**Ministry of Environment Protection,
Natural Resources and Forestry
of the Republic of Poland**

FIRST NATIONAL REPORT TO THE CONFERENCE OF THE PARTIES TO THE CONVENTION ON BIOLOGICAL DIVERSITY

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1. SUMMARY

This *First National Report to the Conference of the Parties to the Convention on Biological Diversity* has been drawn up on the basis of wide-ranging analysis of Poland's experiences in the given subject matter, as well as *Suggested Guidelines for National Reports on the Implementation of Article 6*, which was an appendix to Decision II/17 of the Second Conference of the Parties.

The report presents assumptions underlying the policy to date as regards the conservation and rational use of biological diversity, as well as the results obtained by its implementation. Also set out are the basic assumptions to the now-prepared draft strategy for the conservation of biological diversity and action plan up to the years 2010, as well as a discussion of the significance of biodiversity conservation to Poland and local communities, the identification of partners participating in the process and the indication of the existing routes by which information may be accessed.

Two appendices to the report contain a general characterisation of Poland on the eve of the 21st century, as well as a description of its biotic resources.

2. CONSERVATION OF BIOLOGICAL DIVERSITY IN POLAND

2.1 The system for the management of natural resources

Thanks to suitable natural conditions and historical (economic and social) conditioning, Poland has been able to preserve considerable natural wealth. Diversity at the species, ecosystem and landscape levels is among the highest in Europe. The need to take action to protect nature was noted a long time ago, as attested to by edicts of Polish kings from the 15th to 17th Centuries concerning bans on the cutting of yew trees (*Taxus baccata*), and limitations on the hunting of certain animals like the aurochs, *Bos primigenius*.

At the end of the 18th century, the first attempts at *ex-situ* protection were made in relation to the tarpan (*Equus gmelini*) in a specially-created zoological garden. A subsequent landmark was the entry into force in 1868 of a special statute prohibiting the hunting of two species of animal in the Tatra Mountains - the alpine marmot (*Marmota marmota*) and the chamois (*Rupicapra rupicapra*). The idea of protecting the Tatra Mountains in a National Park emerged at about the same time.

Following the regaining of independence in 1918, the inter-War period saw Poland take comprehensive action to preserve its natural wealth. In 1921, a forestry reserve was established in the Bialowieza Forest, with strict or partial protection extended to more than 4500 ha of the most valuable fragments of forest. The first National Parks proper – in Bialowieza and in the Pieniny Mountains, were established in 1932. Conservation measures of this kind were accompanied by legislative work which bore fruit in 1934 with the first *Act on Nature Conservation*.

Also boasting a long history (back to the 19th Century) is systematic research on the country's biological diversity and the threats to it. Knowledge

of these issues, as on the country's natural resources, is considerable, and this makes it possible not only to diagnose the current situation, but also to define needs where the protection of biological diversity is concerned, and to draw up an appropriate strategy.

More than 33,000 species of animal have been recorded in Poland, along with more than 11,000 of plants and 5,000 of fungi. Nevertheless, the level of knowledge of species diversity remains uneven in relation to both different groups of organism and regions of the country. There is good documentation of habitat conditions and real or potential plant communities, but data on diversity at the genetic level are very limited: these are relatively new issues whose research requires considerable financial outlays.

Poland's legal system is well-developed where the need for sustainable development in accordance with natural conditioning is concerned. The most important pieces of legislation are:

- the Act on Nature Conservation of October 16th 1991;
- the Act on the Protection and Management of the Environment of January 31st 1980;
- the Act on Forests of September 28th 1991;
- the Act on Spatial Management of July 7th 1994;
- the Act on the Protection of Agricultural and Forest Land of February 3rd 1995;
- the Hunting Law Act of October 13th 1995;
- the Regulations of the Minister of Environmental Protection, Natural Resources and Forestry concerning the species protection of animals and the species protection of plants, respectively from January 6th and April 6th 1995;

and a series of others.

The system is being improved on a step-by-step basis, especially as the time of Poland's accession to the European Union approaches.

All actions concerning the protection and utilisation of natural resources must also take account of the provisions of conventions and international agreements to which Poland is party. Of the 150 agreements of this type entered into worldwide, one third lie within Poland's sphere of interest.

Recent times have seen a start made to work on the harmonisation of national legislation with that in force in the European Union. The most important elements of this include:

- Directive 79/409/EEC, establishing a comprehensive system for the protection of wild birds and their habitats;
- the Habitats Directive (92/43/EEC) on the Protection of the Natural Ecosystems of Wild Flora and Fauna.
- Agri-environmental Regulation 2078/92 covering principles of the conservation of biodiversity.

An important tool in the conservation of biodiversity is improved and universal access to gathered data. Thanks to aid from UNEP, Poland is currently implementing a Project for the *Management of Data on Biological Diversity at the National Level,* which allows for the inventorying of

information possessed, the drawing-up of principles for their storage, and the establishment of a system for information exchange. This is also important in the context of the introduction of an EU-wide information system on the basis of Decision 76/161/EEC.

Poland has established a system for the management of the natural resources (including the biological diversity) of the country. The supervising department at the level of the central administration is the Ministry of Environmental Protection, Natural Resources and Forestry, within which actions serving the protection of the biological diversity are the direct responsibility of the Departments of:

- Environmental Policy,
- Nature Conservation,
- Forestry.

Also involved in an assisting capacity are the Department of Water Management, the Department of Environmental Protection Systems, the Office for European Integration and Foreign Cooperation, the Department of Geology and others. Also acting within the framework of the Ministry is the independent National Board for the National Parks – the unit coordinating Park activities. All issues associated with nature conservation come within the remit of the Chief Nature Conservator, who holds the rank of Under-Secretary-of-State.

The advisory bodies to the central administration are the State Council on Nature Conservation and the Forestry Council. Assistance is also provided by the State Council on Environmental Protection, the Commission on Environmental Impact Assessments, the Geological Council and others.

Particularly noteworthy within the system was the aforementioned Governmental Commission on Sustainable Development, which was created in line with the recommendations of Agenda 21. In turn, at the voivodeship (provincial) level, the issues of biodiversity conservation are dealt with by:

- Departments of Environmental Protection, Voivodeship Nature Conservators and Departments of Agriculture,
- Voivodeship Commissions on Nature Conservation and Environmental Protection,
- the Boards and Scientific-Social Councils of Landscape Parks.

At the level of the local administration, the issues of nature conservation are dealt with by the relevant sections of gmina offices, which are often also responsible for agricultural matters.,

National Parks – the highest spatial form of nature conservation – are under the direct supervision of the Minister of Environmental Protection, Natural Resources and Forestry. Their activity is coordinated by the aforementioned National Board for the National Parks, while each Park has its own Scientific Council.

Actions serving the *in-situ* and *ex-situ* protection of biological diversity are also being taken in Poland. Thanks to a long and noble tradition in nature conservation, the majority of the areas valuable from the natural point of view have been brought under legal protection. On the basis of

regulations set out in the *Act on Nature Conservation*, a well-functioning system of protected areas has been established. This includes:

- 22 National Parks covering a total of 296,555 ha or 0.94% of Poland. The areas in question cover at least 1000 ha and stand out for their scientific, natural, social and cultural value. With two exceptions, all qualify for category II in the IUCN classification. Recent years have witnessed a significant quantitative and spatial expansion of the system. In 1986, the 14 Parks covered 0.4% of Poland, while in 1990 the 17 Parks then in existence covered 0.5%. It is anticipated that the establishment of 3 new Parks in the nearest future, and the expansion of 2 existing ones, will take the total proportion of the country protected in this way to 1.2%;
- 1183 Nature Reserves covering a total of 128 001 ha, or 0.4% of Poland, and including 122 under strict protection. Of the 1183, 588 are forestry reserves; 143 floral reserves; 121 peatland reserves; 131 faunal reserves; 101 landscape reserves; 50 reserves for abiotic nature; 32 steppe reserves; 24 aquatic reserves and 3 reserves for halophytic vegetation. Reserves preserve ecosystems in a natural or near-natural state, particular species of plant or animal, and elements of abiotic nature. They are of particular value from the scientific, natural, cultural or landscape points of view. The strict reserves qualify for category I in the IUCN classification, while the partial reserves are included within category IV;
- 106 Landscape Parks with a total area of 2,081,000 ha or 6.6% of the country. These are areas protected for their natural, historical and cultural value in conditions of natural management. They qualify for category V in the IUCN classification;
- 369 Areas of Protected Landscape covering a total of 6,665,434 ha (21.3% of Poland). These include areas with different types of ecosystem that are outstanding in terms of their landscape. They fall within IUCN category VIII.

Among the above, some of the particularly valuable areas have also obtained international ranking:

- Bialowieza NP is a World Heritage Site;
- 7 areas are Biosphere Reserves (Babia Gora NP, Bialowieza NP, Karkonosze NP, Slowinski NP, the Tatra Mountains NP, and the Lake Luknajno Reserve. The Bieszczady NP and two adjacent Landscape Parks form the Polish section of an international Biosphere Reserve);
- 8 sites are entered on the list of Wetlands protected under the Ramsar Convention. These are Lakes Luknajno, Karas, Oswin and Swidwie, the Slonsk Reserve; the Milicz Fishponds and the Biebrza and Slowinski National Parks;
- 4 areas have been accorded the status of transboundary Biosphere Reserves: the Polish-Belarussian Bialowieza Forest Biosphere Reserve, the Polish-Slovakian-Ukrainian Eastern Carpathians International Biosphere Reserve in Poland, Slovakia and Ukraine, the Polish-Slovak Tatra Mountains Reserve and the Polish-Czech Karkonosze Reserve.

Overall, spatial protection takes in more than 26% of the country's area, but the national system of protected areas is supplemented by

individual, local categories of protection: Monuments of Nature (30205), Areas of Ecological Utility (3356 of total area of 25380 ha), documentation sites (48 of total area of 294 ha) and Nature/Landscape Complexes (108 of total area of 33938 ha).

In addition, there is a great need for the principles of biodiversity conservation to be developed and implemented outside protected areas by way of wider consideration for sustainable development in policy formulated at the national, regional and gmina levels. It is also important for *in-situ* protection measures to be strengthened in departmental programmes, especially those concerning agriculture and forestry.

Legal protection with a view to preserving the species and genetic diversity of wild species has been extended to most of the most endangered plants and animals, including:

- 111 taxa of various rank among trees, shrubs, green plants and fungi, which are under strict protection;
- 18 species of lichen, shrub, green plant and fungus, which are under partial protection;
- representatives of 125 animal taxa at species, genus and order level, as well as protection for the breeding and living areas of 19 animal species most endangered with extinction.

In addition, on the strength of the *Hunting Law* and *Fishing Law Acts*, a group of several tens of species have been brought under partial protection.

A number of programmes for the re-establishment of endangered species have been run for many years. The most important recent projects include:

- the reinstatement of the peregrine falcon (*Falco peregrinus*);
- the reintroduction of the lynx (*Lynx lynx*) to Kampinoski National Park;
- the reintroduction of the eagle owl (*Bubo bubo*) to Wolinski NP;
- the reintroduction of the apollo butterfly (*Parnassius apollo*) in the Pieniny and Sudetic Mountains;
- the reinstatement and protection of the European bison (*Bison bonasus*);
- the protection and reintroduction of the European pond terrapin (*Emys orbicularis*).
- protection of bats
- protection of the brown bear (*Ursus arctos*) in the Polish part of Carpathians

Work is also ongoing on an action plan for the protection of small cetaceans in the Polish zone of the Baltic Sea.

Poland has many collections of native species, including 16 botanical gardens and arboreta and 12 zoological gardens, as well as many seed plantations of forest trees and centres for the breeding of game animals. More than 20 gene and seed banks for crop plants have been established, along with livestock gene banks, seed banks for forest tree species and a Forest Gene Bank in Kostrzyca financed by the GEF.

Particularly noteworthy in Poland are the old varieties of crop, races of livestock and crop-associated weeds that have persisted thanks to the

maintenance of traditional forms of cultivation. All of these require enhanced protection through both *in-situ* and *ex-situ* methods.

2.2 A characterisation of the biological diversity of selected sectors

2.2.1 Forestry

Forests are an important element of the Polish landscape, covering more than 28% of the country (8.78 million ha). The greater part (6.88 million ha) is under the management of the state forest holding known as the State Forests Enterprise. The present situation regarding forest cover is largely the result of a consistent policy to reconstruct forests destroyed by two World Wars, which has been pursued over the last 50 years. In 1945, forests covered just under 6.5 million ha (ca.20.8%) of Poland. Since that time, timber resources have increased from 906 to 1572 million m^3, while stand volume has risen from 135 m^3 per ha on average to 177 m^3 per ha (and 195 in the State Forests). The proportion of forest of broadleaved species has risen to its present level of 22.2% by area, while the mean age of stands is now 50 (55 in the State Forests). The mean annual harvest of timber varies between 1 and 3% of standing resources, while the ratio of timber harvested to increments in standing volume has been 0.57 to 0.64 in recent years, ensuring a continuous and stable increase in forest resources.

Forests are the main component in all forms of nature and landscape conservation. They account for 54% of the area within Nature Reserves (1183 objects), almost 63% of the land within the 22 National Parks and respectively 55 and 43% of the area embraced by the 106 Landscape Parks and the 344 Areas of Protected Landscape. In addition, so-called protective forests have been distinguished since 1957. These may be water-protecting, soil-protecting, zones of tall greenery, forests in areas of mass recreation, treeline forests, forests of spa-climate significance, those in zones of industrial impact and landscape-creating forests. In addition, since 1991, protective forests have also included the categories of valuable biocenoses and biotopes, animal refuges and seed stands. The area so protected has increased from 1,485,000 ha in 1957 to 3,439,000 ha in 1996 (i.e. from 22.5 to 47.3% of the forested area managed by the State Forests).

Since 1994 the so called promotional forest complexes have been established in the area of National Forests to promote sustainable forestry management and nature protection in forests. So far, ten such complexes covering 6.5% of the area of National Forests have been established. They represent different natural and geographic regions.

2.2.2 Agriculture

Agricultural areas, which cover more than 60% of Poland, are characterised by uniquely-valuable natural and landscape features, and in particular by:

- traditional diversity of management types over a great part of the area,
- a mosaic-like landscape configuration,
- diverse moist and wet ecosystems of grassland, meadow and mountain pasture, as well as xerothermic grasslands,
- rare communities of edges in rural areas and the strips of vegetation

separating fields,
- habitats for wild animals and plants.

Agriculture and rural areas are among the most important elements of Polish socio-economic life as the 21st Century approaches. They also represent some of the most serious and most difficult problems to be solved in the process of the systemic transformation and accelerated development of the country. Rural areas support about 38% of the Polish population in nearly 42,000 villages and 10-20,000 smaller settlements.

Most of the inhabitants of rural areas earn their livings in agriculture. However, many regions retain the traditional model of extensive agriculture on the basis of family farms of relatively low productivity and economic efficiency. The areas of almost 55% of farms (among more than 2 million family farms) do not exceed 5 ha. The mean area of a farm was 7.1 ha in 1992, and is about 7.6 ha now. The mean amount of fertiliser used is 80 kg of NPK per ha of agricultural land and the mean use of plant protection agents 0.48 kg per ha when converted to biologically-active substances.

Also representing biological diversity is the wealth of varieties of crop plant and breeds of livestock. The genes deriving from wild progenitors that are preserved in such old forms may code for desirable traits, while local forms show adaptation to the local environmental conditions in which they were created: to climate, soils, types of nutrition and living conditions. They have unique genotypes and a high level of vitality and toughness, as well as manifesting specific utilitarian features.

In contradistinction to other European countries, Poland has retained local forms of livestock and crop plants, mainly thanks to the continued prevalence of small farms. Particular strongholds for such varieties are in the south of the country (the Carpathians). Smaller refuges have been identified in the east and south-east, in Podlasie and in the Sandomierz Basin. The geographical/ecological and socio-economic conditions of these regions continue to favour the survival of these local variants.

Poland has many valuable native breeds of livestock, such as the "Z³otnicka bia³a", "Pstra" and Pu³awska pigs; the "Œwiniarka", "Wrzosówka" and "Olkuska" sheep; Polish red cattle; the "Zielononó¿ki kuropatwiane" hen and others. Flocks of sheep are very varied, with 21 breeds and types, and a large number of variants among them. Also noteworthy are the "Kampinoska" and "Augustowska" varieties of the Central European race of honeybee.

The country also boasts a number of progenitors of crop or other cultivated plant species, e.g. among the genera *Prunus* and *Lactuca*. An ancestor of cultivated lettuce *Lactuca serriola* occurs widely across the lowlands and foothills, while *L. saligna* occurs in Silesia and has genes in common with the cultivated species. Many native species important for their medicinal properties are also abundant in natural habitats, although others are now endangered.

There is a wealth of plant species whose genes have the potential for being put to use. This is particularly the case for fodder species, for local populations of *Alopecurus* and *Bromus* grasses and for a variety of legume species. Finally, there is also a group of wild species which might serve as

ornamental plants in the future.

2.2.3 The maritime economy and inland fisheries.

Poland is not a major world force where the exploitation of marine resources (including fisheries) is concerned. According to statistical data, the total catch of (marine and freshwater) fish was 358,200 tonnes in 1996, of which sea catches accounted for 320,200 tonnes. Calculated per inhabitant this makes c. 9.3 kg of fish per year. This leaves the share of the country's GDP taken by fisheries hovering at around the 0.05% mark. Nearly 46% of fish derive from long-distance fleets, and c. 43% from the Baltic Sea.

In exploiting the living resources of the seas and oceans, Poland has based and bases itself on the principle of the freedom of the seas and access to fishing grounds, as set out in the 1982 Law of the Sea Convention and relating, i.a., to fisheries and defined rights to exploitation and access, as well as to an obligation to preserve marine fishery resources. However, the dynamic development of marine fisheries worldwide in the last 40 years has combined with global environmental changes and particularly intensive catching of certain species to lead to a situation in which the self-renewability of living marine resources may well be threatened. Poland understands and supports all efforts made by the international community and individual countries to reverse these unfavourable trends. In its actions to protect the living resources of the sea, it is directed by international agreements and conventions.

3. MONITORING AND ASSESSMENT

Data and information on the state of the environment in Poland have been gathered at varying intensities for decades. Some observations (e.g. in hydrological monitoring) go back to the 19th century. The resources are thus huge, though their dispersal combines with the lack of information on the contents of data banks to hinder access, and use in management. Fortunately, an awareness of the significance and role of information in environmental management is now growing among both politicians and - to an ever greater extent - society in general. For these reasons, the last few years have seen a series of actions taken to improve the processes by which information on the environment is collected, processed and accessed. These actions were directed at the modernisation of systems and technical means for the collection of information, enhancement of organisational structures, the dissemination of modern processing techniques and the expansion of the range of information available in improved forms and addressed to an ever-wider range of users.

The system of State Environmental Monitoring has been in operation since 1991, and is run and coordination by the State Environmental Protection Inspectorate (PIOŒ). Brought together within it are elements of the observation of the state of the environment ongoing in Poland as early as in the 1970s and 1980s. These include the system assessing water quality, hydrological monitoring and the monitoring of air quality.

The entire system, and the concepts behind its functioning, have been subject to multi-faceted analysis in recent times. This was followed by

adaptation to the needs of decision makers involved in the protection and shaping of Poland's environment. The improvements brought in have concerned the structure of the monitoring system as a whole and the methods behind it, as well as the range of subjects that are studied and measured. In this, use has been made of the experiences of other European countries and the United States. As a result of this work, the State Environmental Protection Inspectorate drew up the "Programme of State Environmental Monitoring for the years 1994-1997", which has served as a basis for all further activity in this sphere. The Programme details the thematic and functional scope of the following five informational blocks that are of primary importance:

- natural resources and components of nature;
- hydro-meteorological and climatic conditions;
- emissions;
- environmental quality;
- prognoses.

Observation of changes in the status of the environment in Poland is carried out on a wide scale. Physico-chemical and biological parameters of the different components of the environment (water, the air and soil) are measured widely, but natural elements are only monitored to a limited degree - mainly as part of the monitoring of forests, and work on the monitoring of animate nature initiated in 1993.

Biological monitoring of forest has been functioning in Poland since 1989. The programme takes in observation of morphological features of trees, as well as the distribution of levels of damage and changes in them. Also analysed are the links between damage to forests and biotic and abiotic environmental factors. The system of monitoring organised in this way provides information on the state of forests, and amongst other things on the level of damage to stands and the stability of forest ecosystems. It also makes it possible for short-term predictions to be made in relation to changes in the degree of damage to forests. The scope of the monitoring has been widened steadily, with monitoring of forest soils having been carried out since 1995, for example. Around 37% of the permanent observation plots used in forest monitoring are included within the Europe-wide system.

Work is now underway on the introduction of a comprehensive system for the monitoring of nature at the level of the biocoenosis, the ecosystem and the species. This will follow changes ongoing in nature and will also supply data on the real influence of the environment (air, water, climate, etc.) on ecological systems. The "Implementation Programme for the Monitoring of Animate Nature in the years 1996-2005" anticipates assessment of all the organisational levels of natural systems: from that of the individual, through those of the population, species, biocoenosis, physiocoenosis and landscape, up to the level of the vegetation cover of the country as a whole. In addition, the Programme contains:

- the number and list of objects which should be monitored;
- the detailed scope of the monitoring, with information on the features to be studied and the optimal frequency with which this should be done;
- a description of methods to be applied in the field or used in the

processing of results, the collection of data and the organisation of databases;
- information on the organisation of monitoring;
- information on the scope of the work which should be done before monitoring begins;
- a timetable for the different tasks and actions;
- an approximate costing and justification;
- the most important limitations or difficulties with the implementation of monitoring.

The introduction of the Programme will require considerable efforts and resources, but will allow for the most effective ways of protecting biological diversity to be worked out.

The involvement of Poland in actions to protect the marine environment of the Baltic is also reflected in the research and monitoring that is carried out. The work currently being done is in part a continuation of observations and measurements begun much earlier. For example, hydrological research in the Baltic with ecological elements had begun in Poland by the end of the 1930s. Regular checks on the state of the environment in the Baltic began after the signing of the Helsinki Convention in 1974. Poland took an active part in successive monitoring programmes of HELCOM-BMP. Stage IV of the international Baltic Monitoring Programme began in 1994 and includes regular measurements and observations of a series of physicochemical and biological parameters. The results of Stage III of BMP are now being compiled into a *Third Periodical Assessment of the State of the Environment in the Baltic Sea*.

The results of monitoring suggest that water quality in the basin has not improved significantly, in spite of long-term efforts at combating pollution from the Baltic countries, including work of a legislative, organisational and investment nature carried out by Poland. Local improvements have been obtained – mainly in coastal areas – as a result of the bringing-into-operation of many modern sewage treatment plants and a significant limitation of releases of untreated wastewater to the Vistula, Odra and coastal rivers. In contrast, the biocoenoses of the southern Baltic have witnessed an enhancement of certain unfavourable biological phenomena first observed at the beginning of the 1990s. These changes, particularly clear in the dominance structure of species, are occurring in all ecological formations, but are most intensive in the shore zone, above all in coastal lagoons.

4. THE SIGNIFICANCE OF BIOLOGICAL DIVERSITY FOR THE COUNTRY AND LOCAL COMMUNITIES

In Poland there is now a steadily-increasing awareness of the fact that biological diversity is a particularly important element of national heritage, and that actions to protect it and use it sustainably are irrevocably linked to measurable benefits to society and future generations. The preservation of nature's riches is of fundamental significance to health, nutrition and education, and also plays a major role in the process of the sustainable

development of the country (economy and science), especially in the fields of agriculture, forestry, tourism, pharmacy, water management, spatial organisation, etc.

The retention of a high level of biological diversity is particularly important if the health of Polish people is to be improved. Life expectancy and indicators of infant mortality and of the incidences of "diseases of civilisation" all depart in an unfavourable direction from European averages. Although Polish conditions do not allow for the uncovering of a direct correlation between the aforementioned parameters and the state that nature is in, it is obvious that the latter does play a major role in determining the physical and psychic health of society. In the same way, all reclamation or restoration work that is done is of significance, especially in areas suffering significant degradation as a result of human activity.

The retention of a wealth of native genetic resources - especially old varieties of crop and breeds of livestock - is of ever greater significance to the development of agriculture and the feeding of the nation. Since Poland's agriculture remains at a relatively low level of intensification, there are still good conditions for introducing pro-ecological methods of cultivation. At the same time, there is - both at home and abroad - increased interest in, and demand for, attested food of high biological quality. The introduction of the principles of biodiversity conservation into agriculture, and the development of organic farming, especially in the north-east and in mountain and lakeland regions, are leading to improved natural conditions (limitations on the eutrophication of lakes and soil erosion and improved water and climatic relations).

One of the more important tasks in making the implementation of sustainable development more effective is the raising of the ecological awareness of society. Environmental education basing on direct contact with nature is of special importance for that process. It is thus of exceptional importance that the full spectrum of biological diversity be preserved, in order to permit the observation of, and the gaining of an acquaintanceship with, the phenomena, processes and interdependencies characterising nature.

Action concerned with the conservation of native biological diversity is also justified in economic terms. The introduction of modern ecological methods in forestry allows for the raising of stand resistance, and at the same time lowers the costs of production. New prospects are also opened up by biotechnology utilising the features inherent to the microorganisms, plants and animals living in Poland. The preservation of a wealth of biological diversity also has a direct influence in the development of tourism. This sector of the economy has grown dramatically in recent years, and has been favoured by the natural geographical conditions, as well as by the existence of near-intact regions highly valuable from the natural point of view.

The well-preserved biological diversity in the country offers a particularly valuable training ground for the development of both pure and applied scientific research. This is confirmed by the many examples of valuable results having been obtained, among other things in agriculture, forestry, pharmacy, the food industry and environmental protection.

5. ASSESSMENT OF POSSIBILITIES FOR THE PROVISIONS OF THE CONVENTION ON BIOLOGICAL DIVERSITY TO BE IMPLEMENTED

Poland has signed and ratified the Convention on Biological Diversity in the full knowledge that it is to be treated as the most important global agreement for:

- the protection of biological resources (occurring in the natural or domesticated state);
- the rational use of biological resources and harmonious development based upon them;
- the just division of the benefits deriving from the utilisation of biological diversity.

Such an approach is first and foremost a consequence of the fact that the premises upon which the Convention is based also relate in part to the realities of the Polish situation. This is particularly the case in relation to the following facts:

- that the country's biological resources are diminishing steadily (as ecosystems are destroyed and species or varieties heading for extinction in natural conditions or in the domesticated state);
- that the forms and methods applied hitherto in conservation have not always proved adequate;
- that there is a lack of a system for the identification and just division of the benefits flowing from the possession and utilisation of biological resources.

All of the obligations under the Convention are being addressed by Poland, though are in different stages of implementation. Nevertheless, the situation remains in compliance with the provisions, which do leave the Parties relatively free in relation to scope, rates and methods. The actions currently being taken are concentrated on:

- the adoption of a national strategy and action plan for the protection and sustainable use of biological diversity, as well as their implementation in appropriate departmental and interdepartmental plans, programmes and policies;
- the identification and monitoring of components of biological diversity;
- the *in situ* and *ex situ* protection of the components of biological diversity;
- the introduction of the sustainable use of biological diversity;
- the establishment of economic and social incentives to the protection and sustainable use of components of biological diversity;
- the refinement of the legal bases underpinning biodiversity conservation;
- the setting-up and promoting of scientific and educational programmes for the identification, protection and sustainable use of biological diversity;
- the shaping of the ecological awareness necessary for the protection and sustainable use of biological diversity;

- the carrying-out of assessments of impacts on biological diversity, particularly with a view to the avoidance or minimisation of unfavourable human influences on biological diversity;
- the facilitation of access to genetic resources and technology transfers;
- the facilitation of information exchange;
- the development of scientific and technical cooperation;
- the establishment of mechanisms by which priority actions linked with the aims of the Convention can be financed.

The provisions of the Convention correspond closely with the directions of action set out in the "State Environmental Policy" that was adopted by the Council of Ministers and Parliament in a resolution of May 10th 1991. The function of coordinator of the implementation of provisions is served by the Minister of Environmental Protection, Natural Resources and Forestry. Obligations imposed by provisions of the Convention join decisions of Conferences of the Parties in being directed to all the Ministries, as well as to local and provincial authorities, enterprises, non-governmental organisations and institutions, and society as a whole. In connection with this, one of the first actions taken in the process of ratification was the wide dissemination of the texts of the Convention and of decisions taken at Conferences of the Parties.

In accordance with Article 6, a priority aim is that the protection and sustainable use of biological diversity be taken into account in sectoral and intersectoral strategies, plans and programmes. This type of action is taken by the Governmental Commission on Sustainable Development, which is chaired by the Minister of Environmental Protection, Natural Resources and Forestry.

6. THE FORMAL LEGAL BASIS FOR THE SUBMISSION OF REPORTS

Parliament's adoption of the Act of August 31st concerning the ratification of the Convention on Biological Diversity makes the heeding and implementation of the provisions of this document compulsory. Poland became a Party to the Convention with the submission of the instrument of ratification to the Secretary-General of the UN.

Article 26 establishes the obligation that the Conference of the Parties be in receipt - at defined intervals - of reports on actions taken to implement the provisions of the Convention. This reads as follows: "*Each Contracting Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties reports on measures which it has taken for the implementation of the provisions of the Convention, and their effectiveness in meeting the objectives of this Convention*".

Decision II/17 of the Second Conference of the Parties provided that a national report should be prepared for the first time in time for the Fourth Conference. At the same time, it was made clear that this report should focus on actions relating to the implementation of provisions from Article 6, i.e. "*General measures for conservation and sustainable use*". More specifically:

"*In line with conditions and possibilities, each Party:*
a) shall draw up a national strategy as well as plans and programmes concerning the conservation of biological diversity and the sustainable use of its elements, or else adapt an existing strategy or plans and programmes to this objective in such a way as to reflect, inter alia, the requirements of this Convention in relation to the given Party;
b) shall, as far as possible and in relation to need, include the conservation of biological diversity and the sustainable use of elements of it in departmental and interdepartmental plans, programmes and strategies."

In addition, Decision II/17 requires, *inter alia*, that the report prepared make use of information in Country Studies on biological diversity and other national and international documents. At the same time, the appendix to Decision II/17 contains suggestions as to the scope of national reports. Their general character leaves Parties rather free as far as the preparation of such a study is concerned, but also gives rise to many substantive and technical queries. In Poland's case, these result, first and foremost, from the fact that the first national report should mainly embrace the implementation of the strategy and action plan - documents that are not yet approved or adopted by the appropriate national opinion-giving and decision making centres.

The third Conference of the Parties, which saw a Polish delegation participate as representatives of a Party Country for the first time, adopted Decision III/9 concerning the implementation of the provisions of Articles 6 and 8 of the Convention. Bearing in mind that the next (Fourth) Conference of the Parties is to take place in May 1988, it has been agreed that the national report will be submitted to the Convention Secretariat not later than January 1st 1998.

At the same time, Decision III/9 confirms that the first national report will focus largely on measures linked with the implementation of Article 6, with the experiences gained by Parties with this first report providing a basis for future agreement as to the form and frequency of submission of future reports. In addition, it has been agreed that the national reports submitted to the Secretary-General at the end of 1997 will not be circulated as official documents of the Conference of the Parties, but will rather be sources of information used by the Executive Secretary, along with other available materials, in presenting a synthesis report. Also proposed is the taking of further steps in connection with perfecting the form and content of further reports. In this situation, Parties have been asked to make reports available by E-mail, as well as, where possible, on the Internet.

7. PROGRAMME IMPLEMENTATION

7.1 Programmes directed towards improving the state of the environment

The political and economic changes in Poland after 1989 have had a favourable influence on the meeting of requirements as regards environmental protection. An indication of this may be seen in the departure from traditional, narrowly-defined environmental protection in favour of sustainable development, i.e. development subordinating the needs and

aspirations of society and the state to the possibilities for development created by the natural environment in which we live. Such an approach was confirmed in the Constitution of the Republic of Poland enacted in 1997. Here, Article 5 provides that the Republic of Poland shall ensure the protection of the environment on the basis of the principle of sustainable development. A formula for ecodevelopment understood in this way should bring, and is already bringing, benefits in social, environmental and economic terms. In this, Poland has joined a group of countries subscribing to similar values. The principles in question are also an integral element of other important governmental documents including the "Strategy for Poland" and the "Outline concept for socio-economic development to the year 2010".

The "State Environmental Policy" adopted by the Council of Ministers in 1990, and setting out objectives and actions in relation to improving the state of the environment, was given over for implementation by way of the resolution of the Sejm (Parliament) of the Republic of Poland of May 10th 1991. It selects priorities in three time perspectives, namely:

- the short term, with implementation begun immediately and with results already visible. Priorities here included many tasks which had remained outstanding, as well as others resulting from existing threats whose counteraction could not be postponed to a later period because of their direct consequences for human health or the country's most valuable natural features;
- the medium term, with emphasis on systematic action to protect the air, waters, the earth's surface and nature, and with the aims being to bring a halt to the unfavourable trend of ongoing degradation, to reverse the trend and to limit pressure on the environment to a significant extent. The attainment of medium-term objectives should allow Poland to move closer to European environmental standards and to accession to the European Union. It is assumed that aims in this category should largely have been achieved by the year 2000;
- the long term, with a view to the full introduction of the principles of sustainable development in the economy and the obtainment of an environment in a state allowing it to be considered desirable according to presently-accepted criteria and thus capable of assuring the safe existence of society and the stable functioning of nature. The long-term objectives should have been attained by around the year 2020.

The priorities set out in the "State Environmental Policy" correspond closely with assessments made in the "Polish Study on Biological Diversity", which indicates, *i.a.* that environmental pollution is one of the most major threats to biological diversity in Poland.

As part of cyclical reviews of actions resulting from the Statute on Environmental Protection and Management, the Council of Ministers carried out an assessment of the implementation of the aforementioned short-term priorities in 1994. A special debate in the Sejm was also devoted to this issue. The assessments indicate that the policy has been implemented in line with the assumptions made, and does not in principle reveal a need for tasks included under the medium-term priorities to be modified.

The medium-term priorities, as set out in the "Implementation

Programme to the State Environmental Policy to the year 2000", are in the nature of operational plans which define objectives more precisely, along with investment and non-investment tasks. The former are linked to completion dates, as well as sources of funding, estimates of expenditure and outcomes anticipated. The only undertakings to be mentioned in specific terms are larger ones, treated as of pilot significance. The numerous smaller ones are taken as a group only. In the face of the government's non-acceptance of certain economic programmes extending to the year 2000, the investment tasks presented are likely to require further, more precise definition.

Non-investment tasks are given along with completion times, the name of the body responsible for coordination, the unit involved in implementation and the anticipated results. These tasks include actions in the legal, organisational and managemental spheres, economic mechanisms, science and education.

The basic objective of the "Implementation Programme to the State Environmental Policy to the year 2000" is to ensure a noticeable improvement in the state of the environment, to create conditions for sustainable economic development, and in particular:

- to enhance and accelerate the existing trends towards reduced emissions of particles and noxious gases to the atmosphere and pollutants discharged with wastewaters to surface waters and the Baltic Sea;
- to reduce the deficit in clean water and to step up the protection of raw resources;
- to limit the amounts of industrial and municipal wastes generated and dumped, and to accelerate action to detoxify toxic wastes and to make noxious wastes harmless;
- to halt the increase in the negative impact on the environment of transport, transmission lines and lines of communication;
- to reduce the threats - including transboundary threats - posed to people and the environment by industrial and transport accidents;
- to improve the state of health of forests and to increase the total protected area with highly-valuable natural features.

In the investment sphere, the main directions of action to achieve the above objectives are:

- undertakings in the field of protection of the air, including: modernisation of dedusting equipment, the construction of desulphurization installations - above all in Upper Silesia and other regions where permissible concentrations of pollutants in the air have been exceeded, and the building of plants for the enrichment and desulphurization of coal; as well as action for the efficient use of energy;
- the building of wastewater treatment plants throughout the country, and at a faster rate on the coast, in the drainage basins of lakes and in the basins of rivers supplying reservoirs;
- the building of installations for the processing, utilisation and deactivation of wastes, as well as the faster undertaking of reclamation and revegetation work, with particular account being taken of degraded bases taken over as Soviet forces withdrew from Poland;

- the reafforestation of areas no longer used by agriculture, and intensified protective actions in forests, especially in areas threatened by the nun moth *Lymantria monacha*;
- the establishment of further National Parks, and the enlargement of existing ones.

In the non-investment sphere, the main actions serving attainment of the assumed objectives are:

- continued waiving of import duties on equipment and apparatus serving environmental protection, as well as tax relief on goods and services associated with pro-ecological activity;
- work on new economic mechanisms by which to stimulate pro-ecological investment and pro-ecological behaviour among producers and consumers (catalytic converters, lead-free petrol, biodegradable household chemicals and packagings, etc.);
- updating and amendment of the system of fees and fines for the utilisation of the environment, with a view to enhancing their role in stimulating pro-ecological activity;
- work on new legal solutions which would rationalise the consumption of energy and raw materials in the national economy;
- a departure from the previous strategy entailing the liquidation of the undesirable consequences of production on the environment, in favour of the so-called "clean production" strategy working to limit the generation of wastes and prevent the wasteful use of labour, materials and energy;
- the pursuit of a location policy based on an improved environmental impact assessment system;
- the adjustment of legal solutions, procedures and standards to those in force in the European Union, and the expansion and strengthening of bilateral and multilateral cooperation with other countries;
- enhancement of the monitoring system and the system of supervision and checks on compliance with the law, as well as reform of the systems by which water management is administered and extraordinary threats to the environment countered;
- a raising of society's awareness regarding the rights and duties of citizens, of social organisations acting in the environmental protection sphere and of consumer organisations.

The executive programme for medium-term priorities under the State Environmental Policy was worked out in relation to: protection of the air against pollution from stationary sources; protection of the air and against noise in relation to transport; protection of waters; nature conservation; waste management; the management of water resources; forestry management; the management of raw materials; land management, protection against noise and vibration; protection against non-ionizing electromagnetic radiation; the combating of extraordinary threats to the environment and an integrated approach to the environment.

The basis for launching investment activity is provided by information sent by voivodeship offices and programmes for given sectors, branches or enterprises, as well as information contained in applications for the part-

financing of undertakings from non-budget funds or for the extending of preferential credit.

7.2 Programmes aimed directly at the protection of biological diversity

The basic tasks of national policy in the sphere of nature conservation are to preserve valuable natural resources and the diversity of flora and fauna, as well as to maintain gene pools. These tasks correspond with the *Strategy for the Conservation of Living Natural Resources* adopted in 1991 and working towards the preservation of all forms of life at the species, genetic and ecosystem levels.

The executive programme earmarks 94,000,000 zl (at 1994 prices) for nature conservation undertakings of an investment-related character to the year 2000. Within the National Park system, the most important of these are:

- the purchase of land in Kampinoski, Ojcowski, Babiogórski, Wigierski and Gorczañski National Parks;
- the construction of education centres in 9 Parks;
- the setting-up of centres for integrated monitoring in all the Parks;
- the reconstruction of technical infrastructure (including the erection of 40 buildings and the building of 260 km of roads, along with bridges);
- the establishment of a computer network for the Parks.

Investment-related undertakings anticipated in the Landscape Parks include the building, equipping and operational organisation of 10 ecological education centres as well as the renaturalization of water relations in Narwiañski LP.

The programme also assumes the designation of some 10 million zl (at 1994 prices) for the purchasing of land in new Nature Reserves.

Non-investment activity to be implemented for National Parks before the year 2000 includes:

- the drawing-up of protection plans for all the Parks;
- the creation of 3 new Parks (Mazurski, Jurajski and Turnicki);
- the enlargement of 7 Parks;
- the enlargement of the Polish part of the Puszcza Bia³owieska (Bia³owie¿a Forest) international Biosphere Reserve;
- the attainment of Biosphere Reserve status by Kampinoski, Tucholski, Woliñski and Wigierski National Parks;
- the obtainment of agreements under which to regulate administration and cooperation in relation to the international Biosphere Reserves (Eastern Carpathians, Tatra Mountains, Karkonosze Mountains and Bia³owie¿a Forest);
- the establishment or activation of cooperation with neighbouring countries in relation to border areas and protected areas.

Other examples of spatial forms of protection to be created are new Landscape Parks and c. 50 Areas of Protected Landscape. "Instructions for the drawing-up of protection plans for Landscape Parks" will be devised, and protection plans for the Parks then produced on the basis of them. The creation of c. 200 new Nature Reserves is planned, along with the

preparation of the protection plans for individual Reserves. Such plans will then be devised.

Anticipated where the species protection of plants and animals is concerned are the issuing and implementation of executive regulations to the Act on Nature Conservation, and the continuation and expansion of actions to protect sites for endangered species.

Education-related tasks in nature conservation are to include the systematic issue of promotional materials (films, books, booklets, leaflets, etc.), the organisation of a post-graduate study course for nature conservators at voivodeship (provincial) level, and the development of another such course for employees of the National Parks. Starting the Program of Biodiversity Data Management was an important element of biodiversity conservation. Additionally, Polish and English versions of information service covering biodiversity has been presented on Internet (Clearing House Mechanism). Several national and international conferences were organised, including those on strategy and managing of biodiversity data bases mainly for representatives from Eastern and Central Europe.

Appropriate forestry management is of particular significance to the retention of biological diversity. A basic element of such activity is the preservation of forest as the most important factor in maintaining ecological balance in the biosphere. This aim, a consequence of global policy on the sustainable development of forestry and Polish policy for the comprehensive protection and improvement of forests, seeks to enhance the environment-creating functions of forests and protect forest biological diversity in its entirety, through improvement of the biological features of stands and entire forest biocoenoses. This requires active protection of gene resources, the preservation or restoration of the full complexity of forest ecosystems and the biological diversity of forests, the application of environmentally-safe working practices and the harvesting of timber in such a way as to guarantee the permanence of forest complexes.

The principles of Poland's policy for the comprehensive protection and improvement of forests are gradually being brought into action throughout the country as part of the managemental activity of the State Forests organisation. The aim is to steer forestry in a way that takes account of the full recognition and fulfilment of requirements where nature conservation is concerned. This denotes a need for activities working towards:

- the retention of forest ecosystems in a near-natural state and the directing of ecological processes towards the regeneration of forest biocoenoses that are in harmony with the habitat;
- reinstatement of distorted or degraded forest communities;
- protection, and the renewal of biological diversity in forest communities;
- enhancement of the favourable influence exerted by forests on the natural environment, and the harmonisation of the social and economic development of a region with the rational protection and use of forest resources.

Priority actions serving the sustainable development of forestry are concerned in particular with:

- the preservation of seeds and the development of seed plantations, as well

as preservational cultivation carried out in harmony with the long-term programme for the preservation of forest genetic resources and the selective cultivation of forest trees in Poland;
- the ongoing renewal of forests, with the principle of accord between stand and biotope being upheld;
- the reconstruction of stands appropriate to habitat properties and threats faced;
- stand husbandry with a view to the retention of a healthy forest that is diverse in terms of species;
- the introduction of improvement felling and a departure from clear-cutting;
- in-depth protection of stands against harmful factors, as well as of biocoenoses against the direct and indirect consequences of human presence in forests;
- the biological reconstruction of the forest edge and division lines;
- the protection of valuable components of biocoenoses (e.g., ground cover, ants, birds and plant and animal species under legal protection);
- the conservation of forest soils, including of cumulation, and the protection of organic matter.

One of the basic elements of national policy being implemented in line with the "national programme", is an increase in Poland's forest cover to 30%. The first stage is involving the reafforestation of marginal land excluded from use in agriculture.

Investment undertakings linked with forestry management to the year 2000 will absorb some 65,000,000 z³ (at 1994 prices). Funding will mainly come from the central and provincial budgets, the National Fund for Environmental Protection and Water Management, Voivodeship Funds for Environmental Protection and a loan from the World Bank. Among the main steps to be taken in the period are:
- the reafforestation of 140,000 ha of land taken out of agricultural use;
- the reconstruction of 65,000 ha of stands destroyed or highly-damaged by air pollution;
- the intensification of husbandry measures;
- the selection and management of seed stands;
- the expansion of seed plantations;
- the extension of preservational cultivation;
- the harvesting, and bringing back into production, of forest areas damaged by fire.

Anticipated forest-related undertakings of a non-investment nature include:
- the drawing-up of a plan through which to implement the national programme for the augmentation of forest cover and tree planting and the devising of relevant economic instruments; the verification of land classifications and designations and the making of provisions for reafforestation in local physical development plans;
- the devising and introduction of principles to change the ways in which

existing or would-be forest land in Upper Silesia is managed, with use being made of their ecological and social functions;
- the development and introduction into forestry work of environmentally-safe technologies;
- the drawing-up of habitat maps for some 200 Forest Districts, as a basis for administrative planning, and the protection and restitution of biological diversity in forests;
- the enactment of a strategic government programme for a Pro-ecological model of forestry management.

Legal and political manifestations of efforts to increase forest cover take the form of provisions in:
- the 1991 Act on Forests (*forestry management is carried out ... [with the aim of] ... the general protection of forests, ... the permanent maintenance of forests and of continuity of use, and ... the augmentation of forest resources*);
- the 1994 version of the State Environmental Policy;
- the National Policy on Forests from 1996;
- the National Programme for the Augmentation of Forest Cover from 1995.

The National Policy on Forests was drawn up at the Ministry of Environmental Protection, Natural Resources and Forestry in November 1996 and was adopted by the government in 1997. In it, the arresting of deforestation is set out as one of the main objectives. This is to be achieved by ensuring the permanence of forests and their multifunctionality, and in particular by:
- augmenting the country's forest resources;
- improving the state of forest resources and providing comprehensive protection for them;
- ending the dominance in forestry of the raw-material model, with a reorientation of management, and the introduction of a model for pro-ecological, sustainable, multi-functional management that corresponds with criteria formulated for Europe at the Helsinki Conference, but also takes accounts of specific characteristics of Polish forestry.

The legal provisions adopted in Poland make many references to international conditioning, constituting as they do the practical implementation of provisions in Conventions on environmental protection and nature acceded to by Poland, as well as resolutions of the Strasbourg and Helsinki Ministerial Conferences.

The years 1994-5 saw all Forestry Districts within the State Forests carry out an extraordinary inventory of elements of biological diversity, including in planned or proposed Nature Reserves not so far brought under protection; in flora-rich and near-natural native forests and in forests valuable from the ecological point of view (e.g. those in wet habitats). Data were also gathered on areas of ecological utility (marshes, peatlands, natural bodies of water, heaths, etc.), as well on fauna and flora enjoying species protection. The results of the inventory were entered into the databases of

the Forestry Research Institute and linked with the spatial information system on forests.

In 1996, The Instruction for Preparation of Nature Protection Programme in Forest Divisions was published. The Programme will be a part of a forest management plan prepared for individual Divisions every ten years. It will mainly include: assessment of the state of nature and a plan of its protection, evaluation of consistency of species composition and habitat features, recommendations concerning environmental friendly technologies in forest management, etc.

The most important executive regulations bringing ecological forestry principles into force are the Regulations of the Director-General of the State Forests concerning:

- forest management on ecological bases (linking up with the State Environmental Policy, the Act on Forests and the Helsinki Resolutions);
- detailed principles for the management of the Bia³owie¿a Primaeval Forest;
- the establishment of Promotional Forest Complexes (the 10 Complexes so far established include over 6.5% of state-owned forests and are a testing ground for Poland's introduction of the principles of sustainable forestry management integrated with active nature conservation and the socialisation of the use of forests).

The concepts of augmenting forest cover and tree planting and of giving preference to the environment-creating role of forests offered a basis for the National Programme for the Augmentation of Forest Cover adopted by the Council of Ministers in 1995. The programme assumes an increase in cover from the present 28% (28.7% of the land area) to 30% by 2020 and 33% by 2050. It anticipates the bringing into operation of economic mechanisms by which to stimulate the forest utilisation of some marginal agricultural land, as well as setting spatial priorities resulting from the physio-tactic role of forests in the shaping of the environment. One of the Programme's most important tasks is the reafforestation of polluted and degraded land.

Reafforestation is also a major means by which to rationalise land use structure in Poland. It is estimated that some 3.3 million ha of agricultural land is of marginal significance, while some 600,000 ha has also come out of intensive agricultural use or even been abandoned.

In the period 1992-1996, some 10-15,000 ha of ex-agricultural or unused land was reafforested annually. Funding for this came from the central budget, and from loans from the European Investment Bank and World Bank. In 1995, total reafforestation and renewal in state-owned forests, together with the planting of gaps, took in 63,000 ha. However, there remains a feeling that reafforestation - particularly of private land - requires acceleration and greater assistance from budgetary funds, while the spatial distribution of reafforestation should be linked with a programme to improve water management.

Current intensive efforts to improve forest management in Poland entail work on the application of new techniques and informational sources like GIS, teledetection and data registers. The State Forests Information

System (SILP) came into operation in 1996 and provides integrated information on natural and economic aspects of forest management.

A second important sphere of the economy impacting directly on biological diversity is agriculture. National policy in this area anticipates the stepwise strengthening of the requirement that the principles of environmental protection be heeded by the producers of food, along with simultaneous state support for pro-ecological actions taken in agriculture. A significant problem is the rational use and protection of agricultural land. Entering into force in 1995 was the Act on the Protection of Agricultural and Forest Land, which provided for adaptation to the changed economic and political situation and thus replaced hitherto-binding regulations dating back to 1982. The Act sets out, *inter alia*, the principles by which the designation of land for non-agricultural purposes is to be limited, land degradation prevented, land reclamation and reutilization achieved and utility increased.

The principles underpinning the use of land in development are set out in the new Act on Spatial Planning in force since January 1st 1995. This piece of legislation is the first in history to require that principles of sustainable development be a directing force in the planning process. It requires each *gmina* (unit of local government administration) to have drawn up - by the year 2000 - planning documents called "Studies of the conditioning and directions of physical development of gminas". Planners are also obliged to develop "Prognoses as to the influence of plan provisions on the natural environment".

Also underway in Poland is work towards the devising and introduction of new techniques and technologies for agricultural production. Participants include research units of the Ministry of Agriculture and the Food Economy (including the Institute of Crops, Fertiliser Use and Soil Science and the Institute of Building, Mechanisation and Electrification in Agriculture), as well as higher education establishments (e.g. the Main School of Farming, SGGW, in Warsaw).

In 1994, the government devised and adopted a strategy for the economic development of the country which gave pride of place to a "Programme for the Development of Rural Areas" seeking to modernise agriculture and ensure the multifunctional development of the countryside. The Programme set out the following objectives:

- multifunctional development of rural areas, the modernisation and improvement of the structure of agriculture, and the creation of new jobs in manufacturing and processing, services, trade and branches linked with the valuable features characterising rural areas and agricultural surroundings;
- the directing of changes in agriculture in line with ongoing changes in EU agricultural policy and the global economy;
- the development of socio-economic infrastructure (cooperative movements, agricultural chambers, market and exchange systems);
- improvement of the quality of life in rural areas (the provision of telephones, roads and sanitation);
- the development of agricultural advisory services;
- the utilisation to full advantage of the valuable natural features of rural

areas.

Also drawn up - in December 1994 - was a document entitled "Assumptions to the socio-economic policy for rural areas, agriculture and the food economy to the year 2000", which detailed the main directions of action, as well as the bases of a national strategy for the sustainable development of agriculture. It anticipates, *i.a.*:

- conservation of, and care for, the natural environment, the rural settlement network and the valuable recreational and landscape features of rural areas;
- the modernisation and restructuring of agriculture and the development of rural infrastructure;
- improvement of the quality of agricultural raw materials and food;
- the development of research, advisory services and agricultural education.

In April, 1997, as it was postulated by Governmental Commission on Sustainable Development, The Minister of Agriculture and Food Economy prepared a new document entitled „The Program of Environmentally Friendly Development of Rural Areas, Agriculture and Food Economy to 2000 and Later".

8. THE SYSTEM OF SCIENTIFIC RESEARCH IN THE FIELD OF BIOLOGICAL DIVERSITY

8.1 A general characterisation of the system

Polish science has a long tradition in the carrying-out and development of natural research. As of 1994, research and development work was done in:

- 22 institutions of the Polish Academy of Sciences (PAN) (26% of all the institutions),
- 11 research-and-development units (5% of the total),
- 101 departments at higher education establishments (18% of the total),

as well as in a certain number of other units like the scientific laboratories of National Parks and regional natural history museums, and by societies and associations of nature-watchers, etc.

The total number of scientific personnel engaged directly or indirectly in the study of biological diversity is estimated at c. 4000.

The range of subjects studied as part of the above institutions' statutory activities is very wide and includes:

- the genetic variability of plants and animals; the mutagenic influence of the environment on plants and animals; and the collection, evaluation and use of plant genetic resources;
- the systematics of plants and animals; the species structure of biocoenoses and variations in it; plant succession in areas subject to anthropopressure; strategies for species and biocoenosis conservation; methods of *ex situ* conservation and the reintroduction of rare and endangered plant species;

- the organisation of spatial ecological systems; methods for the active conservation of ecosystems and methods for the protection of the biological resources of the agricultural environment, forests and areas of planted trees among fields;
- the links between human development and the state of the environment;
- legal and economic aspects, and the didactics of nature conservation and environmental protection;
- the methods, techniques and technologies of environmental protection.

Funding for scientific research derives mainly from the Committee for Scientific Research (KBN), as well as from the budget of different ministries (notably the Ministry of Environmental Protection, Natural Resources and Forestry and units subordinated to it or supervised by it like the State Forests and the National Fund for Environmental Protection and Water Management), and of units of the provincial administration (Voivodeship Offices). At the voivodeship level, Voivodeship Funds for Environmental Protection and Water Management also play a role in the funding of research.

The lists of projects financed by the KBN in the years 1991-1994 included respectively 34-53 subjects among accepted individual research projects on the state of the natural environment and different aspects of biological diversity. These were respectively 0.9-2.6% of all individual projects and 14-25% of the projects devoted to the problems of the natural environment. There were 5-13 projects (14-25%) concerned with the diversity of ecological systems, 8-15 (15-28%) with the species diversity of plants and 13-19 (25-36%) with the species diversity of animals. The issue of diversity at the genetic level is addressed by only 1-4 projects a year. Funding from the KBN for the completion of the aforementioned individual research projects accounted for 0.1-0.4% of the total designated for this kind of project and they may thus be considered relatively inexpensive.

In different years, other sources finance between several and as many as 30 research subjects concerned with biological diversity - mainly in forest areas or areas enjoying legal protection (National Parks and Nature Reserves).

An important condition in the effectiveness of scientific research is the availability of results and an effectively-functioning system allowing for the gathering and flow of information. Included within the system are, among other things, modern databases, pages on the Internet, regular scientific publications and books, and conferences, symposia, seminars, etc. The functioning of the aforementioned elements of the system varies greatly, but has changed for the better in recent years.

There has been particularly intensive development by R and D units of the processes transforming data into digital form. A number of these units have now made their results available at Websites. Nationwide, there are several hundred scientific periodicals concerned with nature, including several of international renown. The list also includes some from NGOs whose reach is usually confined to narrow groups of interest. Relatively few are interdisciplinary publications, including ones focusing on the issues of nature conservation, and there are none at all dealing solely with

biodiversity-related themes.

Each year several hundred symposia and seminars are organised within Poland. However, the majority of these are no more than regional in scope. Conferences of national or international rank are decidedly too few in relation to both needs and opportunities.

8.2 The level of scientific knowledge of Poland's biological diversity

Polish science has made undoubted achievements in the field of biodiversity conservation, as revealed in:

- the country's contribution in creating a scientific base, and outlining a strategy, for the conservation and restitution of the European bison *Bison bonasus* and other mammals,
- an extensive knowledge of the biology and ecology of the white stork *Ciconia ciconia*, and the conditions for its preservation,
- the results of research into the functioning of primeval populations and communities of forest in Bia³owieski National Park,
- the results of research into biological diversity and the threats to it in wetland areas, including peatlands,
- the results of long-term observations of the changes ongoing in National Park areas and in the lakes of the Suwa³ki and Mazurian Lakelands.

That said, knowledge on the status and variability of Poland's biological diversity does include a number of gaps, while knowledge of the different elements is very varied. The deficits in information concern all levels of organisation of living things.

At the genetic level, there remains little scientific information on the actually-existing genetic diversity of natural populations - most of the knowledge that is available is concerned with the theoretical aspect. Research in the field of population genetics is concerned with only two species of tree (the yew *Taxus baccata* and the larch *Larix decidua* - which are studied isoenzymatically), with the European bison and with several species of small mammal. Also lacking are data on the genetic diversity of populations of rare and threatened species and those reaching the limits of their ranges in Poland. Such data are essential if protective or restitution work is to be planned properly.

Information on the diversity of Poland's fauna and flora - even in relation to widespread, easily-identified and well-known species - is usually concerned with a few well-researched regions and cannot be related to the country as a whole.

Detailed information on the level of knowledge of species richness in different systematic groups is to be found in monographs. In the case of the fauna, catalogues and keys have been produced for about 30-40% of native species. These point to the degree of familiarity with the species diversity of animals in Poland. Such reconnaissance work on the country's flora and fauna has provided the basis for the compiling of Red Books of plants and animals that are endangered or threatened in Poland, and consequently for the extension of legal protection to many species.

The state of biological diversity at the levels of ecological systems (ecosystems, landscapes, etc.) is also not known fully. In addition, significant

difficulties occur as attempts are made to assess diversity in its dynamic and functional aspect.

9. THE SUSTAINABLE USE OF BIOLOGICAL DIVERSITY - CROSS-SECTORAL COOPERATION

The concept of sustainable development - implying economic, technical and civilisational development of a kind which does not damage the natural environment or deplete resources excessively - was introduced into law by a Resolution of the Sejm of the Republic of Poland of May 10th 1991. Policy based upon it directs the development of consumption, production and civilisation towards the long-term preservation of the environment's valuable features and resources, and hence towards its protection.

A further important step towards the achievement of sustainable development was the Resolution of the Sejm of January 19th 1995, which was adopted following a parliamentary debate on ecological issues and which requires that the principles of sustainable development be integrated into economic policy and strategies, and departmental programmes and plans. The Resolution makes close reference to Article 6 point b of the Convention on Biological Diversity, which provides *inter alia* that: "*Each Contracting Party shall, in accordance with its particular conditions and capabilities ... 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*."

The need for appropriate accommodations in the fields of environmental protection, health care and the rational use of natural resources to be reached at various stages of the economic decision making process is in fact anticipated in earlier legislation, as well as in that now being drawn up and enacted, *i.a.* as Polish law is adjusted to EU and OECD requirements, or as the provisions of international law, including conventions ratified, are incorporated. The effectiveness of the subsequent implementation process is increasing and the relevant institutional framework is being strengthened.

The Regulation of the Chairman of the Council of Ministers (i.e. the Prime Minister) of October 28th 1994 provided for the establishment of a government-level Commission on Sustainable Development. This was a forum at which programme documents, development plans and bills can be evaluated in relation to the assumptions of the State Environmental Policy. It includes representatives of all the Ministries and central offices (mostly at Under-Secretary-of-State level), as well as of the regional administration and the ecological funds. Also present at sittings on an *ad hoc* basis are invited representatives from the world of science and the NGO's, as well as the Chair of the Parliamentary Commission on Environmental Protection, Natural Resources and Forestry. The Commission for Sustainable Development itself is under the chairmanship of the Minister of Environmental Protection, Natural Resources and Forestry.

As the highest authorities within the central administration, the Council of Ministers and the Standing Committees subordinated it provide an appropriate forum for discussion and decision making regarding the

integration of sustainable development policy into policy in general, departmental strategies and economic programmes. The process is served by legal instruments in a set of ecology-related Acts which require consideration to be given to environmental and natural conditioning, human health and life, population, the protection of cultural heritage and social factors, irrespective of the system by which agreements are reached and opinions given. The obligation that conditioning of this kind be respected has also been introduced into many Acts and Regulations of government departments concerned with the economy, while regulations introducing liability for non-compliance with the law on environmental protection and nature conservation are now included in the Civil and Criminal Codes.

Poland is party to many global and regional conventions, protocols and agreements which assume an obligation on parties to introduce the principles of sustainable development into economic processes and the decisions associated with them.

The Commission on Sustainable Development has verified a series of development programmes for economic sectors (in particular those posing a direct threat to the environment). Among these are:

- *The Restructuring Programme for the Iron and Steel Industry;*
- *The Restructuring Programme for the Hard-coal Sector;*
- *The Restructuring and Privatisation Programme for the Oil Sector;*
- *The Restructuring Programme for the Heavy Chemicals Sector;*
- *The "Polska 2000 Plus" Strategy for the Spatial Organisation of the Country;*
- *Assumptions to the National Transport Policy;*
- *Assumptions for the Development of Public Transport;*
- *The Strategy for Poland's Socio-economic Development to the Year 2010;*

as well as programmes in the environmental protection, natural resources and forestry sector, e.g.,:

- *The Strategy for Water Management.*

In January 1996, the Sejm approved the assumptions to "*An Energy Policy for Poland to the Year 2010*". This has as one of its main objectives the introduction of a sustainable energy policy that takes account of economic, ecological and social criteria, and is integrated with economic and environmental policy.

The principle of sustainable development is fully reflected in the Act of August 29th 1997 on the Amendment of the Act on Environmental Protection and Management and the Amendment of Certain Acts. This contains the following provision:

"*Directed by the principle of sustainable development, the Republic of Poland determines to work towards:*

- maintenance of the renewability of natural resources;
- the rational use and substitution of non-renewable resources;
- limiting burdens on the environment and keeping within limits denoted by its resistance;
- the preservation of biological diversity;
- the safeguarding of the ecological security of its citizens;

- the establishment of conditions allowing businesses to compete fairly for access to limited resources and the opportunity to discharge pollution;
- ensuring the protection and rational shaping of the environment as a shared good of the whole nation; and the creation of conditions allowing all citizens to exercise their legally-enshrined right to equal use of valuable features of the environment ."

Appropriate legal bases have been created to improve administration at local level. At present the main planning documents employed at this level (that of the *gmina*) are:

- gmina studies on the conditioning and directions of physical development (obligatory), and strategies of socioeconomic development setting out development policy for gminas that are towns;
- different types of development programme (on public developments, land use, economic activation, environmental protection and management, etc.) that are operational in nature;
- local physical development plans and administrative decisions - of a regulatory nature, serving in the attainment of objectives set out in political and operational documents.

Most gminas are now in the process of drawing up studies on the conditioning and directions of physical development, in line with the 1994 Act on Spatial Planning which requires all gminas to be in possession of a document of this type by the end of 1999. Strategies for socio-economic development have so far been devised by about 30% of gminas, mainly those which are large towns. Many of these strategies emerged as part of programmes for local development of different types, including some funded from abroad. A number of urban gminas have set to work on documents which are to detail the principles and means by which the sustainable development concept is to be implemented. Amongst the documents drawn up are: for Warsaw - *Assumptions of Sustainable Development Policy* (1995), with the Policy itself now being worked upon; for Lublin - *Ecological Policy* (1996); for Wroc³aw - *Ecological Policy* (1996); for Ustka - *A Strategic Programme for Sustainable Development* (1996); for E³k - *A Gmina Action Plan for Sustainable Development* (1997) and for Radom - another *Gmina Action Plan for Sustainable Development* (again from 1997). All of these studies provide local-level development of recommendations set out in *Agenda 21* and include among the issues of nature conservation the question of the protection and rational use of biological diversity.

10. STRATEGY AND ACTION PLAN FOR THE PROTECTION AND RATIONAL USE OF BIOLOGICAL DIVERSITY

10.1 General outline of actions taken

There has long been a need for Poland to draw up a strategy and implementational principles for actions taken in the name of nature conservation. A primary impulse to initiatives in this field came with the *World Conservation Strategy*'s recommendations regarding the preparation of

national strategies which would offer more precise instruction and guidance adjusted to local issues and conditions, and hence take better account of the implementational possibilities of given countries. A first result in Poland was the 1991 *Strategy for the Protection of Living Natural Resources in Poland*, which formulated, as the basic aims of national policy in this area:

- the maintenance of the basic ecological processes and life-support systems;
- the retention of the genetic diversity of organisms;
- the safeguarding of the sustainable use of species and ecosystems.

The *Strategy* assumed that all measures taken to protect nature, and all economic tasks, should be planned and implemented with account taken of scientifically-documented evidence as to the functioning of ecological and landscape systems.

Also produced in 1991 was the *Polish Study on Biological Diversity*, which indicated the main directions of actions concerning different categories of valuable and/or threatened areas and species.

The first action plan targeted directly and indirectly at the conservation of biological diversity was contained in the *Executive Programme to the State Environmental Policy to the Year 2000*, which was approved for implementation in 1994.

The process of ratification of the Convention on Biological Diversity was preceded by multifaceted analysis of the possibilities for its provisions to be implemented. This analysis confirmed the great need for a national strategy for the conservation and rational use of biological diversity as understood by Article 6 of the Convention.

1995 saw the completion of a first working version of the national strategy for the conservation of biological diversity. This came to be regarded as valuable material whose use in further studies was anticipated.

In February 1996, UNEP offered the Polish Party funding from the Global Environment Facility (GEF) for the completion of a project entailing the drawing-up of a *National Strategy for the Conservation of Biological Diversity*, an *Action Plan* and a *First National Report to the Conference of the Parties to the Convention on Biological Diversity*.

In the course of negotiations linked with the above project, the Ministry of Environmental Protection, Natural Resources and Forestry recommended that the National Foundation for Environmental Protection be given the function of national executive agency. This proposal gained UNEP approval. The Ministry then called into being a Steering Committee for the project whose membership included authorised representatives of interested government departments and advisory bodies, as well as experts from the world of science and the NGOs. The tasks of the Committee are to offer opinions as to directions of action and to assess progress with the work.

10.2 Assumptions of the strategy and action plan

The Strategy for the conservation of biological diversity and the Action Plan have been based on four fundamental principles:

The principle of consolidation, entailing effort towards the maximum possible integration of actions for the conservation of biological diversity,

both in relation to departmental and interdepartmental actions or those concerning the state environmental and planning policies, and in relation to research, education, the law, the economy and monitoring - including as part of international integration. This principle is to favour the creation of a joint and comprehensive system for the protection and rational use of biological diversity, of which a part should be appropriately-prepared services subordinated to the state administration, non-governmental organisations, research and educational institutions, etc.

The principle of regionalization, which indicates a need for regional strategies and programmes of biodiversity conservation to be devised, and a decentralised administrative and monitoring structure responsible for their implementation set up.

The principle of "Europeanization" entailing the preparation of Poland for compliance with the binding Directives, Regulations and standards forming EU law, including those in the fields of environmental protection and biodiversity conservation, such as the "Wild Birds" Directive (79/409/EEC), the Regulation on the Conservation of Marine Mammals (348/81/EEC), the "Habitats" Directive (92/43/EEC) and the "Agri-environmental" Regulation (2078/92/EEC) which deals with the protection of biological diversity in rural areas, among other things.

The principle of socialization , expressing the need for mechanisms encouraging the participation of local communities in biodiversity conservation programmes, for the launching of local initiatives (e.g. the establishment of private/communal protected areas) as well as for the promotion of a feeling of linkage with a region's natural heritage and wider participation in the decisionmaking process.

In setting out the scope and methodology of work on the strategy and action plan, it was assumed that the document should be a multi-level one, taking account of:

- all levels of biological diversity,
- diverse forms of protection *in* and *ex situ*,
- all aspects contained in the Convention on Biological Diversity,
- international experiences to be found, *inter alia*, in the UN-recommended "National Biodiversity Planning".

The accepted principles and assumptions found reflection in all the aspects presented by the Strategy, amongst which the most important were:

1. *in situ* conservation of biological diversity
2. ex *situ* conservation of biological diversity
3. sustainable use of elements of biological diversity
4. monitoring of biological diversity
5. scientific research into biological diversity
6. increasing society's knowledge and awareness
7. management of data on biological diversity
8. access to biotechnology and its development and transfer
9. access to genetic resources
10. the environmental impact assessment system
11. economic and financial aspects of biodiversity conservation
12. international conditioning of Poland's implementation of provisions of

the Convention on Biological Diversity

The provisions of the Strategy and Action Plan were presented, and subject to ongoing consultation, at a series of seminars devoted, *inter alia*, to:

- a strategy for the *ex situ* conservation of wild animals;
- a strategy for the *ex situ* conservation of wild plants;
- a strategy for the *in situ* and *ex situ* conservation of crop plants;
- the role of scientific research in the recognition and conservation of biological diversity;
- the role of education in the conservation of biological diversity;
- a strategy for the conservation of livestock animals;
- the problems of the conservation of biological diversity in agriculture.

Running parallel with this work were consultations with experts and specialists from the central and local administrations, research establishments and NGO's.

The contents of the Strategy were also presented at two sessions of the Working Steering Committee. The broader composition of the second allowed it to take on the character of a National Workshop. In turn, the Committee's preliminary acceptance of the draft version of the Strategy allowed for more precise detail to be included in the working version of the Action Plan.

The draft Strategy and Action Plan approved by the Steering Committee are to be presented for agreement among:

- organisational units of the Ministry of Environmental Protection, Natural Resources and Forestry;
- the relevant Ministries and central offices;
- administrative bodies at local level;
- non-governmental organisations;
- the Commission on Sustainable Development;
- the Council of Ministers.

Once this agreement is achieved, the draft National Strategy and Action Plan will take on the status of an official government document. However, since the reports have yet to gain legal status, their presentation in the official First National Report is premature from both the formal and substantive points of view.

This is particularly the case for such crucial issues resulting from the draft Strategy and Action Plan as:

- the summary of strategic tasks and recommendations adopted for implementation, with accompanying establishment of priorities;
- the assignment of actions and tasks to different departments and central offices, economic entities, research establishments and non-governmental associations and organisations;
- the timetabling of the implementation of different tasks, reflecting in turn the priorities established;
- the budget for the Action Plan, with a determination of financial requirements in relation to operating expenses, capital purchases,

transport and field costs, etc.

However, it is possible to present the general strategic directions that should be taken into account in measures seeking to conserve and make rational use of biological diversity and the draft version of the Strategy does indeed include the following fundamental provisions:

- that the conservation of biological diversity should be considered a basic element of national policy pursued in line with the principles of sustainable development;

- that a particularly important strategic objective for biodiversity conservation in Poland is a raising of the level of society's nature-related culture by way of appropriate steering of education in schools of all types and in informal education. Only a society aware of the effects of degradation in nature will accept its protection, require appropriate action from its representatives in local authorities, parliament and government and adopt individual and collective lifestyles that are friendly to the environment and nature;

- that the conservation of biological diversity requires the direct targeting of an appropriate fraction of the national budget, as well as the creation of economic stimuli to the designation of such funding from local government budgets. The sums involved should go for the protection of endangered species and areas particularly rich in ecologically-valuable features, as well as environments safeguarding high biological diversity on the genetic, species and ecosystem levels;

- that the conservation of biological diversity must address nature nation-wide, irrespective of the degree to which the environment has been degraded or transformed. General programmes for biodiversity conservation should be part of physical development studies and plans, as well as a basic element of all environmental impact assessments;

- that the protection anticipated under the Act on Nature Conservation should be extended to existing areas of particular value from the point of view of biological diversity, as well as to wild species - and domesticated or cultivated varieties and breeds - that are threatened with extinction; and that special programmes for the conservation and restitution of the latter should be devised and implemented;

- that planning measures should afford appropriate protection to biological diversity, especially at the level of ecological systems in urbanised areas. This not only links up with the idea of biodiversity conservation, but also ensures suitable environmental conditions for the human populations in these areas;

- that agriculture should take particular care to not only maintain biological diversity at its present level, but in fact to raise it, in recognition of

the favourable consequences for production that ecological balance in the agricultural landscape can have. Agriculture also has a duty to protect the genetic resources linked to the old crop varieties and breeds of livestock that represent particularly valuable natural resources;

- that forestry should take particular care to adapt its managemental methods in productive forests to the principles of biodiversity conservation. Forests whose composition among all species (microorganisms, plants, fungi and animals) is a natural or near-natural one are the most biodiverse areas in Poland's climatic zone;

- that Poland, as a signatory to the Gdañsk and Helsinki Conventions, should continue to take successive coherent measures in line with its obligation to restore the biological resources of the Baltic Sea. The Baltic Basin is an area of high potential biodiversity which has been very much devastated by pollution;

- that the planning of measures by which to enhance water retention should involve total adjustment of hydrotechnical work to the principles of biodiversity conservation;

- that the relevant government departments should be required to pay greater attention to the influence of measures taken on the state of biological diversity. A requirement should be that negative consequences be minimised, and also compensated for by way of appropriate action to raise the natural value of neighbouring areas;

- that there is an urgent need for higher priority to be assigned to relevant research in the field of biological diversity - to be funded by the Committee for Scientific Research (KBN) or special targeted funds;

- that Poland should become more active in the international arena, where the creation and implementation of programmes of biodiversity conservation are concerned;

- that accelerated action is required to adjust Polish legislation and standards to those binding in EU and international law;

- that the system and mechanisms coordinating interdepartmental activity for the conservation and rational use of the country's biodiversity must be improved;

- that the considerable potential and ecological knowledge of NGOs should be applied much more widely in action for the conservation and rational use of biological diversity; and that these organisations should be given easier access to sources of finance for worthwhile projects and programmes relating to nature.

The attainment of these objectives should allow for the filling of

existing gaps between the current situation and the strategic intentions regarding the conservation and rational use of biodiversity that have been identified in the course of work on the Strategy.

The draft Action Plan, constituting an integral part of the Strategy, includes tasks to be implemented in the period 1998-2010. Indicated for each of these is the responsible unit or execution team, the deadline, an estimate of essential costs and a proposal as to the possible source of finance.

It is anticipated that, as in the case of assessments of the implementation of other national and departmental policies and strategies, so the *Strategy for the Conservation of Biological Diversity* and the *Action Plan* will be subject to periodic review and assessment of the progress of implementation work. Departments will reach agreements on the character of this types of analysis and the manner in which it will be carried out, as the formal process of approving the Strategy begins.

11. PARTNERS IN THE IMPLEMENTATION OF PLANS, PROGRAMMES AND STRATEGIES

The broad-scale implementation of measures to improve the state of the environment and to protect natural resources requires an understanding of the value of this work among society, business and the public administration at all levels. It is for this reason that both the *State Environmental Policy* and the draft Strategy and Action Plan formulate tasks for:

- central state bodies;
- provincial bodies of the governmental administration;
- local government;
- the business sector;
- research institutions.

The obligations and duties of citizens are also indicated as part of the effort to "socialise" the issues of nature conservation by bringing NGOs into the process of shaping social behaviour that is well-disposed to pro-ecological policy at the national level.

Under the law in force, each citizen has the right to use the environment and its resources, as well as a duty to protect them. This means that the role of the main groups in society in shaping the country's development should be unambiguously pro-ecological in character.

The central bodies of the governmental administration organise the country's economic life and social fabric. As such they have a responsibility to citizens where the state of the environment and the utilisation of natural resources are concerned. However, their fundamental tasks in line with provisions of the Convention on Biological Diversity are to include the conservation and sustainable use of biological diversity in departmental and interdepartmental plans, programmes and strategies.

The objectives defined in the *State Environmental Policy* for bodies in the public administration, entities in the business sector and NGOs are a good basis for the implementation of the detailed tasks presented in the draft

Strategy and Action Plan.

An ever greater role in the country's sustainable development is played by co-participation on the part of local authorities. Poland's administrative system is made up of 2486 local governmental units (gminas, towns and city districts). After 1989, these gained broader decision making powers, as well as sources of finance by which they might implement their own programmes. Regrettably, however, the money at their disposal remains insufficient in relation to needs.

Since 1993, local government bodies have been in receipt of informational materials concerning sustainable-development-related measures at gmina level. In turn, in 1995, the Ministry of Environmental Protection, Natural Resources and Forestry prepared, and presented the provincial (voivodeship) administration with "*Methodological Guidelines and Directions of Action for the Drawing-up of a Voivodeship Environmental Protection Programme*". This guides regional services of the central administration in the devising and implementation of longer-term regional programmes for environmental protection and sustainable development. These types of programme are a local-level development of the recommendations in "Agenda 21", and a number of gminas have now completed work on them and begun implementation. The work has been supported by international regional programmes, such as the EU's STRUDER programme for regional development, as well as by programmes of border cooperation.

In 1994, the Office of the President of the Republic of Poland joined the regional administration in organizing a competition for the most ecological gmina in Poland. The aim was to promote the pro-ecological programming of development at local level. 169 rural gminas and 139 urban/rural gminas took part.

Recent years have also seen increased interest in the sustainable development process among Poland's business and industrial sectors. This phenomenon has in large measure been a "forced" one, following the consistent application since the early 1990s of economic instruments founded upon the "user pays" and "polluter pays" principles.

The interest of business circles in the so-called "win-win strategy" was also aroused by the introduction and consistent application of a system of fees for the use of the environment and fines for non-compliance with the law, as well as preferences, state aid and targeted funding for enterprises engaging in pro-ecological activity. The new generation of managers and businessmen is ever more likely to perceive the promotional benefit of opportunities to market their own products in appropriately-announced programmes for environmental protection, as well as the results of bringing in cleaner technologies. There is considerable interest in state-sponsored actions promoting the principles of sustainable development in industry, mainly among small and medium-sized enterprises. Particular examples are:

- the programme of clean production implemented under the auspices of the Ministry of Industry and Trade and the Ministry of Environmental Protection, Natural Resources and Forestry;
- the establishment of the Chemical Industry Centre for Ecological Management (*Centrum Zarz¹dzanie Ekologicznego Przemys³u*

Chemicznego);
- the establishment of the Polish Sustainable Development Council (*Polska Rada Ekorozwoju*) formed by representatives of business and financial circles;
- the introduction to management programmes at enterprise or plant level of the EMAS, ISO 9000 and ISO 14 000 standards;
- the marking of energy-efficient installations and machinery and preparatory work in relation to the "eco-labelling" of products;
- the introduction of excise duty on plastic packaging, with simultaneous relief for returnable packaging.

In the last 5 years, some 435 pilot programmes of clean production have been implemented, with 63 plants or enterprises receiving the relevant certification in 1996.

Scientific and technological circles have long participated in the processes by which sustainable development principles (including those for the conservation and sustainable use of biodiversity) are devised and introduced. Indeed, the process began long before sustainable development came to take on a legal dimension. Representatives from the world of science play an active part on various commissions, committees and councils, as well as in the initiative-taking and advisory bodies cooperating with the central administration. These include:
- the governmental Commission on Sustainable Development;
- the Commission on Environmental Impact Assessment;
- the State Council on Environmental Protection;
- the State Nature Conservation Council;
- the Coordinating Council on Research Programmes.

Programmes for the conservation of biological diversity are launched by scientific institutes and subject-related committees of the Polish Academy of Sciences, especially its Divisions of the Biological, Agricultural and Forest Sciences. Natural R and D backup for implementing government programmes is provided by the departmental institutes subordinated to different Ministers. Scientists also cooperate in an advisory or executive capacity with the majority of the ecology-related NGO's.

Ecological societies and movements are a particularly important focus of cooperation between the administration and society. On the one hand, their non-conformism, unconventional perception of reality and criticism make them an exceptionally important factor correcting actions taken by the administrations at central and local levels. On the other hand, their high intellectual potential, dynamics of operation and organisational abilities allow them to proceed from the initiation of ideas through to the wider mobilisation and activation of society. More than 1200 pro-ecological NGO's have appeared in Poland in the 1990s. Most of these are established by people with a concrete aim in mind. They are for the most part characterised by a high turnover of members and a lack of stable funding. Poland also has foundations and institutes with highly-qualified personnel at their disposal, as well as relatively modern technical infrastructure. These organisations have relatively-assured funding or are able to generate it from business

activities engaged in. Some NGO's engage also in commercial activities, but differ from commercial-law companies in designating their income to ecological activity defined in their statutes. In general they are well able to compete on the services market for public contracts, against departmental institutes and commercial firms at home and abroad.

Specialists from the administration and from NGO's worked together to compile a *Report on Cooperation between the Ministry of Environmental Protection, Natural Resources and Forestry and Non-Governmental Ecological Organizations*. This revealed that one of the basic hindrances to the functioning of NGO's is the lack of a stable system of financing.

12. SOCIETY'S ACCESS TO ASSESSMENTS AND REPORTS

The Constitution of the Republic of Poland and other legislation guarantees the rights of the country's citizens and organisations to check on the activities of the authorities, to co-participate in the decision making process and to challenge decisions in the courts. Conditions for the accessing of information on the environment are to be found in relevant provisions of the amended Act on Environmental Protection and Management enacted by the Sejm in 1997.

As part of a process to enhance the effectiveness of organisational structures, an Office for Information and Contact with Society was established within the Ministry of Environmental Protection, Natural Resources and Forestry. Its tasks include to safeguard the proper flow of information and to work in consulting bodies of The Ministry of Environment, Forestry and natural Resources as well as to represent Poland in international meetings together with representatives of the administration.

Work is also ongoing on the manner in which to establish, and the mechanisms by which to finance, a network of regional information centres and databases, as well as on the ways in which to call upon and authorise representation from among NGOs in cooperative ventures with the administration, including even at international level.

The State Environmental Protection Inspectorate (PIOŒ) developed a programme for the provision of computer information systems to the Ministry of Environmental Protection, Natural Resources and Forestry under the name of the "Œ*RODOWISKO*" (Environment) Integrated Computer System. The programme details the organisational conditioning of the system, its structure, the main partners who will work to establish and make use of it, the technological solutions employed, the manner in which it is to be set up, a timetable for establishment and details of the way in which given undertakings are to be funded. The components of the "ŒRODOWISKO" system include not only functional modules designed for the organisational servicing of the Ministry, but also a series of subject-related subsystems (including "*PRZYRODA*" - i.e. "NATURE") from which information will be made available to all interested parties.

Poland is one of several countries with a UNEP/GRID centre. An Agreement entered into by the Minister of Environmental Protection, Natural Resources and Forestry and the Executive Director of UNEP, which was

signed in September 1991, led to the establishment of the GRID-WARSAW Centre within the structure of the National Foundation for Environmental Protection. It was only the third centre of its type in Europe, and only the 7th in the world. From the time of its establishment, the Centre has played an active part, both at home and at international fora, in the generation and dissemination of information on the environment, including on biological diversity. In 1993, it produced Polish and English versions of a report entitled „The State of the Environment in Poland" which discussed, *i.a.* the state of biological diversity and actions taken for its conservation. The publication was entered by the Ministry of National Education on its lists of handbooks for biology, geography and environment-related subjects at primary and secondary school levels. An updated version of the report has recently been published on the Internet, accessible via the server of the Ministry of Environmental Protection. In addition, as part of international cooperation, the Centre has worked on the production of the "ELADA 21" electronic atlas, which has given priority to the issues of biodiversity conservation.

Project work within the CORINE Programme has in turn created numerical databases that describe the most valuable refuges for plants and animals (CORINE-Biotopes), and land cover (CORINE Land Cover), as well as inventorying the air pollution emitted by industrial plants (CORINAIR). The information in these bases is accessible to anyone interested, at home or abroad.

13. In line with the recommendations of "Agenda 21", the documentation of available sources of information is of key significance. In Poland, this function is served mainly by the "INFOTERRA" Centre established at the Institute of Environmental Protection.

13. *Annex 1* POLAND ON THE EVE OF THE 21ST CENTURY

Located in the centre of the continent, Poland is Europe's 9th largest country in area (at 312,700 km^2) and 8th largest in terms of population (with 38.6 million people). Its neighbours are the Federal Republic of Germany, the Czech Republic, Slovak Republic, Ukraine, Byelorussia, Lithuania and the Russian Federation's Kaliningrad District. In addition, the 528 km shoreline of the Baltic Sea forms approx. 15% of the country's border.

Poland is in the temperate zone, with a climate transitional between Western European Oceanic and the Eastern European Continental. The transitional status ensures considerable variability in the weather from day to day and from year to year. Mean annual temperatures vary from 3^{o} C in the mountains of the south to 8^{o} C in the west-central part of the country. Mean yearly precipitation totals are in the range 550 mm – 1300 mm (with the respective extremes in the central part of the country and in the mountains).

There is a wide variety of types of relief, but lowlands occupy 91% of the country and uplands only 8% (with true mountains accounting for only about 1%). The mean altitude is 173 m.

The present landscape is almost entirely anthropogenic in character, with changes having been wrought by agriculture, forestry, and development (of settlement, industry and transportation), leading to habitat fragmentation and the creation of barriers isolating species populations. New types of ecosystem have also been created, including those of strip mining, spoil heaps and reservoirs. The intensity of human activities depends on land use patterns and reaches the highest level in the Southern Central Poland. More than 60% of the country is agricultural, and within this area 76% is arable and 22% grassland. Thanks to the continuous existence of private land ownership (family farming) the landscape remains very heterogenous, with small fields separated by boundary strips and mosaic cultivation. Nevertheless, the last 25 years have witnessed a decline in the area of land used in agriculture.

Forests cover over 28% of Poland, with most of the country lying within the zone of mixed forest. However, human intervention has ensured the predominance of coniferous forest, mostly of *Pinus sylvestris* and including monocultures of this species. Northern areas have broad-leaved forest with an admixture of Norway spruce (*Picea abies*), or a forest of beech (*Fagus sylvatica*), while mixed forest dominated by pine occurs in the south, along with multi-species broad-leaved forest. The forest cover of different regions varies greatly, with central voivodeships provinces having as little as 11%. The present situation contrasts markedly with that of the late 18th century, when forest still covered about 60% of the country. The two World Wars caused particularly significant losses in forest ecosystems, but the post-War period has been characterised by a steady increase in cover.

Aquatic ecosystems (flowing and standing waters, including reservoirs) occupy about 3% of the country. The total length of rivers, brooks, larger streams and drainage channels is estimated at about 98,000 km, of which about 40% is of greater significance to the functioning of Poland's river

system. Almost 99.7% of the country is within the drainage basin of the Baltic sea, which is mainly fed via the systems of the Vistula and Oder. The Vistula is one of the last large rivers in Europe with a largely unregulated course. It creates a unique environment with a diverse flora and fauna. Most of the country's lakes are in the north and north-west, with an estimated 9300 covering more than 1 ha. The number of large reservoirs is estimated at 140.

There has been an increase in the area of abandoned land in recent years. This has mainly resulted from limitations to the agricultural utilisation of land in the east, where poor soils make agriculture unprofitable, as well as in the north-west, where most of the large, unprofitable state farms have been closed down.

Among unused land an important category is that of marshes and peatlands. The most extensive of all are the 1400 km^2 Biebrza Marshes – Poland's largest natural store of water. In addition, there are five large areas with raised bogs – two in the north, one in the east and two in the south. Fens are present throughout the country, prevalent in the east, and few in the south.

Water management, especially drainage, has ensured that the majority of the country's wetlands have dried out to a greater or lesser extent. This has had obvious and significant effects on flora and fauna: effects which have only been enhanced by more than 14 years of drought. Mean annual precipitation of 622 mm in the years 1951 to 1980 compare to 587 mm for the period 1981–1985, and only 568 mm in the years 1989–1993. Raised bogs and transitional peatlands have been most affected, and while drainage has also led to the disappearance of small ponds in fields and of areas with trees or shrubs.

Poland is among the most biodiverse countries in Europe, as a result of favourable natural conditions and variable human impacts of lesser intensity than in many other countries. The wealth of flora and fauna in some areas is unique not only for Europe, but for the whole world. In an effort to preserve these riches, the country has long been developing diverse forms of legal protection for plants and animals and their habitats. The system of protected areas (National Parks, Nature Reserves, Landscape Parks, Areas of Protected Landscape, etc.) now extends over more than 26% of the country, and there are plans to bring more valuable areas under protection. Extensive ecosystems of national or international significance are linked by ecological corridors of ECONET, and a strategy for their protection is now being drawn up.

Poland has about 370 types of plant association, of which 12% are considered endemic. Primary vegetation is mainly retained in single wetland areas and on rocks, including the high mountains. However, a natural or semi-natural character, with the initial floral composition, has been maintained by some extensively-utilised or unexploited forests, as well as some marsh or peatland communities and lightly-grazed mountain grasslands. Synanthropic (mainly segetal and ruderal) communities account for about 14% of the total, but cover more than 55% of the country.

Some plant communities are in the process of change, with recent decades witnessing the disappearance of 3 of the 280 lowland species, the decline of

a further 55 and the endangerment to a greater or lesser degree of almost 130.

Observations carried out over many years have led to some 33,000 species of animal being recorded in the terrestrial and aquatic ecosystems of Poland. Among them are 38 relict species and 36 species that are endemic. The last several hundred years have seen the extinction or disappearance of an estimated 62 species, while 130 are currently on the verge of extinction or highly endangered. Indeed, the list of species threatened to greater or lesser extents is a much longer one which runs to 1318 species, and which is being supplemented continually. Among the vertebrates, only 10% of species are not in decline.

By European standards, Poland has an averagely-high population density of approx. 120 people per km^2. The total population of 38.6 million includes 62% in urban areas and the remaining 38% in rural areas. The most densely populated are the large urban agglomerations of Lodz (740 per km^2), Warsaw (630) and Katowice (more than 580). The north and north-eastern areas have much lower population densities, mostly in the range 40–50 people per km^2.

The community system includes 58,000 localities, of which 860 are towns or cities supporting a total of 24 million people. Population density in large cities is moderate. The 42 cities with more than 100,000 inhabitants support 30% of the whole population and approx. 50% of urban residents, while more than half of the towns and cities (450) are inhabited by fewer than 10,000 people.

Poland is a relatively homogeneous country as far as nationality is concerned. More than 98.8% of the populace declare themselves Polish, while there are 350–500,000 people who are German in their cultural and linguistic traditions, 250–300,000 Ukrainians and Lemeks, 250–300,000 Byelorussians and smaller numbers of Romany people, Lithuanians, Slovaks and Jews. Since people are free to determine their own allegiances in terms of nationality, the above data can only be regarded as estimates.

Administratively, Poland is divided into 2483 gminas (communes) and 49 voivodeships (province). Gminas form a basic territorial unit and the first selfgovermental level. Gmina authorities are elected, while voivodeships are part of the central government structure.

The manner and conditions of management at gmina level are set out in the Act on Local Self-government from 1990. This Act relates to all gminas, irrespective of whether they lie within agglomerations, towns or rural areas. Gminas are legal entities have municipal property at their disposal and perform public tasks in their own name and at their own responsibility. In particular, they are obliged to supply drinking water to the population, and to organise systems for the receipt and treatment of wastewaters and the collection and disposal of municipal refuse. Gminas may form unions with one another or enter into municipal agreements or associations. They run their own financial affairs on the basis of a budget enacted by the gmina council.

Gminas are not authorised to set taxes and cannot engage in economic activity extending beyond tasks of public utility. Similarly, most powers relating to conditions for the use and protection of the environment are not

in the hands of gminas but reside with the central administration. However, gminas do have basic powers in planning and spatial management by way of enacting local spatial management plans (of gmina regulation status), on the basis of which Decisions Concerning Building Conditions and Land Use are issued.

Discussions continue in relation to a possible reform of power structure, including that of local self-government. Consideration is being given to the introduction of a second level of local authority called powiats. Work is also underway on a Act concerning the organisation of urban agglomerations (metropolitan areas).

Poland's present political and socio-economic situation is the product of the dynamic, sometimes even revolutionary, changes which have occurred since 1989. It may now be said that Polish society did make the most of a historic opportunity and – through great political efforts and economic sacrifices – was able to overcome a conditioning rooted in the past, which hindered the sustainable and free development of the country. Some unfavourable conditions had their genesis in World War II as well as its political and economic consequences for the world, especially for Central and Eastern Europe. Following the capitulation of Germany, decisions taken by the victorious powers saw Poland left in the zone of influence of the Soviet Union, on the eastern side of the Iron Curtain. Political domination by the USSR gave rise to political and economic changes. Industries and banks were nationalised, an attempt at the collectivisation of agriculture along Soviet lines was made, democratic freedoms were curtailed and one-party government was introduced. The economic system functioned on the basis of central planning and gave preference to an inefficient, raw materials-based model for the development of industry. There were chronic shortages of funds for other purposes, including environmental protection. In some places the intensity of the resultant harmful impacts had become so great by the early 1980s that materials from the then Central Planning Commission forced official recognition of the fact that 11% of the country, with almost 40% of its population, was within areas threatened ecologically.

From 1989 on, Poland passed quickly along the road to comprehensive changes in the political and economic system. Far-reaching economic change began after January 1990, with a view of transforming an outdated centrally-planned economy into a modern one based on the principles of the free market. The private sector underwent strong development, to the point where it accounted for 62% of employment by 1995. Small businesses and trade were rapidly privatised, though the process was slower where large enterprises were concerned.

Nevertheless, the transitional years 1989–1991 saw a deep (18%) decline in industrial production and GNP unprecedented in Poland's peacetime history. Only in 1992 did it begin to seem that the recession was ending, as some growth was noted in the economy (a rise in GNP of 2.6%). The rise was greater in 1993, at almost 4%, and increased further to 5% in 1994 and 7% in 1995. Estimated data for 1996 suggest a maintained rate of growth in GNP of 6%.

Poland's economy has a chance to sustain this high rate of growth and to pursue the qualitative and structural changes that have begun, in future

years. This will require accelerated restructuring and re-development of the existing productive potential, growth in foreign trade, further reductions in inflation and an improved situation where public finances are concerned. At the same time there must be a continuation of the policy seeking to improve standards of living, and especially to reduce unemployment, which remains a serious problem.

Political and economic changes after 1989 also had a favourable influence on the fulfilment of requirements relating to environmental protection. 1991 saw Parliament approve the programme entitled the National Environmental Policy. This set out detailed aims and actions to improve the environment and represented an acceptance at the highest level of society economic progress based on the principle of sustainable development (most often referred to in Poland as „eco-development"). These principles also form an integral part of other important government documents – the Strategy for Poland and the Outline Concept for Socio-economic Development to the Year 2010.

Systemic changes in Poland's economy, combined with strengthened requirements for those polluting the environment and the imposition of fines, have a fundamental influence on action in the technological and organisational spheres. Since the beginning of the 1990s, real expenditure serving environmental protection has risen. Indeed, expenditure equivalent to 464 million USD was even made in 1990, in the face of Poland's deepest economic crisis of the post-War period. The following year – the first year of operations of the National Fund for Environmental Protection and Water Management – saw these expenditures rise by almost 80% to 800 million USD. In 1994, pro-ecological expenditure reached 1 billion USD, and in 1996 near 1.5 billion USD. Expenditure on environmental protection accounts for more than 1% of GNP (1.1% in 1995), and more than 6% of all investment outlays in the economy. This investment activity is very largely (95%) financed from domestic sources, with more than 50% of the sum deriving from the Funds for Environmental Protection and Water Management and the Bank for Environmental Protection. It should be added that support for environmental undertakings remains a relatively new phenomenon in Poland, albeit an element of banking that is developing rapidly.

Increased environmentally sound investment has been combined with efforts to use primary raw materials more effectively to reduce emissions to the environment. The years 1989–1995 saw an approx. 12% decline in the amounts of wastewater discharged to surface waters, including a decline of more than 30% in untreated discharges. Emissions of particles and pollutant gases declined significantly by (40% in the years 1989–1995 in the case of nitrogen dioxide, by approx. 24% in the case of particles and by 30% in the case of carbon dioxide). These emissions are concentrated in highly-industrialised regions and derive mainly from the power generation sector. The total amount of waste generated has also declined by approx. 15%.

Due to the installation and operation of nearly 1500 combined sewage treatment plants from 1992 onwards, as well as reductions in the amounts

of untreated sewage discharged to surface waters, a favourable change in the quality of inland waters, particularly rivers, has been observed. However, the strict requirements set forth for classification in Polish law ensure that a statistical assessment of water quality (especially in relation to microbiological and physico-chemical indices) does not yet reflect this better situation. Even so, the analysis of partial measurement results, points towards a clear improvement. Comparative results from monitoring carried out by the State Environmental Protection Inspectorate show that the period 1992–1995 witnessed an improvement in river quality in all groups of pollutants. The results of a reliable assessment involving the obligatory parameters suggests that the extent of water polluted to an excessive degree has declined from 23.6% to 12.6%.

What remains a serious problem is the inadequate number of sewage treatment plants in large urban agglomerations, and also discharge of wastewater from rural areas which are not served by sewer systems. An additional major problem is the management of wastes, which has been carried on for many years in a disorganised and random manner.

In recent years, Poland has strengthened its contacts in the international forum, with new cooperation agreements in the sphere of environmental protection entered into with almost every neighbouring country the majority being with European countries and the USA and Canada. The country also played an active role in many regional programmes embracing, for example, the Baltic Sea Basin, the Green Lungs of Europe, the Eastern Carpathians and the Lower Oder River.

Poland's willingness to heed the principles of sustainable development has been confirmed many times in the international arena, as attested to by, amongst other things:

- signing by representatives of Poland of the final documents from the UN Environment and Development Conference (the so-called Rio Earth Summit) of 1992;
- a relevant entry in the Agreement of Association with the European Communities (Article 71 point 2 of December 16th 1991, which states that „...The policy for the economic and social development of Poland should be directed by the principle of sustainable development. It is essential to guarantee that the requirements of environmental protection be fully included into this policy from the very beginning...");
- the signing or ratification of more than 40 regional or global conventions concerning the environment;
- international co-operation within the framework of the Environment for Europe programme, including approval of the documents from the Conferences of Ministers held in Lucerne in 1993 and Sofia in 1995.

Poland is working towards political and economic integration with the countries of Western Europe and fellow member countries of the OECD. Obtaining Associate Status to the European Union in 1991 also provided a framework for the gradual development of free trade in goods and services and the free flow of capital. In turn, the country was accepted into the OECD in July 1996.

14. Annex 2 A GENERAL CHARACTERIZATION OF POLAND'S BIOLOGICAL DIVERSITY

13.1 Introduction

Descriptions of the status of biological diversity tend to focus most on threats to it, as these indicate the directions of protective measures. However, this does not mean that biological diversity is especially threatened in Poland. Indeed, quite the reverse is true, with this country having a greater wealth of biodiversity at all levels of organization than most other European states. There are still regions with the traditional agricultural management favouring the retention of old livestock breeds and crop varieties, while wild species include many endangered elsewhere in Europe. In some cases, Polish populations may sustain those in the continent as a whole (as in the case of the aquatic warbler *Acrocephalus paludicola*, the white stork *Ciconia ciconia* and the otter *Lutra lutra*). Similarly, Poland has many objects at the highest organizational levels (those of ecosystems and landscapes) that are very valuable on the world scale. Examples here are the Bia³owie¿a Forest and the Biebrza Marshes. A detailed description of the status of biological diversity in the country may be found in Andrzejewski and Weigle (1993).

13.2 The status of genetic diversity and the threats to it

Little is known of the genetic diversity of most of Poland's wild species, but theories from population genetics suggest that the greatest threats face those populations whose gene pools are limited. Such a situation applies to those at the limits of their ranges ("selected for" through the action of defined extreme conditions), as well as endemic and relict species (with their small, isolated populations) and those in sites isolated from others.

At 59, the number of endemics in the Polish flora is limited. One reason is the lack of natural barriers (the continuity of habitats to the east and west). Another is that the flora is a relatively young one which appeared following interrupted development during the Pleistocence glaciations affecting all of what is now Poland. The greatest numbers of endemic species are found in the Carpathian, Tatra and Sudetic Mountains.

36 endemic invertebrates have so far been described (Andrzejewski and Weigle 1993). Most are again montane species associated with the Carpathians. Also of great significance to biological diversity are the 40 relict species (Andrzejewski and Weigle 1993) whose origins ensure them a relatively narrow range of ecological tolerance, and hence a greater likelihood of extinction, than species of greater plasticity. The relicts largely occur in the habitats most vulnerable to destruction or transformation, like peatlands or xerothermic grasslands. Relict species of Arctic mollusc are to be found in the Baltic.

A high proportion of Poland's invertebrate species occur at the limits of their ranges. Between 7 and 50% of species in the 16 best-studied faunas at the class, order, sub-order or family levels are in this category, including 29% of the country's earthworm species, almost 50% of its chilopods and more than 37% of its ants.

Within the vertebrate fauna, some migratory fish have isolated and discontinuous ranges. The populations of wild salmon *Salmo salar* in different Baltic rivers provide an example which is a significant element in the genetic diversity of this Sea's anadromous fish.

Amphibians include the Montandon's or Carpathian newt *Triturus montandoni*, which is confined to these mountains, as well as 5 species at the northern limits of their ranges.

In turn, most of the country's 9 reptile species have small, isolated populations, with relicts at the limits of their ranges including the Aesculapian snake *Elaphe longissima* and the European pond terrapin *Emys orbicularis*.

Among birds, almost 60 are at the limits of their ranges, while among the mammals there is one (probably full) species confined to the Baltic (the ringed seal *Phoca hispida*) and one rodent endemic to the Tatra Mountains (the Tatra pine vole *Pitymys tatricus*). These are augmented by 4 relict species (the alpine marmot *Marmota marmota*, the spotted souslik *Spermophilus suslicus*, the snow vole *Microtus nivalis* and the chamois *Rupicapra rupicapra*). Finally, no fewer than 30 of Poland's mammal species are at the limits of their ranges.

The endangerment of relict and endemic species is a clear threat to genetic diversity. By their very nature, such species have populations that are confined in area and limited in size. However, another type of threat is posed by any kind of limitations on panmixis which result for example when habitats are fragmented, or bisected by linear structures (roads, railway lines, etc.). Such isolating factors have a particularly marked impact on specialized species.

13.3 The status of species diversity and the threats to it

13.3.1 Prokaryotes

The well-known groups are largely those parasitizing plants, livestock or humans. Considerable attention has also been paid to the microorganisms responsible for diseases among insects that do damage in agriculture and forestry. In contrast, knowledge of the natural occurrence of viruses and bacteria in Poland is very poor.

The statuses of blue-green algae are known to varying extents. An estimated 800 species occur - mainly in freshwater, where they may generate blooms that are harmful to other organisms, as well as in soils. They are of significance as bioindicators, showing increased representation in plankton where water pollution is more severe. Indeed, as most of the species are associated with fertile or polluted waters, it would be difficult to regard this group as threatened in Poland.

13.3.2 Fungi and lichens

The best-known group are those with large fruiting bodies. Among these species, some 25% (1013) are included on the "Polish Red List of Plants"[1]. Threats result mainly from the disappearance or degradation of habitats, air and soil pollution, and uncontrolled picking which destroys habitats as well as depleting numbers of fruiting bodies. Noted more recently, the disappearance of mycorrhizal fungi has been linked to industrial pollution (acid rain with sulphur compounds) and pollution by nitrogenous compounds. Further losses are occurring among species associated with disappearing communities (like those of wetland habitats). Equally, there are some species - including protected species - which are in fact increasing.

The slime-moulds are not well-known but it is thought that c. 40% of native species are endangered. Declines are due to pollution of the air and consequently the soil, as well as to the disappearance of communities of higher plants with which the different species are associated.

The Red List also includes 602 lichen taxa (c. 38% of the national total). Epiphytic and epixylous species are the most endangered, with the severest threats being posed by industrial emissions of SO_2 and NO_2 and emissions from transport. Inappropriate forestry management

[1] This list of plants threatened in Poland (from the Institute of Botany of the Polish Academy of Sciences, Kraków, 1992) categorizes species as Ex - extinct, E - endangered, V - vulnerable, R - rare; - brought back from the verge of extinction and I - of indeterminate status. An analogous list has been compiled and published for animals (Department of Nature and Natural Resources Conservation, Kraków 1992). The so-called "Red Books" (also separately for animals and plants) are broader works which also set out the reasons for endangerment and the survival prospects of different species.

in the form of clear-cutting and the destruction of old trees and roadside avenues also has an unfavourable influence, as do changes in water relations. Collection for pharmaceutical purposes constitutes a further direct threat.

13.3.3 Algae

The algae form another inadequately-known group, among which the Red List includes 256 species. The greatest threats to freshwater communities are posed by pollution with sewage and effluents; the eutrophication of bodies of water following the runoff of biogenic compounds from fields; the heating of waters by power stations; the salinification of waters by mining; regulation and the building of hydrotechnical installations and drainage. In turn, the poorly-known soil-dwelling species are threatened by the pollution of soils and the air (acid rain).

With the exception of a few brown or green species, most sessile macroalgae of the Baltic may be considered rare or threatened as a result of the pollution of coastal waters.

13.3.4 Liverworts

Virtually all of the c. 250 species in Poland are threatened to some extent, although the Red List only includes c. 20% of this total. The epiphytic species are most threatened - by reduced air humidity, while those of wetlands are declining as these habitats disappear. Species living on decaying wood are also declining, as are representatives of the autumn flora of cultivated fields (probably as a result of fertilizer use and the sowing of catch crops) and species associated with such disappearing habitats as xerothermic grasslands.

13.3.5 Mosses

The Red List considers only c. 20% of the 900 species present in Poland. The most important factors posing a threat are the pollution of waters and the air, the disappearance of wetland habitats, the destruction of old tree stands and the increased use of chemicals in agriculture.

13.3.6 Vascular plants

Over 400 of Poland's more than 2300 such species are entered on the Red List (i.e. nearly 20% of the native flora). The threats to different groups are similar: habitat destruction (as a result of the drying-out of wetlands and urbanization), industrialization and the associated pollution of waters, air and soils, and tourism. The species most threatened are those of aquatic communities (especially oligotrophic ones), peatlands, marshes and xerothermic habitats, as well as the sessile vascular plants of the Baltic Sea.

Another type of threat is that posed by direct contacts between closely-related taxa. These are made possible by the disruption of the natural occurrence of species and they facilitate hybridization. Many species able to hybridize with crop plants are threatened in this way.

Also endangered is a group of plants associated with man, but now disappearing as traditional agricultural methods are replaced and considerable areas of light soils taken out of cultivation. Examples here include the weeds associated with the cultivation of flax, as well as some weeds of cereals. Equally, there are a certain number of species which are declining in their natural habitats but present in abundance in anthropogenic ones. A classic case is that of some otherwise rare orchids that occur in heavily-industrialized Upper Silesia.

Table 2.1. Protected and threatened species of fungi and plants (after Zarzycki *et al.* 1992, modified)

Systematic group	Pr	Ex	E	V	R	I	Total threa-tened or extinct	% of Polis h flora
Slime-moulds		24			13	51	88	40
macrofungi*		71	172	188	296	286	1013	25
lichens*		60	180	120	127	115	602	38
algae		29	21	84	93	29	256	
liverworts			26	5	14	5	50	20
mosses		4	17	45	29	41	136	20
vascular plants	209	40	54	142	146	36	418	19

Pr - protected, Ex - extinct, E - endangered, V - vulnerable, R - rare, I - of indeterminate species

* numbers of protected species are not given on account of discrepancies in the systematics of these groups. Several tens of fungi species and several hundred lichens may be assumed to be protected.

13.3.7 Invertebrates

Knowledge of the occurrence of invertebrates across Poland is very uneven and different systematic groups are also known to differing extents. It is however clear that the most-threatened species are stenotopic in nature, of higher trophic levels or associated with clean waters (e.g. mayflies - more than 30% threatened, bivalve molluscs >70%, aquatic snails 50%, leeches 44% and sponges 37.5%). On land, the species most threatened are those of peatlands, moist thickets and carr, wet meadows, xerothermic habitats and fir or spruce forests.

Direct threats to a given species may entail collection or capture for food or trade, or vandalism, but the list of species suffering in this way is much shorter than that of species being eliminated in a more indirect manner. Thus, among the terrestrial snails and slugs, only one of the several tens of threatened species is in such a situation as a result of direct activity. The most important causes of the indirect threats are the destruction or modification of habitats or ecosystems, though the main dangers for parasites are threats to their host species.

The dynamics to the population declines in many invertebrate groups are not well known. Relatively exhaustive data are available for terrestrial snails and slugs, orthopterans, bees, some Lepidoptera and ants.

13.3.8 Fish

Poland has 116 fish species, of which 23 are alien. This group is well-known, on account of its economic significance, but the Red Book's inclusion of only 8 species of fish plus 3 of lamprey does not provide a realistic picture of threats to Poland's ichthyofauna. A great richness of species has been preserved in rivers which retain their natural character - like the Narew and Bug and their tributaries, the rivers of east-central Poland, some sections of the Odra and Bóbr basins and sections of the Middle and Upper Vistula.

Rivers in other parts of the country - including the Warta, Pilica, those in the Danube drainage basin and the Nida - have seen many species disappear and the structure of the

ichthyofauna change. In turn, the sturgeon *Acipenser sturio* and the fifteen-spined stickleback *Spinachia spinachia* have disappeared from the Baltic recently and many other species are threatened there.

Other important factors threatening diversity among fish are drainage and the regulation of rivers, as well as the introduction of alien species. Thus the release of cyprinids into some lakes has caused native plant-eating species to decline.

13.3.9 Amphibians and reptiles

18 species of amphibian occur in Poland, along with 9 species of reptile. Of these, all are threatened and under species protection (albeit confined to the spring period in the case of 3 species of frog). In contrast, the Red Book only lists 3 species of reptile and 2 of amphibian.

Amphibians are threatened by drainage and the disappearance of small bodies of water, by the use of chemicals in agriculture, by the barriers posed by transportation routes and the increasing traffic on them, and by the introduction of fish to bodies of water where they were not present previously. The most-threatened of the country's amphibians is the Carpathian newt *Triturus montandoni*.

In turn, declines in reptile populations are the result of the disappearance of habitat and breeding areas, as well as human persecution. Most-threatened are the European pond terrapin *Emys orbicularis*, and the Aesculapian snake *Elaphe longissima* - a species occurring at the limits of its range.

13.3.10 Birds

365-370 bird species occur in Poland at present, of which 229 breed. Perhaps the most threatened taxa are the plovers and sandpipers *Charadriiformes*, the owls *Strigiformes* and the birds of prey *Accipitriformes*. A total of 67 species are listed in the Polish Red Book.

17 of Poland's 54 regularly-occurring plovers or sandpipers are in the Red Book and on the Red List. The majority of the threatened species are associated with wetlands, so the greatest losses to populations are brought about by the drainage of meadows, regulation and building along rivers, pollution, the intensification of agriculture in river valleys and changes in land use and agrotechnical measures.

In turn, 6 of the 13 owls are listed by the Red List and Red Book, although all but the tawny owl *Strix aluco* are scarce or very scarce. The threats to most are posed by the redevelopment of tree stands and the declining area of large forest complexes.

Thirteen species of bird of prey are to be found in the Red Book. The main threats to them are:

- the pollution of the environment with pesticides, PCBs and heavy metals, which reduce reproductive success and increase mortality;
- the development of tall infrastructural elements (e.g. overhead cables, masts and chimneys) which increase the number of fatal collisions;
- active persecution (by hunters, fishermen, pigeon fanciers and the rural population);
- the anthopogenic disturbance of breeding processes and sites;
- an increase in the number of vehicles increasing the number of fatal collisions.

In addition, a threat to all birds beyond those resulting from habitat destruction and pollution is posed by the activities of wandering cats, which attack nests and broods.

13.3.11 Mammals

About 90 species of mammal are present in Poland, while the Red Book includes 30. The most threatened orders are *Chiroptera* (the bats) and *Carnivora* (the carnivores).

Particular threats to bats (of which the Red Book lists 6 species) result from their migratory habits, difficulties in finding appropriate wintering and breeding sites, changes in building construction (a lack of attics) and the use of pesticides.

The country's theriofauna now includes 16 wild species of carnivores. The European mink *Mustela lutreola* has been lost in the present century, while gains to the fauna are the alien raccoon-dog *Nyctereutes procyonoides*, American mink *Mustela vison* and raccoon *Procyon lotor*.

The country's significance in protecting biodiversity is related to the presence of large carnivores like wolves *Canis lupus*, lynxes *Lynx lynx* and brown bears *Ursus arctos*, as well as small ones like the steppe polecat *Mustela eversmanii* and the wild cat *Felis sylvestris*. The otter *Lutra lutra* is also noteworthy on account of the scale of the threat to the species throughout Europe. Two of the large species - the brown bear and wolf - have tended to increase in the last twenty years, while the lynx population has declined.

Notable among the rodents is the beaver *Castor fiber*, whose numbers have increased as a result of successful reintroductions. In contrast, the small Tatra Mountains population of the Alpine marmot *Marmota marmota* is very much threatened. The declining souslik *Spermophilus suslicus* is confined to the Polesie region, while the so-called common hamster *Cricetus cricetus* - at the limits of its range - is also becoming rarer and rarer.

Dormice (family *Gliridae*) are also now scarce and threatened, mainly as a result of the disappearance of old trees from forests.

Also showing a clear decline is the population of chamois *Rupicapra rupicapra*, confined to Poland's small area of high-mountain habitat.

All four species of marine mammal are rare and threatened. The isolated Baltic population of common porpoises *Phocoena phocoena* numbers only c. 1000 individuals, while the grey seal *Halichoerus grypus* reaches the Polish coast on migration only and the common and ringed seals *Phoca vitulina* and *Ph. hispida* are recorded occasionally.

Major threats to mammal species diversity and the sizes of populations are also posed by:

- habitat changes, including the fragmentation of ecosystems, the drying-out of large areas of marshes and peatlands, the destruction of watercourses and small bodies of water, the cutting of planted trees in the middle of fields and the pollution of the environment;
- the development of the transportation network, which interrupts the natural ranges of populations, limiting migration possibilities and free interbreeding and raising mortality among mammals. Species particularly likely to die on roads include hedgehogs *Erinaceus europaeus*, small mustelids and badgers *Meles meles*;
- feral dogs and cats, which attack badgers, foxes *Vulpes vulpes*, raccoon-dogs, hares *Lepus europaeus*, roe deer *Capreolus capreolus* and small mustelids;
- the poaching of all hoofed species, most of the carnivores, hares and marmots.

Table 2. protected and threatened animal species
(according to the Polish Red List, G³owaciñski 1992, modified)

Systematic group	**Pr**	**Ex + Ex P**	**E**	**V**	**R**	**O**	**I**	**Total threa-tened or extinct**	**% of Polis h fauna**
Mammals *Mammalia*	59	3	5	2	17	2	3	32	35
Birds *Aves*	291	8	12	14	23	3	9	69	19
Reptiles *Reptilia*	8	0	0	0	2	0	0	2	11
Amphibians *Amphibia*	15	0	2	0	0	0	1	3	33
Fish *Pisces*	22	1	1	0	6	0	0	8	7
Cylostomes *Cyclostomata*	3	0	0	2	1	0	0	3	60
Bivalve molluscs *Bivalvia*	4	1	7	9	8	0	0	25	73
terrestrial snails and slugs *Gastropoda terrestria*	5	0	12	28	35	0	2	77	44.5
aquatic snails *Gastropoda aqua.*	0	0	4	7	16	0	1	28	50
Hymenoptera (excl. *Apoidea*)	0	0	4	15	52	0	1	72	.07
Bees *Apoidea*	25	15	3	38	115	0	52	220	48
Caddisflies *Trichoptera*	0	0	1	29	41	0	3	74	28
Butterflies and moths *Lepidoptera*	13	12	46	116	342	0	10	526	11.5
Orthoptera	1	6	4	6	8	0	2	26	25
Stoneflies *Plecoptera*	0	4	9	8	12	0	1	34	31
Mayflies *Ephemeroptera*	0	1	14	10	10	0	4	39	32
Arachnids *Arachnida*	5	0	3	0	5	0	0	8	0.3
Malacostracans *Malacostraca*	0	1	2	11	23	0	2	39	32
Leeches *Hirudinea*	1	0	0	3	8	0	0	11	44
Sponges *Porifera*	0	0	0	0	3	0	0	3	37.5

Pr - protected species, Ex - extinct, E - endangered, V - vulnerable, R - rare, I - of indeterminate status.

13.4 Biological diversity at the ecosystem level

13.4.1 Terrestrial ecosystems

The considerable diversity of terrestrial ecosystems is a reflection of the great variability in soil and climatic conditions in Poland. In line with the Braun-Blanquet classification, 295 associations or parallel units have been identified in the country. Among these:

- 35% are moderately-common associations present throughout the country or in most of its regions;
- 26% are moderately-common associations present in some regions;
- 21% are rare associations present at only a few sites;
- 13.5% are associations often encountered throughout the country or over considerable areas of it;
- 4.5% are associations with uneven distributions.

Particular rare - and hence threatened - terrestrial ecosystems are those of steppe, saline, sandy, wetland and montane habitats, represented *i.a.* by the following communities:

- primitive communities of saline habitats of the class *Thero-Salicorniatea*
- pioneer communities of coastal dunes of the class *Ammophilatea*
- halophilic meadow/rush communities of the class *Asteretea*
- Euro-Siberian calamine grasslands of the class *Violetea calaminariae*
- thermophilous steppe-like grasslands of the class *Festuco-Brometea*
- communities of the class *Scheuchzerio-Caricetea fuscae* and order *Scheuchzerietalia* (transitional peatlands and *Caricetalia davallianae* of carbonate bogs)
- raised bogs (class *Oxycocco-Sphagnetea*)
- willow scrub (class *Salicetea herbacea*)
- alder carr and willow scrub in marshland habitats, representing the classes *Alnetea glutinosae-Myrico-Salicetum auritae* and *Betulo-Salicetum repentis*
- xerothermic pine forests on limestones (class *Erico-Pinetea*)
- from the class *Vaccinio-Piceetea* - dwarf pine scrub and high-mountain bilberry scrub, upper montane forest, sub-boreal spruce forest, upland fir forest, coastal crowberry communities and sub-oceanic marshy birch scrub
- acidophilous oak woodland (class *Quercetea robori-petreae*);
- from the class *Querco-Fagetea* (European broadleaved forest): thermophilous oak woodland and hazel scrub, riverine forest, river floodplain vegetation in large river valleys, mountain alder forest, sub-oceanic oak-hornbeam forest, maple/lime forest on slopes, thermophilous beech woods on limestone and mountain sycamore forest.

Rare non-forest communities

Xerothermic vegetation is present at many sites in Poland, but the total area is small and the vegetation type very much threatened. For example, the Lublin Upland has lost 27% of communities in the class *Festuco-Brometea* in the last 40 years. The threat is posed by inappropriate agricultural and forestry management, the increased use of chemicals in agriculture and air pollution.

Halophilic communities occur in five parts of Poland fed by saline waters, namely: the coastal belt, the Wielkopolska/Kujawy area, the £êczycki area, the lower Nida and the Carpathian Foothills.

The existence of such communities as xerothermic grasslands, communities of saline

habitats and mountain meadows is dependent on grazing and mowing. The abandonment of such management leads to rapid succession and the overgrowing of these kinds of vegetation.

Also particularly threatened are communities in the extreme habitats of coastal dunes, rock fissures and scree, as well as those of water-heads.

The communities of wetland ecosystems are very important for the functioning of nature, but are also among the most threatened. This is particularly true of peatlands, which account for 28.9% of the wetland area, as well as non-peat areas which take 71.1% and which may be linked in their genesis with topogenic or fluviogenic situations. 10.2% of Poland's wetland area is still in a natural state, while the remaining areas are to varying degrees dried out and modified. Research has shown that 90% of hydrogenic habitats have undergone some drying and hence been changed to a greater or lesser extent.

An unfavourable phenomenon is the increase in tall vegetation on wetlands. Such areas - mainly meadows - can only be maintained with traditional management and regular cutting of the vegetation. Abandonment of these activities leads to rapid changes in the cover, with the development of scrub and the alteration of valuable features of the biotope. The result is frequently the disappearance of many herbaceous species, and hence the impoverishment of the species diversity of the entire ecosystem.

Forest and scrub communities

The forests that have been retained in Poland are mainly on soils and in areas that are relatively unsuitable for agriculture. The dominant type of forest habitat is of oak *Quercus* and hornbeam *Carpinus betulus* together, but forestry management in the past led to the domination of pine *Pinus sylvestris* and spruce *Picea abies* over much of the country.

According to the accepted Strategy for Protection of Forest Biological Diversity in Forests special attention should be paid to:

- riverine, marshland and floodplain forests (with elm, alder and ash, willow and poplar or alder);
- coastal forests, including pine forest with crowberry *Empetrum nigrum* or wintergreen *Pyrola* close to the shore, acidophilous oakwoods, mixed forest and beech forest;
- montane forests, including montane beech forests or oak-hornbeam forests and acidophilous oak-hornbeam stands in the foothills;
- boreal and sub-boreal forests, including coniferous and mixed/coniferous forests at the north-eastern limits of the occurrence of spruce;
- lowland oak-hornbeam forest.

Threats to the biological diversity of forests result from the model of forestry management adhered to until recently (the introduction of species that did not accord with the habitat, the use of non-native species or varieties, the development of single-species stands, etc.), as well as drainage, the pollution of the air and groundwaters and the fragmentation of the forest landscape.

13.4.2 Freshwater ecosystems

Highly-threatened ecosystems of this type include oligotrophic lakes in the mountains, as well as those of the so-called "lobelia" type occurring mainly in the Pomeranian Lakeland. The danger results from vulnerability to eutrophication and the low resistance of the organisms present to such changes. Dystrophic lakes within forests are also threatened, being vulnerable to drying-out, eutrophication and acidification. The lowering of the water table may be a factor threatening all lakes.

The most threatened of the plant communities of freshwater ecosystems are:

- some associations of the class *Charetea* (underwater stonewort meadows);
- communities of shallow dystrophic waters (*Urticularietea*).

Besides pollution, construction and regulation along rivers seriously threaten biological diversity, disrupting environmental conditions in corridors and adjacent areas and impoverishing the typical flora and fauna. The destruction of riverside areas of marsh and floodplain leads to higher unit flows by reducing the retention capacity and promoting the destruction of ecotonal zones.

13.4.3 The Baltic Sea Ecosystem

A characteristic feature of the Baltic ecosystem is the high zoogeographical diversity of species of differing origin. At present, the fundamental natural factor shaping diversity is the Sea's low level of salinity. This limits the occurrence of many groups of stenohaline sea organisms, as well as freshwater ones. In consequence, diversity is low compared with other seas, and the number of species declines with decreasing salinity in the direction from the Danish Straits to the north. Subject to the greatest changes are the deep-water ecosystems of the Bornholm, Gdañsk and Gotland Deeps. In the last 50 years, a long-term oxygen deficit has led to the virtual elimination of macroscopic life from the sea bed, with the zone of water below the halocline experiencing considerable limitations on the occurrence of plankton and on reproduction among fish.

The highest diversity is characteristic of inshore areas, whose location in turn ensures that they are threatened with degradation. A characteristic feature of this zone is the lack of any sharp boundary between the ranges of occurrence of marine and freshwater species.

£awica S³upska (the S³upsk Bank) is a unique region from the point of view of the diversity of benthic communities. This area is well separated from sources of pollution and so remains in a largely natural condition. The seabed here has a diverse sessile vegetation and a bottom fauna created by communities of *Mytilus edulis* and *Gammarus salinus*. Still present in the area are plant species extinct in the Gulf of Gdañsk or not even noted in other regions of the Polish zone.

The only area in the Polish zone to have extensive "underwater meadows" of macroalgae and vascular plants is the Bay of Puck. Unfortunately, the unique sessile plant communities in the Bay have been significantly impoverished in the last 20-30 years. The most threatened community is *Zosteretea marinae*.

High diversity also occurs in other inshore regions in the Gulf of Gdañsk and the Kêpa Or³owska area.

The most serious threats to biological diversity in the Baltic Sea are considered to be:

- the processes of eutrophication, which promote phenomena like a decline in water clarity limiting the development of macrophytes, an intensification of oxygen deficits, an increase in blooms of toxic algae and the consequent disappearance of some plant species and also of areas where fish spawn, pass their early lives and feed;
- the excessive or inappropriate exploitation of living resources, thus changing the structure of the whole ecosystem;
- the physical destruction of biotopes through shoreline construction changing the movement of shingles (e.g. the port in W³adsys³awowo), bottom fishing, the exploitation of aggregates and oil and dredging. A further important factor is tourism and the associated development of coastal infrastructure;
- the influx of pollutants, including biogenic compounds, heavy metals and pesticides. The main sources of pollutants are urban and industrial wastewaters, as well as increasingly chemical-intensive agriculture;

- the introduction of alien species capable of causing significant changes to the structure and functioning of the marine ecosystem. Their introduction may be intentional (in the course of aquaculture) or unintended - by way of ballast water, fishing implements and baits, the provision of organisms for aquaria, etc. At least 50 species have been introduced to the Baltic in the last 100 years, mainly with ballast water.