ESTONIAN NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

CONTENTS

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 Advisory Board 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. More than one hundred people participated in the work, and their names are presented on p. ... 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
CBD Convention on Biological Diversity
EBST Estonian Biotechnology Strategy and Action Plan
EU European Union
GMO genetically modified organism
GTO Genetic Technology Department of Tartu University
IFOAM International Federation of Organic Agriculture Movement
KTK National Environmental Action Plan
KTO
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
TELO Youth Centre
TÜT
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.

1. 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 Environment 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 (see BOX 1).

BOX 1

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 (BOX 2).

BOX 2
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 11April 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 Stockholm 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.

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[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 lk.*

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.

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

2.1. 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;

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

- 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.

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[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. /Käsikiri. Eesti Metsanduse Arenguprogrammi tellimus/

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.

2.2. 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.

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, 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.

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[7] *National Programme for the Adoption of the Acquis 1999*: http://www.eib.ee/el/vv_tegevuskava_99/doc2/index.html

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.

3. 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), Riigi Teataja 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 accordance 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 pr□Kactically no scientific data to prove these

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

e
Biological invasion is a globally intensifying process endangering local biological dirsity 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 information 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.

4. 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 K.E.v. Baer Herbarium, separate from the main herbarium, (ca. 6500 specimens); the Tooma Mire Protection Station (Moorversuchstation Thoma) herbarium; and the personal collections of many other famous naturalists (W. Petersen, G. Vilbaste).

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 will also be used in the new Biomedicum of the faculty of medicine of Tartu University when it is completed in the summer of 1999.

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 immuno-diagnostics 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 (TÜT) 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.

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
General education		Pre-school education	0-7	Kindergarten	Local authority, private individual
	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	Local authority, private individual, state

				education	
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 education	17+	adult education establishment	State, local authority, private individual, legal person in public law

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 distribution 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.

<u>What needs to be done:</u>

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

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 economic 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, ground-water 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].

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).

Many plant species are at the border of their distribution range in Estonia (so-called margin-species). Two hundred fifty-one (251) higher plant species in Estonia (see Table 1, Number of natural species and distribution under protection categories) have been discovered to be on their northern, southern, eastern or western margin: 71 species on the northern margin (*Cladium mariscus, Heliochrysum arenarium, Berula erecta, etc.*), 50 species on the eastern margin (*Juncus subnodulosus, Litorella uniflora,etc.*), 32 species on the south-eastern margin (*Cornus suecica, Cochlearia danica, etc*.), 9 species on the southern margin (*Botrychium lanceolatum, Carex glareosa, etc.*), 14 species on the south-western margin (*Carex brunnescens, C. globularis, etc*.), 16 species on the western margin (*Chamaedaphne calyculata, etc*.), and 59 species on the north-western margin (*Arenaria procera, Trisetum sibiricum, 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, Scrophularia auriculata* (17 species).

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[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

Group		Recorded number of species	Protection Category I	II	III	Under monitoring procedures
FLORA						
Vascular plants	-	1441	22	122	41	X
Bryophytes	-	507		23	2	X
Lichens	-	786				
Algae (+Cyanobacteria)	-	2500				X
Fungi	-	3461		24	6	
FAUNA						
Vertebrata						
Mammals	-	64	2	15	12	X
Birds	-	332	7	36	179	X
Reptiles	-	5		1	4	X
Amphibians	-	11		4	7	X
Fish (*Cyclostomata+Piscies*)	-	76		2	2	X
Invertebrata						
Arthropoda	-	10206			26	X
Mollusca	-	136	1			X
Bryozoa	-	7				
Annelida	-	130		1		X
Priapulida	-	1				
Nemertini	-	4				
Nemathelmintes	-	451				
Plathelmintes	-	304				
Ctenophora	-	1				
Coelenterata	-	8				
Porifera	-	3				
Protozoa	-	11597				

Bryophytes are a very important component in the ecosystems of Estonia, especially in forests and mires. Of the 507 known species, 350 belong to the order *Bryales*, 120 to *Hepaticae*, 37 to *Sphagnales*. More than 100 moss species in Estonia are rare and endangered, and 21 species have become extinct.

Algae (together with *Cyanophyta,* which are transferred to *Bacteria* as *Cyanobacteria* in modern times) is a species - rich macro-group in Estonian biota: at present we know more than 2500

freshwater, marine, soil and aerophilous algae species. One species of *Phaeophyta, Waerniella lucifuga*, is extinct.

Fungi is the greatest macro-group in the old Kingdom of Plants with its 3,461 species; they grow on 1,160 phorophytes (on fir - 157 species, on pine - 121). 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 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 – 11,597 species are known. There are many rare, relict and endangered species of various (subarctic, boreal, atlantic, subboreal) climatic periods among Protozoa, Nemanthelmintes, Annelida, Mollusca and Arthropoda.

The richest with respect to the species composition in invertebrate groups are insects - nearly 10,000 species (including *Coleoptera*, about 3,050 species, *Lepidoptera*, 1,787, *Diptera*, 2,113 species). Several invertebrate species are under national protection: the Freshwater Pearl Mussel *Margaritifera margaritifera*, the Common Red Ant *Formica rufa*.

The list of the Estonian vertebrates consists of 488 species, including the vertebrates which are naturally spread in Estonia and 8 wildly breeding introduced 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*, 73 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 Vôrtsjärv.

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 national 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*).

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.

***In-situ* and *ex-situ* conservation system**
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 into 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.

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 co-ordinating 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.

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 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.

Table 2. **Threats to habitats** (after K. Peterson 1995)

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		eutrophication
- coastal meadows	- abandonment of grazing, drainage	
- alluvial meadows	- abandonment of mowing, drainage	
- marshy meadows	- drainage	
- wooded meadows	- abandonment of grazing and mowing	
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	- construction activities on the coast - eutrophication
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)	

***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	**Family**	**Genus**	**Species**	**Individuals**
Amphibians	2	6	6	9	38
Reptiles	5	13	20	30	81
Birds	12	21	62	102	426
Mammals	10	25	53	94	392
Total	**29**	**65**	**141**	**235**	**937**

Currently the Tallinn Zoo participates in the European Endangered Species Programme and is working with the revival of 21 species:
Aegypius monachus, Grus japonensis, Grus dauricus, Haliaeetus albicilla, Pongo pygmaeus, Ursus arctos arctos, Ursus thibetanus, Crysocyon brachyurus, Speothos venaticus, Lutra lutra, Mustela lutreola, Panthera pardus orientalis, Panthera pardus saxicolor, Panthera tigris altaica, Uncia uncia, Loxodonta africana, Hexaprodoton liberiensis, Diceros bicornis, Equus hemionus kulan, Equus przewalskii, Ovibos moschatus and Bos javanicus.

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

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

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. 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 pererginus, 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 over-exploitation 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.

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: 1) the sharp rise of the abundance of pike-perch, the appearance of several strong year-classes and 2) 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 reproduction 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.
1.1. 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.
1.2. 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.
1.3. Pollution. Especially harmful for fish reproduction (increased embryonic and post-embryonic mortality, disorders of gametogenesis).
1.4. Water-flow regulation facilities (e.g. dams on rivers). First of all they influence spawning migrations (access to spawning grounds).
1.5. 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.
1.6. 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.
1.7. Introductions (incl. parasites, new food items, fish-eating predators).

2. Natural abiotic processes.
2.1. Temperature regime of water bodies. With warming climate the fauna is partially replaced with other warm-water species and cold-water forms become endangered.
2.2. 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.
2.3. 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.
3.1. Changes in the abundance of fish-eating predators (seals, cormorants, etc.).

3.2. 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
1.1. Anthropogenic eutrophication of water bodies
1.2. Pollution of water bodies
1.3. Water-flow regulation facilities (dams on rivers)
1.4. Mechanical modification of water bodies, incl. displacement of sediments (dredging, modification of riverbeds, changes of water level due to amelioration works or dams)
1.5. Introductions (incl. parasites, new food items, fish-eating predators)
1.6. Long-term climatic change
1.7. Fisheries (fish, crayfish)

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

3. Natural biotic processes
3.1. Changes of predator abundance (fish, etc.)
3.2. 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 Estonian 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.

The impact of fishery on biological diversity

1. Fishing
1.1. Changes in the structure of fish communities (relative abundance of species)
1.2. Decrease of abundance of specific species (up to extinction), changes in the population structure
1.3. By-catch of rare unprotected species
1.4. 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)
1.5. Impact on biological diversity of other parts of the fauna (animal groups):

a) 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)

b) other species are killed in fishing nets and traps: e.g. seals in trap nets and diving ducks in gill nets

1.6. Mechanical influence of active gear on benthic biotopes: transportation of sediments into water

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

2. Fish farming

2.1. Impact on genetic diversity (inbreeding due to the low number of breeding stock; it is possible to increase/restore genetic diversity)

2.2. Introduction into water bodies of reared alien species and forms (incl. their parasites and morbid agents)

2.3. Introduction into water bodies of reared genetically modified forms (induced polyploids, hybrids, etc.)

2.4. The change of population structure through introduction of juvenile fish into natural water bodies

2.5. Impact on water polluted in fish farming

2.6. Spread of fish parasites and morbid agents through fish used as breeding stock and introduced juvenile stock

3. Fish processing

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

4. 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

1.1. 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

1.2. 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

3.1. **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 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

[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.

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