct grants, tax concessions, special borrowing terms)		2000–2005	MM, PM, KKM, RM	pm	120 000	not covered	VT, VL, RE	**I**
10.4.3.	**Technical measures (incl. investments)**	4.1., 4.2., 4.3.							
10.4.3.1.	The establishment of modern small meat and milk processing industries		2000–2005	MM, PM	pm	pm	pm	EK, VL, L, EIF	**I**
10.4.3.2.	The establishment of modern small meat and milk processing industries		2000–2005	MM, PM	pm	pm	pm	EK, VL, L, EIF	**I**
10.4.3.3.	The establishment of small industries which use small diameter logs		2000–2005	MM, PM	pm	pm	pm	EK, VL, L, EIF	**III**
10.4.3.4.	The establishment of small-scale production from reeds		2000–2005	MM, PM	pm	pm	pm	EK, VL, L, EIF	**III**
10.4.4.	**Education, information, raising awareness**								
10.4.4.1.	Explanation of the ties between the traditional landscape and small industry	4.1., 4.2., 4.3.	2000–2005	MM, PM, KKM	1	1 200	not covered	RE, VP	**II**
10.4.5.	**Applied research**								
10.4.5.1.	Market research for small industries which support biological diversity	4.1., 4.2., 4.3.	2000–2001	MM, PM	1	400	not covered	VT, ETF, EIF	**I**
									8
								I	4
								II	2
								III	2

10. INDUSTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 10.5. A reduction in mining volumes and the stopping of the excavation of mines which are dangerous to the environment

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
10.5.1.	**Legislative and institutional changes**								
10.5.1.1	Complementing of the Mineral Resources Act		1999	KKM	0.3	40	kaetud	RE	**III**
10.5.1.2	More stringent monitoring of the implementation of the mineral resources act		1999–2000	KKM	pm	pm	likely	RE	**II**
10.5.1.3	Formulation of the strategy and long-term plan for the mining of minerals in Estonia	10.1.	2000–2003	KKM, MM	1	600	likely	RE, KF	**III**
10.5.2.	**Economic measures**								
10.5.2.1.	The revision of the rates of natural resource use taxes	KTK 2.1.5.	2001–2002	KKM, RM	0.3	50	likely	RE	**I**
10.5.3.	**Technical measures (incl. investments)**								
10.5.3.1.	The reuse of building waste	11.1.	2001–2005	KKM, TSM, RM, MM	pm	5 000	not covered	RE, KF, VT	**III**
10.5.4.	**Education, information, raising awareness**	KTK 7.2., KTK 7.6.							
10.5.4.1.	Explanation of the negative effects of mining		2000–2005	KKM, MM	1	1 200	not covered	RE, KF	**II**
10.5.5.	**Applied research**								
10.5.5.1	Studies of the biota of the areas ruined by mining activities		2000	KKM, ITK	2	300	partly likely	RE, KF	**II**
									7
								I	1
								II	3
								III	3

10. INDUSTRY. ACTION PLAN UP TO THE YEAR 2005

Objective 10.6. The creation of diverse habitats suitable for endangered species, in disused quarries

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
10.6.1.	**Legislative and institutional changes**	10.5.							
10.6.1.1.	Prepare county and local government strategic development plans for mining and for the recultivation of mines		2000 –2001	KOV	3	1 000	not covered	KE, KF	**II**
10.6.2.	**Economic measures**								
10.6.3.	**Technical measures (incl. investments)**								
10.6.3.1.	The planning and management of pollution clean up work in disused quarries	KTK 6.2.2., KTK 6.2.16.	1999–2003	KKM	3	2 500	not covered	KF, VT	**II**
10.6.3.2.	The recultivation of oilshale quarries		1999–2005	EP	pm	24 500	likely	EK	**III**
(6.3.2.)									
(6.3.6.)									
10.6.3.3.	The recultivation of disused quarries and their modification to provide breeding habitats for frogs and nesting sites for aquatic birds	KTK 6.3.3., KTK 6.3.6.	1999–2005	KKM, KOV	pm	14 000	partly covered, partly likely	KF, KE	**I**
10.6.4.	**Education, information, raising awareness**								
10.6.4.1.	Educate planners, environmental officials and decision makers on all levels on the subject of the sustainable use of mineral resources		2000–2002	KKM	1	900	not covered	RE, KF, VP	**II**
10.6.4.2.	Ensure that all interested parties and residents participate in the decision making process about mining activities	3.1.	2000–2005	KOV	pm	pm	pm	KE, RE	**II**
10.6.5.	**Applied research**								
10.6.5.1.	Compile an inventory of disused quarries as habitats for frogs and other endangered species		2000–2002	KKM	1	600	not covered	RE, KF	**I**
10.6.5.2.	Map mining areas	KTK 6.1.9., KTK 6.1.17., KTK 6.1.18.	2000–2003	KKM, ITK	2	1 200	not covered	KF, VT, EK	**II**
									8
								I	2
								II	5
								III	1

11. TRANSPORT. ACTION PLAN UP TO THE YEAR 2005

Objective 11.1. Minimisation and avoidance of negative influence of transport infrastructure

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
11.1.1.	**Legislative and institutional changes**								
11.1.1.1.	Elaboration of system for calculation of and compensation for environmental damage caused by construction of transport infrastructure	3.1.	2000	KKM	0.2	30	not covered	RE	**II**
11.1.2.	**Economic measures**								
11.1.2.1.	Compensation for damage caused by transport infrastructure	3.1.	2001–2005	pm	pm	pm	pm	pm	**II**
11.1.3.	**Technical measures (incl. investments)**								
11.1.3.1.	Construction of overpasses and tunnels	3.1., 13.1.	2001–2005	TSM	pm	25 000	not covered	RE	**II**
11.1.4.	**Education, information, raising awareness**								
11.1.4.1.	Assessment of environmental impact of transport infrastructure		2000–2005	KKM, KOV	0.3	420	not covered	RE, VT	**I**
11.1.4.2.	Compilation of a sourcebook for sustainable road construction		2002	KKM, TSM	1	150	not covered	RE, VT	**III**
11.1.5.	**Applied research**								
11.1.5.1.	Strategic estimation of environmental impact (SEA) in the sector of transport	3.1.	2000–2001	KKM, TSM	0.3	90	not covered	RE, VT	**I**
11.1.5.2.	Use of crossing structures by different species, cost investigation	13.1., 6.1.	2000–2001	KKM, TSM	0.5	150	not covered	KF, TF, VT	**II**
									7
								I	2
								II	4
								III	1

11. TRANSPORT. ACTION PLAN UP TO THE YEAR 2005

Objective 11.2. Replacement of environmentally dangerous types of transport with environmentally-friendly alternatives

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
11.2.1.	**Legislative and institutional changes**								
11.2.1.1.	Establishment of regional centres of public transport	KTK 4.2., 11.1.	2001–2005	TSM, SM, OL	3	2 500	not covered	KE	**II**
11.2.1.2.	Enhancement of control over fuel and noise emissions from motor vehicles	KTK 4.2.	1999–2001	TSM, SM, KKM	pm	3 000	likely	RE	**III**
11.2.1.3.	Elaboration and adoption of programs for traffic moderation	KTK 4.2., 11.1.	2000–2005	KOV	1	900	not covered	KE, VT	**III**
11.2.1.4.	Obligatory use of excise tax for financing public transport and light transport	11.1.	2000–2005	TSM, KOV	pm	pm	pm	pm	**II**
11.2.2.	**Economic measures**								
11.2.2.1. **(4.2.18)**	Imposition of road tax for heavy trucks and trailers		2000	RM, TSM	0.5	75	not covered	RE	**II**
11.2.2.2.	Financing of public transport and light transport		2002	TSM, RM	0.5	75	not covered	RE	**I**
11.2.2.3.	Inclusion of environmental damage in fuel excise tax		2001	RM, KKM	0.5	75	not covered	RE	**I**
11.2.3.	**Technical measures (incl. investments)**								
11.2.3.1. **(4.2.19) (4.2.27)**	Planning and construction of a network of bicycle roads and parking areas	1999–2005	KOV, TSM	pm		70 000	10% covered, 60% likely	KE, RE	**I**
11.2.4.	**Education, information, raising awareness**								
11.2.4.1.	Campaigns for the promotion of sustainable transport		2000–2005	VVO, KOV	pm	6 000	not covered	KF, KE, VT	**II**
11.2.4.2.	Compilation of educational materials about sustainable transport and urban planning for institutions of higher education and further education		2001	HM, TSM, KKM	1	200	not covered	RE, VT	**II**
11.2.5.	**Applied research**								
11.2.5.1.	Elaboration of pronciples for determination of transport costs (taxes, duties, charges, transfers to and from budgets, etc.) to ensure preference to public and light transport and types of transport with efficient use of land	KTK 4.2., 11.1.	2001	TSM, RM	1	150	not covered	RE, VT	**I**
11.2.5.2.	Elaboration of methodology for the estimation of external costs of transport and its infrastructure and transformation of these costs into internal costs	KTK 4.2., 11.1.	2000–2001	TSM, RM	1	300	not covered	VT	**II**
11.2.5.3.	Calculation of external costs for all types of transport (total and per unit)	KTK 4.2., 11.1.	2001	TSM	1	150	not covered	VT	**II**
									13
								I	4
								II	7
								III	2

12. TOURISM. ACTION PLAN UP TO THE YEAR 2005

Objective 12.1. Plan and manage tourism and recreation in a way which does not adversely affect biological diversity, which supports its conservation and sustainable use

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
12.1.1.	**Legislative and institutional changes**								
12.1.1.1.	Designate recreation and tourism zoning and define the role of private enterprise and the role and financing of the managers of protected areas in protected area management plans	13.1, 3.1.	2000–2005	KKM, EKAL, TA, KOV, PM, EÖÜ	6	4 800	not covered	RE, KF, VA, VP	**I**
12.1.1.2.	Establish the procedure for charging entry fees for access to protected objects of nature	13.1.	2000–2002	KKM, MM, TA, EÖÜ	1.5	600	not covered	RE, KF	**III**
12.1.1.3.	Carry out planning for recreation areas and integrate them with forestry and nature protection management plans	3.1.	2000–2005	KOV, KKM, MA, TA, EÖÜ	pm	1 800	not covered	RE, MK	**II**
12.1.1.4.	Establish in the Act on Protected Natural Objects the responsibilities of protected area managers in the field of tourism	13.1.	2000	KKM, Ka	0.2	30	not covered	RE	**II**
12.1.1.5. **(2.2.2.)**	Establish environmental standards for tourism service providers		2000–2005	TA, KKM, EVS, EÖÜ	1.5	1 200	not covered	VP, KF, RE	**III**
12.1.1.6.	The affiliation of Estonian national parks with the European Charter on Sustainable Tourism		2000–2005	KKM, TA,EKAL	1	900	not covered	RE, KF	**II**
12.1.2.	**Economic measures**								
12.1.2.1.	Preferential loans and financial support for eco-tourism projects		2000–2005	SiM, MM, KKM, TA, PM	pm	9 000	not covered	KF, RE	**III**
12.1.2.2.	Promote Estonia as a country with a varied wildlife and market Estonian eco-tourism		2000–2005	TA, VM, PR	1	30 000	not covered	RE	**II**
12.1.3.	**Technical measures (incl. investments)**								
12.1.3.1. **(9.2.13.) (9.2.29.)**	Create an information network; develop visitors' centres; build study and hiking trails, etc.		2000–2005	KKM, TA,PM, TSM,Ka	3	30 000	partly likely	RE, KF, RIP, KE, EK, LRPF, L, VA, VP	**II**
12.1.4.	**Education, information, raising awareness**								
12.1.4.1.	Guidance material for nature tourism enterprises on the conservation and use of biological diversity		2000–2001	KKM, TA, EKAL, EÖÜ	1	400	not covered	RE, KF, MK	**I**
12.1.4.2.	Training programmes for nature tourism enterprises on the conservation and use of biological diversity		2000–2005	KKM, TA, EKAL, EÖÜ	1	3 000	not covered	RE, KF, MK	**III**
12.1.4.3.	Guidance material and education for tourists and hikers on how to conduct themselves in natures		2000–2001	KKM, TA, EKAL, EÖÜ	1	400	not covered	RE, KF, MK	**III**
12.1.4.4.	Guidance material and training programmes for the staff of protected areas on the planning and regulation of tourism and recreation		2000–2005	KKM, TA, EKAL, EÖÜ	1	3 000	not covered	RE, KF, MK	**I**
12.1.4.5.	Nature study programmes in protected areas		2000–2005	KKM, TA,HM	0.5	300	not covered	KF, RE, VP	**II**
12.1.4.6.	Environmental (including nature tourism) education for the staff of tourism organisations and for tourism officials		2000–2005	TA, KKM, EÖÜ	0.8	2 400	partly likely	EK, VP, RE	**III**
12.1.4.7.	Education of nature protection workers in the field of tourism (incl. abroad)		2000–2005	KKM, TA	0.8	2 400	not covered	KF, VA, RE, VP	**III**
12.1.4.8.	Guidance material for the KOV for the sustainable management of tourism		2000–2001	TA, KKM, EKAL, Ka	1	300	not covered	KF, RE, VP	**II**
12.1.4.9.	Training programme to help tourism and transport enterprises meet the requirements of the European Charter on Sustainable Tourism		2000–2002	TA, KKM, TSM	1.5	400	not covered	RE,VP	**III**

12.1.4.10.	An annual award for the tourism enterprise most actively supporting biological diversity	2000–2005	TA, KKM, EÖÜ	0.1	600	not covered	KF	**III**
12.1.5.	**Applied research**							
12.1.5.1.	The tourism load capacity of protected areas and of popular holiday regions outside protected areas	2000–2005	KKM, EKAL, KOV	2	2 100	not covered	RE, KE	**I**
12.1.5.2.	Counts of the numbers of tourists visiting protected areas and the collection of statistical data	2000–2005	TA, ESA, KKM, Ka	5	3 000	not covered	RE	**I**
12.1.5.3.	Create "models" on the basis of successful projects for the preservation and use of biological diversity in order to apply these more extensively	2000–2005	KKM, TÜ	2	3 000	not covered	RE	**III**
12.1.5.4.	The implementation of long-term monitoring and an impact analysis programme concerning the effects of tourism and recreation on biological diversity	2000–2005	KKM, EKAL	1	1 200	not covered	RE, KF	**I**

	23
I	6
II	7
III	10

13. NATURE CONSERVATION. ACTION PLAN UP TO THE YEAR 2005

Objective 13.1. Utilisation of inter-sectoral measures for the protection of biological diversity

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
13.1.1.	**Legislative and institutional changes**								
13.1.1.1. **(9.2.2)**	Bring the Act of Protected Natural Objects, the Forestry Act, Planning and Building Act, and Land Amelioration and Mineral Resources Act into correspondence with each other and with applicable international legislation	KTK 9.4.9., 3.1.	2000–2005	KKM	0.3	300	likely	RE	**I**
13.1.1.2.	Supplement the Act of Protected Natural Objects with stipulations about habitat and community protection	3.1.	2000	KKM	0.3	50	likely	RE	**III**
13.1.1.3.	Adoption of program for establishing Natura 2000 Network	3.1.5.4.	2000	KKM	0.2	10	likely	RE	**I**
13.1.1.4.	Adoption of improved system for compensating damages caused by protected species	3.2.5.10.	2002	KKM, EPMÜ, TÜ	0.1	5	partly likely	RE, KF	**III**
13.1.1.5.	Preparation and adoption of management plans both for protected areas and protected species	KTK 9.2.6.	2000–2005	KKM	10	6 000	partly likely	KF, RE	**I**
13.1.1.6.	Preparation/revision of protection rules for protected areas together with the revocation of privatization obligation for state lands with nature conservation value	KTK 9.2.7.	2000–2004	KKM, ITK	2	1 250	partly likely	KF	**I**
13.1.1.7.	Updating of lists of protected species		2000–2005	KKM	0.3	300	partly likely	RE	**III**
13.1.1.8.	Implementation of state program for the protection of wetlands		2000–2005	KKM	3	3 000	partly likely	KF, RE, VP	**I**
13.1.1.9	Working out of state program for the protection of islets, coasts and banks	KTK 9.2.8.	2000–2001	KKM, ÖI, BKA, GI	0.8	250	not covered	RE, KF	**I**
13.1.2.	**Economic measures**								
13.1.2.1.	Prevention of, assessment of, and compensation for economic damages caused by protected species		2000–2005	KKM	pm	9 000	partly likely	KF	**II**
13.1.2.2.	Work out and implement compensation mechanism for damages to habitats caused by protected species		2001–2003	KKM, MM	1	450	not covered	KF, VP	**II**

(continued on p. 156)

13. NATURE CONSERVATION. ACTION PLAN UP TO THE YEAR 2005

Objective 13.1. Utilisation of inter-sectoral measures for the protection of biological diversity

No. (KTK no.)	Necessary activities	Linkage with other objectives	Time-scale	Principal and Other responsible parties	Man power requirement man/year	Cost x1000 EEK	Current funding	Possible sources of funding	Priority I - max III - min
13.1.3.	**Technical measures (incl. investments)**								
13.1.3.1.	Purchase and exchange of land with high nature conservation value by state		2000–2005	KKM	pm	6 000	partly likely	RE	**I**
13.1.3.2.	Improvement of technical capacity of guarding authorities and administrations of protected areas		2000–2005	KKM	pm	6 000	not covered	RE	**II**
13.1.4.	**Education, information, raising awareness**								
13.1.4.1.	Courses about biodiversity protection and sustainable use for managers of natural resources	KTK 9.3.1.	2000–2005	KKM	1	3 000	not covered	RE, KF, VA, EK	**II**
13.1.4.2.	Further education and ongoing training for employees in nature protection	KTK 9.3.3.	2000–2005	KKM	1	1 800	40% likely	VP, KF	**II**
13.1.4.3.	Public information about the development of the Natura 2000 network		2000–2005	KKM	1	3 600	40% likely	VP, RE	**I**
13.1.5.	**Applied research**								
13.1.5.1.	Programs for inventories and monitoring of the status of rare and protected species		1999–2005	KKM, EPMÜ	pm	7 000	75% covered	RE, KK, KF, VP	**I**
13.1.5.2.	Updating of biodiversity monitoring system, working out of indicators	KTK 9.1.1.	2000–2005	KKM, ITK, EPMÜ, TÜ	2	1 800	not covered	RE, KF, VP	**II**
13.1.5.3.	Development of program for the creation of the Natura 2000 network		2000	KKM	1	150	partly likely	RE, KF, VP,	**II**
13.1.5.4.	Compilation of a Red Data Book on Estonian habitat types	KTK 9.2.10.	2000–2002	KKM, TA, ITK, TÜ, EPMÜ	1	450	not covered	RE, KF	**II**
13.1.5.5.	Inventory of endangered and rare communities, habitat types, and species in protected areas and analysis of their level of protection	KTK 9.2.20.	2000–2005	KKM, ITK, TÜ, EPMÜ	2	1 800	not covered	RE, KF, VP	**II**
13.1.5.6.	Compiling new version of Red Data Book, which includes lists of up-till-now insufficiently covered or lacking species groups	KTK 9.4.26.	2002–2003	KKM, TA	1	400	not covered	KF, RE	**II**
13.1.5.7.	Management plans for species or species groups and their expertise		2000–2005	KKM	1	900	not covered	RE, KF, VP	**II**
13.1.5.8.	Cost-benefit analysis of the use of ex-situ methods for protecting endangered species	1.1.	2000–2005	HM, KKM	3	6 000	50% likely	RE, ETF, VP	**II**
13.1.5.9.	Working out of up-to-date principles for the keeping of Nature Conservation Register	3.2.1.2., KTK 9.2.3	2000	KKM, ITK, KKI	0.5	80	50% likely	KF, RE	**II**
13.1.5.10.	Preparation of the reform of the administrative system dealing with the management of biodiversity protection	3.2.1.1., KTK 9.1.3.	2001–2002	KKM	3	1 000	not covered	RE, KF, VP	**II**
13.1.5.11.	Working out of improved system for compensation of damages caused by protected species	4.2.1.3., KTK 9.4.10.	2000–2001	KKM, EPMÜ, TÜ	0.7	200	not covered	KF	**III**
13.1.5.12.	Compiling a list of species connected to international obligations along with expert analysis of those species importance for making decisions at the Estonian level	KTK 9.1.15.	2000–2001	KKM, ITK, TÜ, EPMÜ	1	400	partly covered	KF, RE, VP	**II**
13.1.5.13.	Scientific research of genetic variation of endangered species	GMO 1.2.6.	2000–2002	KKM, EPMÜ, TÜ	0.3	150	not covered	KF, VP	**II**
13.1.5.14.	Analysis of the ecological and economic influences of non-native species along with assessment of future distribution and possible control measures	3.2.1.5.	2000–2001	KKM , EPMÜ, TÜ	2	600	not covered	KF, ETF, VP	**I**

	30
I	10
II	16
III	4

VII FINANCIAL PLAN

The Biodiversity action plan (BDAP) comprises 408 activities classified by fields and intra-field aims. The financial and economic assessment of every activity was conducted in close co-operation with all teams whereby the cost of the activity, labour consumption and existing or potential source of financing were determined. As a result of the financial analysis, detailed tables for activities of every field were elaborated for costs, potential sources of financing and status of financing (appended to the present document). As for some activities (e.g. 4.5.3.1. – creation of buffer zones for feed currents of amelioration; 7.1.3.1. – application of sustainable fishing methods; 10.4.3.1.–10.4.3.4. – establishment of small processing industries supporting the protection of heritage landscapes and habitats, etc.) it was not possible to estimate the costs due to lack of initial data, the data presented below reflect the lowest limit of application costs of BDAP.

The total cost of all activities of BDAP has been estimated at 2.15 billion Estonian kroons. Table 1 presents a summary of costs of activities of all 13 fields. Fifty-three and a half percent (53.5%) (or 1.35 billion kroons) of total costs of BDAP are connected with implementation of activities in the field of industry, including 840 million kroons for six high-cost activities (10.1.3.1. – implementation of energy conservation program; 10.1.3.2. – installation of electric filters in power stations; 10.3.3.1. – completion of Vaivara dangerous waste deposit and collection centre; 10.3.3.3. – implementation of the national program "Reduction of Atmospheric Emissions of SO_2, NO_X, Heavy Metals and Dust" in plants of processing industry; 10.3.3.4. – implementation of the national program "Reduction of Emissions of Volatile Organic Compounds" in plants of processing industry; 10.6.3.2. – recultivation of oil shale quarries). The exclusion of these activities reduces the cost of BDAP to 1.67 billion kroons; the summary is present in Table 2.

Tables 3, 4, 5 and 6 present data of financial needs of BDAP activities in the years 2000–2005 by fields and across years and priorities. The implementation of very important activities (priority I) needs 607.3 million kroons, or 26.9% of total BDAP financing needs; the implementation of important activities (priority II) needs 1,365.2 million kroons or 60.4% of total financing needs; and the implementation of relatively less important activities (priority III) needs 287.6 million kroons or 12.7% of the total. About 40% of financing necessary for the activities may likely be classified as "covered" or "likely covered," and 60% of financing has been included in the "not covered" category.

Estimation of labour consumption necessary for the implementation of the activities has been presented in Table 1. According to the current estimation, the implementation of BDAP needs 1,936 years of human labour or 277 conditional full-time workers annually.

Table 1. Cost of BDAP and labour consumption in 1999–2005

Sector	Total cost		Labour consumption	
	1000 EEK	%	years	%
1. Biotechnology	140 050	5.6	268.8	13.9
2. Education	132 630	5.3	201.8	10.4
3. landscape aspects in planning and land management	101 685	4.1	143.4	7.4
4. Agriculture	414 520	16.5	569.6	29.4
5. Forestry	62 790	2.5	146.4	7.6
6. Hunting	3 970	0.2	19.7	1.0
7. Fishing	27 310	1.1	68.9	3.6
8. National defence	2 080	0.1	5.8	0.3
9. Border control	3 200	0.1	10	0.5
10. Industry	1 348 365	53.7	134.5	6.9
11. Transport	109 265	4.4	32.1	1.7
12. Tourism	100 830	4.0	151.4	7.8
13. Nature conservation	61 945	2.5	183.6	9.5
BDAP total	2 508 640	100.0	1 936.1	100.0

Table 2. BDAP cost and labour consumption in 1999–2005 (excl. Expensive activities of industry sector shown in KTK)

Harukond	Total cost		Labour consumption	
	1000 EEK	%	years	%
1. Biotechnology	140 050	8.4	268.8	13.9
2. Education	132 630	7.9	201.8	10.4
3. Landscape aspects in planning and land management	101 685	6.1	143.4	7.4
4. Agriculture	414 520	24.8	569.6	29.4
5. Forestry	62 790	3.8	146.4	7.6
6. Hunting	3 970	0.2	19.7	1.0
7. Fishing	27 310	1.6	68.95	3.6
8. National defence	2 080	0.1	5.8	0.3
9. National defence	3 200	0.2	10.0	0.5
10. Industry *	509 065	30.5	134.5	6.9
11. Transport	109 265	6.5	32.1	1.7
12. Tourism	100 830	6.0	151.4	7.8
13. Nature conservation	61 945	3.7	183.6	9.5
BDAP total *	1 669 340	100.0	1937.0	100.0

*excl. expensive activities of industry sector: 10.1.3.1.; 10.1.3.2.; 10.3.3.1.; 10.3.3.3.; 10.3.3.4.; 10.6.3.2.

Table 3. BDAP need for financing in years 2000–2005

Sector	need for financing (1000 eek)	%
1. Biotechnology	140 050	6.2
2. Education	131 510	5.8
3. Landscape aspects in planning and land management	94 725	4.2
4. Agriculture	392 405	17.4
5. Forestry	62 790	2.8
6. Hunting	3 970	0.2
7. Fishing	24 735	1.1
8. National defence	2 080	0.1
9. Border control	3 000	0.1
10. Industry	1 144 825	50.7
11. Transport	98 265	4.3
12. Tourism	100 830	4.5
13. Nature conservation	60 945	2.7
BDAP total	2 260 130	100.0

Table 4. BDAP need for financing in 1999–2005 (excl. expensive activities of industry sector shown in KTK)

Sector	need for financing (1000 eek)	%
1. Biotechnology	140 050	8.8
2. Education	131 510	8.3
3. Landscape aspects in planning and land management	94 725	6.0
4. Agriculture	392 405	24.7
5. Forestry	62 790	4.0
6. Hunting	3970	0.2
7. Fishing	24 735	1.6
8. National defence	2080	0.1
9. Border control	3000	0.2
10. Industry *	473 825	29.8
11. Transport	98 265	6.2
12. Tourism	100 830	6.3
13. Nature conservation	60 945	3.8
BDAP Total *	1 589 130	100.0

* excl. expensive activities of industry sector: 10.1.3.1.; 10.1.3.2.; 10.3.3.1.; 10.3.3.3.; 10.3.3.4.; 10.6.3.2.

Table 5. Total across years

Sector	Need for financing in years 2000–2005 (1000 EEK) across years						
	2000–2005	2000	2001	2002	2003	2004	2005
1. Biotechnology	140 050	22 080	24 030	23 635	23 435	23 435	23 435
2. Education	131 510	16 860	23 250	22 850	22 850	22 850	22 850
3. Landscape aspects in planning and land management	94 725	18 150	20 985	14 695	14 395	13 250	13 250
4. Agriculture	392 405	69 830	66 955	64 155	64 655	63 205	63 605
5. Forestry	62 790	12 905	12 475	10 835	9 515	9 180	7 880
6. Hunting	3 970	975	745	675	525	525	525
7. Fishing	24 735	5 560	4 925	4 500	3 250	3 250	3 250
8. National defence	2 080	950	300	215	215	200	200
9. Border control	3 000	500	500	500	500	500	500
10. Industry	1 144 825	185 615	193 280	192 580	191 750	190 800	190 800
10. Industry *	473 825	82 115	79 780	79 080	78 250	77 300	77 300
11. Transport	98 265	12 595	18 565	16 945	16 720	16 720	16 720
12. Tourism	100 830	17 430	17 400	16 650	16 450	16 450	16 450
13. Nature conservation	60 945	10 715	11 075	10 555	9 850	9 500	9 250
Total	2 260 130	374 165	394 485	378 790	374 110	369 865	368 715
Total*	1 589 130	270 665	280 985	265 290	260 610	256 365	255 215

* excl. expensive activities of industry sector: 10.1.3.1.; 10.1.3.2.; 10.3.3.1.; 10.3.3.3.; 10.3.3.4.; 10.6.3.2.

VIII CONTINUATION OF THE BIOLOGICAL DIVERSITY PROCESS

8.1. Implementation of the action plan

Estonia, having joined the Convention on Biological Diversity, has made an international commitment, one of the first stages of which is to work out its biodiversity strategy and action plan. This document, which is now ready, has to be adopted by the government. The total cost of the actions of the highest priority (priority 1) until the year 2005 is 607.3 million kroons, but this money should be found with the help of different financiers, to ensure that solutions are found for at least the most important problems, behind which solutions to other problems stand.

In order to guarantee the implementation of the Convention on Biological Diversity, it is important to ensure that the political circles and economic sectors being responsible in this area are kept well informed and are involved in the process. For this purpose, the present Commission on Biological Diversity has to be maintained or its work reorganised, and should be associated with the Commission on Sustainable Development.

For the practical management of future activities, a co-ordination unit (National Biodiversity Unit) should be established at the Ministry of the Environment, which would check that the actions are implemented by the responsible administrations and organisations, and whose duty it would be to maintain and foster international relationships within the framework of the given Convention.

The co-ordination unit would initiate and organise a system of monitoring the implementation of the Convention, follow the situations and trends in programs and legislation, investments and institutional development in the fields related to biological diversity (including genes, species, habitats, and landscapes). On the basis of the results from this stage, the improvement, amendments and altering of the strategy and action plan will be possible.

It is important to secure that reports about implementation during all stages of the process are made regularly available to the public both at the local, national and international levels.

The given strategy and action plan covers the period up to the year 2005. Thus, a new sectoral situational analysis of biodiversity protection, and specification of strategy tasks, together with the preparation of the action plan for the years 2006–2010 must be planned into the national budget by the year 2004 at the latest.

8.2. Monitoring and evaluation

The form of follow-up activities have not yet finally been decided by the Parties. According to Article 26 of the Convention, the Parties shall submit regular reports on measures they have taken to comply with the convention and shall i.a. include an assessment of the efficiency of the measures in fulfilling their objectives. The national action plans for conservation and sustainable use of biological diversity, which countries are obliged to develop (Article 6), will become the main form of presentation within the framework of the Convention.

In regard to the experience obtained world-wide, the following activities pave the way to the continuous national biodiversity process:

- To initiate and organise a **monitoring system** to follow the Convention implementation process (as regards genes, species, biotopes, and landscapes), the status and trends of implemented plans, legislation, investments, and institutional development. The results of that stage give the possibility to correct, amend, improve or alternate the strategy and action plan.

- Ensure **regular reporting** at all single stages of the biodiversity process and the high public profile of the actions both at local and international levels.
- Initiate a **self-regenerating** implementation process of the Biodiversity convention (biodiversity process)**.**

Each action plan should as a general rule set out clear tasks, targets and mechanisms for assessing their performance and for evaluating progress in the implementation of the strategy. Further information is needed, however, on the state of biological diversity, trends in the pressures affecting it, the realisation of measures contributing to biological diversity, and the effectiveness of the chosen incentives. This information is generated through multi-disciplinary research, monitoring, control, statistics, accounting systems and various reports. This integrated information will be used as input in **revising the action plan** and in drawing up a new action plan when the time comes.

The change in the biodiversity-planning process is inevitable and essential – a plan in one period may be an inadequate basis for a decision in another. The status of trends in species populations, the recovery of wild communities, the viability of *ex situ* collections, livelihoods of rural population, etc., change continuously. Second, in implementing the plan, it is important to learn from each activity, including both errors and successes.

Each policy area in which action is needed to ensure the conservation and sustainable use of biodiversity, will be the basis for the establishment of **indicators**. Both biological and economic indicators will be considered. Indicators that can be measured should show change in environmental factors, shifts in capacity (people, institutions, facilities, and funding), and success or failure of action.

The following indicators are among those that should be included in a monitoring and evaluation program:

- status and trends of the use of biological resources, habitats, species, populations, genes, biodiversity services, and threats to biodiversity;
- shifts in social, political, and economic factors affecting biodiversity;
- changes in the policy and legal framework of natural resources use, including protected areas, land tenure, property rights, trade, and environmental impact assessment;
- changes in the use of biological resources and their sustainability, including natural-resource-based industries, and exploitation of resources for subsistence;
- trends in monetary and non-monetary values of biodiversity and current expenditures and investments; and
- impacts of implementing the activities and policies of the biodiversity plans.

By monitoring the implementation of the national action plan for biological diversity, it can be estimated how well ministries, trade and industry have succeeded in changing trends that are harmful to biological diversity. The ministries and sectors in question will assess the implementation of the action plan in relation to action plans and strategies that they have themselves drawn up.

However, monitoring and evaluation is a sensitive topic. The choice of organisation and methodology will be made openly and co-operatively. The full array of stakeholders will need to be involved in this debate, particularly because monitoring and evaluating the implementation of the various tasks maintains interest in and commitment to the plan.

With regard to the large number of parties and the wide scope of the Convention, a **thematic grouping** of monitoring and reporting activities, either sector-by-sector or media-by-media, is neces-

sary. Thematic monitoring and reporting by sector or by media, means for example, that forestry can be taken up separately or, alternatively, in combination with management of natural and semi-natural biotopes.

If considered suitable or necessary (e.g., depending on how the sector or media discussion is presented), the thematic discussions both at national or supra-national levels may be carried out at the UN's Food and Agriculture regional forestry, fisheries or agricultural commissions.

A national liaison network comprising different branches of policy, administration, economy and NGOs should be established to follow up the implementation of the national action plan for biological diversity and to co-ordinate the national monitoring of the state of biological diversity in Estonia. The Biodiversity Strategy Council and Strategy Steering Group established for the NBSAP process in Estonia may serve as the core group the liaison network under discussion. This network will also prepare the **progress report**, which will be based on information submitted by the members of the network. This report will be available for the Fifth Conference of Parties to be held in May 2000 in Nairobi.

The national biodiversity action plan covers the period from 1999 to 2005. Thereafter it will be revised and updated at five-year intervals. The revision process will take account of monitoring data on the state and development of biological diversity and of new development areas such as the possible implementation of EU environmental requirements, the recommendations of the UN Conference of Environment and Development and other important international obligations in the area.

SUMMARY

Estonia signed the Convention on Biological Diversity in 1992 in Rio de Janeiro. It was ratified by the Estonian Parliament and declared by the President in 1994. Thus, Estonia committed to be constructively engaged in the protection of biological diversity. The Convention on Biological Diversity deals with the preservation of biological diversity both in wild nature as well as in domesticated or cultivated nature, both by the means of protection and sustainable use, as well as in all processes and actions in society which even indirectly affect biological diversity. So the Convention has an impact on many different aspects of society, and reflects the duties of various administrative services. Additionally, the Convention includes international commitments that concern the honest distribution of costs and incomes between the participants.

In the implementation of the Convention, international experience prescribes as a crucial stage the working out of a state strategy, which defines the aims and tactical steps of the biodiversity program, as well as the preparation of a national action plan, which assigns the implementation of the actions defined in the strategy by state and public organisations by locality, by means, by resources (people, institutions and finances), and gives a time schedule for completion of the actions.

The Estonian National Biodiversity Strategy and Action Plan was the result of work in 10 separate working groups. These working groups covered main sectors in which the protection of biological diversity is somehow pertinent (forestry, fishery, agriculture, transport, industry, tourism, nature protection, education, biological resources and biotechnology, and landscapes). The present situation was analysed and strategic aims were set to make up the Estonian Biodiversity Strategy, and according to its aims the Action Plan was laid until 2005. The strategy includes 29 objectives, for the realisation of which 408 actions are planned. The actions are grouped by preferences: very important,

important, comparatively important and less important. The realisation of the total action plan is estimated to cost 2.51 billion kroons. Of this amount, actions of highest importance are estimated to cost 607.3 million kroons. For 40% of the actions, finances exist or are presumed to exist. In order to secure the fulfilment of the action plan, it is necessary to establish a biological diversity co-ordination unit at the Ministry of the Environment that would be responsible for initiating and organising a system for monitoring the implementation of the Convention, for securing the reporting and the further preparation of new action plans.

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