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**Article**

## Biodiversity as an ecological safety condition: The European dimension

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**AGNIESZKA RZEŃCA\***

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**Biodiversity As An Ecological Safety Condition.  
The European Dimension**

**Abstract**

*Contemporary research concerning the benefits (services) of the ecosystems (environment) confirm the rank and significance of the natural environment and its resources for shaping humanity's well-being. Particularly highlighted is the need to protection of live natural resources to preserve biodiversity, which is essential for retaining the basic ecological processes and providing the sustainability of usage of these resources. Consequently, protection of biodiversity is not only an environmental issue, but also an economic and social issue involving the well-being and quality of life of society. Thus, biological diversity is an essential condition for providing ecological safety, retaining the continuity of natural processes, and conditions the quality of life and economic potential.*

*The main purpose of the paper is to indicate the theoretical bases of biodiversity protection from the perspective of the natural and economic sciences, and to describe the diversity of biodiversity protection levels in the EU states. A specific aim is to indicate the forms and instruments of nature conservation involved in biodiversity protection, and to carry out an overview of established nature conservation programmes in selected EU countries. In order to accomplish such a complex aim, this article presents an overview of literature found in the natural, economic and legal sciences and popular magazines presenting scientific research within the field of biodiversity. Then a comparative analysis is presented based on the statistical data coming from various international statistics resources (OECD, EUROSTAT, EEA).*

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**Keywords:** *biodiversity, biodiversity protection, forms of nature protection, Natura 2000, ecological safety conditions*

## 1. Introduction

The organic and non-organic natural environment is rich in elements of practical value with multiple functions of crucial meaning for human existence. It is a capital that serves to meet both biological and esthetical human needs and conditions their manufacturing activity and well-being (Śleszyński 2000, p.13). Every form of human activity happens in the natural environment, but this environment changes and transforms and human activities disturb the processes happening within the natural environment itself and leads to structural transformations, the consequences of which human beings have not been aware of over many thousands of years (Olaczek 1988). Together with the accelerated civilizational development of the “third wave”, the idea of a “return to nature” has resurfaced. *Thorough development*– taking into account the diversity and richness of cultures created by peoples, a new outlook on nature from the view of the continuity of processes happening within itself, and the restoration and durability of natural systems - has become more and more meaningful (Toffler 1997, pp. 441–468). Contemporary research concerning the benefits (services) of ecosystems (environment) confirm the rank and meaning of the natural environment and its resources in the creation humanity’s well-being (Costanza 1997). Of particular importance is the protection of live natural resources in order to retain that biodiversity which is essential to maintain the basic ecological processes and provide for the sustainability of use of these resources.

The quality of the natural environment, and above all biological diversity, will play an ever-increasing role not only in retaining natural capital but also in building up the resistance and adaptability of ecological systems. On the other hand, the dynamics of economic and social processes and the intensity and diversity of human activity increases the demand for places (areas) of rest and regeneration of psychophysical strengths. In particular, the inhabitants of industrial regions and industrial or highly urbanized areas look for peace and silence in places outside their life and work environments.

Ecological safety, which yields biological diversity, can be compared to financial markets. A diversified portfolio of species resources, similarly to securities, may protect against the fluctuations in environment (or a market), which causes a decrease in individual categories of the resources.

This stabilizing effect of “a bio-diversified portfolio of resources” may play a significant role inasmuch as the changes in the environment are happening quicker and quicker owing to global warming and other effects of human activity (Kalinowska 2008, p. 17).

The main aim of the article is to indicate the theoretical bases of biodiversity conservation from the view of the natural and economic sciences, and identification of the diversity of biodiversity conservation levels in the European Union countries. A particular aim is to indicate forms of environmental protection which act as an instrument of biodiversity protection, and present an overview of the established nature conservation forms in selected EU countries. In order to accomplish such a complex aim, this article presents an overview of literature found in the natural, economic and legal sciences and popular magazines presenting scientific research within the field of biodiversity. A comparative analysis is presented based on the statistical data from multiple international statistical resources (OECD, EUROSTAT, EEA).

## **2. Biodiversity protection – origin, core and purposes**

Biological diversity is a term referring to the diversity of organisms on every level – from the genetic varieties belonging to the same species through to species diversity and finally ecosystem diversity. The diversity of living organisms, their morphological, physiological and behavioural characteristics, is the result of evolution processes lasting for millions of years.

Ehrlich P. and Wilson E.O. postulate that the potential number of species on Earth is between 90-100 million (Ehrlich, Wilson 1991, pp. 758-762). There is no precise data on the potential number of species, however, scientific circles speak unanimously with one voice about the necessity of biodiversity protection. The Living Planet Index<sup>1</sup> shows that the biospherical conditions are decreasing dramatically. From 1970 till 2003 the index decreased for 31% for terrestrial species, 27% for sea species, and of 28% for freshwater species.

The biggest losses are recorded in the tropics. The main sources of negligence in the scope of biodiversity protection result from the untrammelled fulfilment of basic economic needs, civilizational expansion, and political

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<sup>1</sup> Living Planet Index, rate of a living planet worked out in cooperation with WWF and United Nations Environmental Programme – UNEP, which estimates biodiversity on the basis of trends in over 3600 populations of 1300 vertebrate species in the world. Among them, data of 695 land species, 344 freshwater species and 274 sea species has been analyzed. <http://www.wwf.pl/informacje/publikacje/inne/lpr2006final.pdf>

decisions. The loss of biodiversity does not trigger instant results, does not influence the level of meeting needs associated with lifestyle, and the benefits of biodiversity are not recognized by the recipients (Kalinowska 2008, pp. 17–18).

Current opinions, especially those of naturalists, have been supported in recent years by economists. Due to the research devoted to ecosystem services, a financial dimension has been assigned to biodiversity, which explicitly proves the necessity for undertaking protective activities. A priority is the protection of living natural resources on every level of organization, which is essential for maintaining the basic ecological processes and providing the sustainability of resource usage. This means preserving the natural capital, both with respect to quantity and quality, which is necessary to guarantee the maintenance of self-reproduction mechanisms (*World Conservation Strategy* 1980).

Biodiversity conservation aims at “preserving the whole natural richness and providing the sustainability and possibility of development of every level of its organization (intraspecific, interspecific, overspecific)” (*Krajowa strategia ochrony...*, 2003, p. 18) Particular emphasis is put on biodiversity conservation of habitats and wild flora and fauna, which are determined by genetic and species diversity and also anthropogenic conditions.

All conservation categories designed to serve biodiversity protection include: scientific protection, partial protection and landscape protection, and have to consist of:

1. recognition and monitoring of the biological diversity conditions and existing potential threats;
2. removing and limiting current and potential threats to biological diversity;
3. retaining and enriching the existing elements and restoring the vanishing elements of biological diversity,
4. integration of those activities necessary for the sake of biological diversity with those activities important for the protection of economic sectors and public administration and society (including non-governmental organizations) (*Krajowa strategia ochrony...* 2003, p. 18).

The international dimension of biodiversity was recognized at the Rio Summit and later the Johannesburg Summit, where it was indicated that the global economy is 40% based on biological products and processes.

One of the purposes of the sixth environment action programme of the European Community 'Environment 2010: Our future, Our choice' is environmental protection and biological diversity, which is to be implemented on every area at different levels of territorial organizations and should concern both used and developed lands as well as significantly degraded lands, and mostly species and habitats which are rare or endangered. Former international activities aimed at and crucial for biodiversity protection, i.e. the Bonn Convention, Ramsar Convention, CITES, National Heritage of UNESCO, accomplished it only in a narrow scope.

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For this reason the European Strategy 2020, which treats the resource-economic problem comprehensively, including the biological resources and their derivatives (landscape), currently has key meaning and crucial importance.

### 3. Biological diversity and its economic dimension

Together with the civilisational development of the “third wave”, the concept of comprehensive development - with diversity and cultural richness created by the peoples and a new outlook on nature - becomes more important from the view of the continuity of processes happening within themselves, and the renewal and stability of natural systems (Toffler 1997). According to current economic thought, natural resources are economic goods and retaining natural capital is an essential condition for stable and sustainable development (Jankowska-Kłapkowska 1993). Natural environmental resources are treated as capital assets from the economic perspective, where nature capital co-exists with anthropogenic capital and it is both its original source and complement.

The role and meaning of biological diversity for the economic system is confirmed by the research concerning “ecosystem services”. This is a new methodological approach which presents ecosystem processes and products as material and non-material benefits for human beings. The research conducted by Constanze R. allowed to differentiate 17 functions of ecosystems and assign to each of them material and non-material benefits, and then estimated the global monetary value of the ecosystem benefits at over 33 trillion USD (*The Millennium Ecosystems Assessment...* 2005). Thus, economic matters currently decide about the level and type of biodiversity protection; from the perspective of economics, devastation of nature is identified with capital decrease, which leads to reducing its value and income inflow.

Data concerning biodiversity losses and its pace is alarming. It is estimated that the pace of species extinction is caused by human activity and is a thousand times faster than the “natural” pace typical for the Earth’s entire history. During the last two decades, for instance, 35% of mangrove forests have disappeared. Some countries lost even up to 80% of mangroves, as a result of their transformation for the sake of aquaculture their excessive exploitation, and storms.<sup>2</sup>

Currently, biological resources (flora and fauna) cannot be treated *a priori* as renewable resources, although they were treated as such for hundreds of years.

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<sup>2</sup> For more, see: *The Millennium Ecosystems Assessment*, Global Assessment Report 1: Current State and Trends Assessment. Island Press, Washington DC.; *The Millennium Ecosystems Assessment*, Living Beyond Our Means: Natural Assets and Human Well-being. Island Press, Washington DC.

Those resources that undergo a continuous anthropogenic impact become a non-renewable source (Sweeney 1993, p. 22). Even acknowledging, however, biological resources as renewable, it has to be highlighted that their potential is not stable, it can increase or decrease depending on the scale of use and the rules governing its use (Woś 1995, p. 131). Renewable resources also “react” to environmental changes (pollution, water shortage, climate change), and both the conditions for regeneration are changing as well as their quantity and condition. Managing these resources should be based on the principle of so-called ‘sustainable yield’, which is about retaining the quantity of resources on the same level, and using only their growth. This is connected with the sustainability criterion of ensuring the continuity of existence, ability for restoration, and high quality of a renewable resource (Pearce 1986, p. 3). Efficient management is supposed to retain the dynamic sustainability of ecosystems, where the resource usage rate cannot be higher than the self-renewable or regeneration rate.

The strong anthropogenic impact is enhanced by the fact that biological resources (biological diversity) are a type of public goods, and nobody is in the legal ownership of them. Public goods, in contrast to private goods, are exposed to an excessive common usage and usually uncontrolled access. Harding explicitly indicated that resources i.e. landscape, air, water, biological diversity etc., which from their nature are common (public) goods and are present in a closed system (a limited world), are condemned in advance to destruction, and he defined their co-usage as “the tragedy of common goods” (Harding 1992, pp. 91-105). He drew attention to the fact that common and unlimited access to public environmental goods threatens them with excessive and irrational usage, and in consequence degradation and irreversible loss. The consequence of human wasteful economy is currently raised as an issue of “environmental poverty”, understood as a shortage of basic environmental resources or their poor quality.

According to H. Daly, market mechanisms do not possess the ability to estimate a socially desired scale of resource usage and effective allocation of limited resources. In case of public goods, the market does not reveal the preferences in terms of supply and demand, and not all external effects (production and consumption) undergo internalization. Mechanisms that regulate and correct the scale and intensity of anthropogenic impact and set the rules of the usage of natural resources should be motivational and preventive comprehensive instruments. A crucial question is biodiversity protection in conditions of sudden and very often uncontrolled spatial processes that lead to permanent changes in the natural environment (e.g. agricultural land usage structure change, suburbanization, transport infrastructure developments), where market bonds are not able to optimally regulate environmental management (Fiedor 2002).

#### **4. Environmental protection forms as an instrument of biological diversity preservation**

The multi-functionality of the natural environment and the possibilities for competitive usage of natural resources, and their loss of the characteristics of free goods means that legal-administrative regulations are essential to retain the sustainability of their existence.

In order to protect the most valuable species and their habitats and diversified ecosystems and landscape, they are put under legal forms of environmental protection. Environmental protection forms are to preserve the spatial integration of valuable lands that undergo anthropogenic impact. Metropolitan areas need a cohesive network of protected areas in order to retain the sustainability, resistance and stability of their already weakened environmental system.

The established forms reflect current trends in environmental protection, beginning with conservation, strict protection, to active and landscape protection, requiring environmental users to act in such a way as to retain, renew and build environmental capital. Another reason for protection in current conditions is to retain aesthetic values and avoid degradation of valuable fragments of natural or cultural landscape. Implementation of environmental protection forms is also an expression of the maturity of a country's or region's citizens, and becomes part of accomplishment of the human development concept, which is understood as a "process of a multiplication of human choices" with respect to the time and scale of usage of available capital, in this case environmental capital. It is also a choice of particular development policy, the basis and priority of which is to preserve environmental capital.

It also constitutes a particular ecological investment. In this context, it may be assumed that protected areas have an economic value, which consists of the following benefits:

1. habitat-forming (the so-called "economic neighbourhood benefit") – stabilizing and improving the potential of the areas (lands) that are within the scope of the protected facility;
2. bio-innovative - including all the benefits from retaining and multiplying the gene fund and biocoenotic fund as current sources of potential lands (genotype, more efficient ecosystems);
3. "attracting" - resulting from the benefits coming from different economic branches which may use the nature potential to stimulate development;
4. financial, where nature is a value, a wealth in itself (Krzyszowska-Kostrowicka 1988, p.47).



The basic criterion for developing environmental protection forms are: represented natural values and the level of their naturalness; meaning for the ecological system of a region (area) or country; way and level of usage and land development; scale and volume of anthropogenic impact. National states individually make decisions as to the scope and activities of protection and nomenclature of the established forms, however, it is characteristic that the idea and purposes of protection are almost identical. National parks and natural reserves, both in Europe and in the world, despite their diversity are the most transparent form of protection, one that highlights remarkable transnational individual characteristics, unique natural values, and their importance and need of protection (Table 1).

**Table 1. Comparison of environmental protection forms in EU states with respect to their subject and scope of the protection**

Poland	France	Czech Republic	Germany
<b>National park</b>			
Park narodowy	Parcnational	Národní park	National park
<b>Nature reserve</b>			
Rezerwat przyrody	Réserves naturel	Národní přírodní rezervace	Naturschutzgebiet
<b>Protected landscape area (park)</b>			
Park krajobrazowy	Parc naturel régional	Chráněná krajinná oblast	Landschaftsschutzgebiet
<b>Nature monument</b>			
Pomnik przyrody	-	Přírodní památka	Naturdenkmal

Source: own work based on the literature mentioned above, red. Burchard-Dziubińska M., Drzazga D., Rzeńca A., Wydawnictwo Uniwersytetu Łódzkiego, Łódź 2014.

Polish natural landscape parks refer, by their idea of nature and cultural landscape protection, to the much earlier-established Natural Regional Parks in France. In the case of France, the initiators and promoters of their formation are local governments. They are also responsible for managing the park. Establishing this form of environmental protection not only serves for the protection of nature and cultural land values, but is also a tool that helps to combine economic and ecologic requirements in rural environments. Characteristic in managing this form of environmental protection is co-management (citizen management), activity integration in the scope of environmental development and protection, combining nature conservation with regional development and integration of local communities and minimizing conflicts (Burchard-Dziubińska, Drzazga, Rzeńca 2014).

In the case of Germany, equivalents of Polish landscape parks and protected landscape areas have been established. Nevertheless, these forms are definitely more rigorous (with a more strict regime) than in Poland. On the other hand, in the Czech Republic, equivalents of the Polish nature reserve are „Národní přírodní rezervace”, and „Přírodní památka”, and also „Přírodní rezervace”, which has a similar form.

For the sake of systematization, but also for carrying out comparative analysis of the environmental protection forms established in the world, the International Union for Conservation of Nature (IUCN) worked out a set of eight categories of protected areas, six of which were accepted by the UN as official categories of protected lands in 1992. The bases for classification assumed were: existing natural values, condition of their preservation, ways of management and usage.

In order to preserve endangered natural habitats and plant and animal species on a European scale, a European ecological network Natura 2000 was founded. The purpose of the network is to preserve biological diversity through protection of the most valuable and rare elements of nature, and also the most typical, still common natural systems characteristic for bio-geographical regions (e.g. alpine, Atlantic, continental). The programme Natura 2000 meets the demand for creating an integrated network of biologically active areas, both natural as well as semi-natural, on the basis of four basic principles, aimed at retaining the:

1. continuity of ecosystems in time;
2. continuity of ecosystems in space;
3. diversity of ecological niches;
4. compatibility between biotic environment and its abiotic conditions (Andrzejewski 1983, Andrzejewski 1985).

Although the Natura 2000 network is non-spatial, it will be a crucial element in the coherent spatial system established on a European level, because it suits the idea of a spatial Pan-European Ecological Network (PEEN), which is an instrument for implementing decisions of the Pan-European Biological and Landscape Diversity Conservation Strategy. PEEN construction is based mainly on the existing forms of legal protection and it is supposed to preserve not only biological diversity but also landscape diversity in Europe. The bases of the network are going to be: interchanging areas (cortical), wildlife corridors and their buffer zones, and areas that undergo re-naturalization, which improve the network's coherence and in the future may become cortical areas or wildlife corridors (van Opstal 1999).

## 5. Biological diversity in the European Union countries – a comparative analysis

Species diversity is estimated within a very broad range. The potential number of species on Earth varies between 3m to 100m (May 2010, pp. 41-42). The “Catalogue of life”<sup>3</sup> records 1.5m species. The estimated percentage of undiscovered plants amounts to approximately 13%–18% (Joppa, Roberts, Primm 2010, p. 554-559). Biological diversity and its degree of identification is difficult because natural processes are very dynamic and they are not readily put into statistics or even generalizations. An additional obstacle is the question of the “peelability” percentage of species and further research and professional personnel (including not only scientists but also enthusiasts). These conditions, however, should not be used as an excuse to not collect, use, process and make new data available.

**Table 2. A set of chosen key indicators of biological diversity of the EU, serving for the assessment of progress in the area of biological diversity loss prevention**

Problematic areas	Indicators
Status and trends of the components of biological diversity	<ul style="list-style-type: none"> <li>• Trends in the abundance and distribution of selected species</li> <li>• Change in status of threatened and/or protected species</li> <li>• Trends in the extent of selected biomes, ecosystems and habitats</li> <li>• Trends in the genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance</li> <li>• Coverage of protected areas</li> </ul>
Threats to biodiversity	<ul style="list-style-type: none"> <li>• Nitrogen deposition</li> <li>• Trends in invasive alien species (numbers and costs of invasive alien species)</li> <li>• Impact of climate change on biodiversity</li> </ul>
Ecosystem integrity and ecosystem goods and services	<ul style="list-style-type: none"> <li>• Marine Trophic Index</li> <li>• Connectivity/fragmentation of ecosystems</li> <li>• Water quality in aquatic ecosystems</li> </ul>
Sustainable use	<ul style="list-style-type: none"> <li>• Area of forest, agricultural, fishery and aquaculture ecosystems under sustainable management</li> <li>• Ecological Footprint of European countries</li> </ul>
Status of access and benefits- sharing	<ul style="list-style-type: none"> <li>• Percentage of European patent applications for inventions based on genetic resources</li> </ul>
Status of resource transfers	<ul style="list-style-type: none"> <li>• Funding to biodiversity</li> </ul>
Public opinion	<ul style="list-style-type: none"> <li>• Public awareness and participation</li> </ul>

Source: *Streamlining European biodiversity indicators 2020: Building a future on lessons learnt from the SEBI 2010 process*, EEA Technical report No 11/2011, p.14, <http://www.eea.europa.eu/publications/streamlining-european-biodiversity-indicators-2020>, access: 10.07.2014.

<sup>3</sup> <http://www.catalogueoflife.org/col/info/totals>, access 09.08.2014.

The process for developing a catalogue of biodiversity indicators: The Streamlining European Biodiversity Indicators (SEBI) on a European level was started in 2005 and aimed at providing knowledge about the issue of biological diversity loss. Currently, this process is continued and a set of indicators is supposed to help in making decisions at various levels of organization (regional, national and international)<sup>4</sup>. The set of indicators (26 indicators) worked out by the European Union serves to identify representative species, monitoring their quantity, scope and condition, and potential changes and threats to the species and habitats. Indicators concerning various levels of natural organization are proposed in seven thematic blocks covering genetic, population, biocoenotic, ecosystem and landscape. This set outlines the scope for carrying out comparative analysis and may be modified at any time in accordance with the purpose and scope of research and data availability (Table 2).

In this paper, for comparative analysis characterizing the biodiversity of EU countries, indicators concerning established forms of nature conservation, forests' condition, and endangered species were chosen. A flagship project of the European Union aimed at biodiversity protection is indicating and establishing areas of Natura 2000 in national states in both those areas not protected to date as well as those which are already protected. The basis for appointing the areas of Natura 2000 constitute two directives, on "habitats"<sup>5</sup> and "birds".<sup>6</sup> On the basis of the birds' directive there special bird protection areas (Special Protection Areas – SPA) are indicated, and on the basis of the habitat directive special habitat protection areas (Special Areas of Conservation – SAC) are designated, both on land and marine territories. The main purpose was the biodiversity protection of the Community's countries through preservation of the most valuable natural habitats and diversity of plant and animal species and bird populations that are present in a natural state and represent various European bio-geographical regions. The protection concerns both areas as well as species. The Natura 2000 programme provides opportunities for intensification of activities for the sake of natural European heritage preservation, on the basis of a uniform law imposing an obligation to prevent deterioration in the condition and quality of habitats and species, as well as provide proactive protection.

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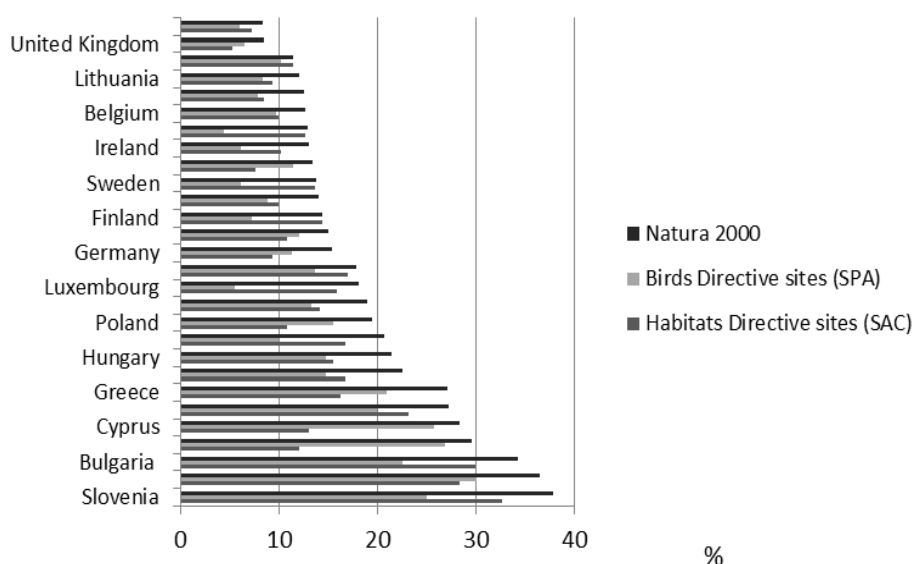
<sup>4</sup> <http://biodiversity.europa.eu/topics/sebi-indicators>, access 24.08.2014

<sup>5</sup> Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, O.J. L206, 22.07.92, [http://eur-lex.europa.eu/legal\\_content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN](http://eur-lex.europa.eu/legal_content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN), accessed on: 01.07.2014

<sup>6</sup> Council Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds (codified version), <http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN>, accessed on: 01.07.2014.

Natura 2000 areas constitute 18.36% of the EU-28 territory, with SACs<sup>7</sup> designated on 14.01% of the EU area, and Special Protection Areas (SPAs) taking up 12.51%<sup>8</sup> (Figure 1). The respective shares of areas covered by Natura 2000 is diversified in individual EU states, which results on the one hand from the natural conditions and level of nature preservation, and on the other from activities undertaken in the scope of implementation of the directive. Among the leading countries with a significant percentage of Natura 2000 areas are countries with the lowest seniority in the EU, which have to catch up with the others in terms of designating areas, which is not easy to do in conditions of a intense investment pressures.

**Figure 1. Share of Natura 2000 areas and share of Natura 2000 areas designated on the basis of habitat directive (SAC) and birds' directive (SPA) (% of the total surface)**



Source: own work based on European Environment Agency data. <http://www.eea.europa.eu/data-and-maps/daviz/natura-2000-barometer#tab-dashboard-03>, accessed on 05.08.2014.

Among the EU countries one can indicate those with the highest biodiversity level, which is determined by a highest share of areas covered by both the birds and habitats directive. These include: Slovenia, Croatia, Bulgaria, Spain, Greece, Estonia

<sup>7</sup> Interpretation Manual of European Union Habitats EUR 28, April 2013, European Commission DG ENVIRONMENT Nature ENV B.3, [http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int\\_Manual\\_EU28.pdf](http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf), access 03.08.2014.

<sup>8</sup> European Environment Agency <http://www.eea.europa.eu/data-and-maps/daviz/natura-2000-barometer#tab-dashboard-03>, accessed on 02.07.2014.

(Figure 1). Poland belongs to the states with a share of Natura 2000 areas similar to the European average share, however it should be kept in mind that the process of appointing these areas is still ongoing. Currently, in Poland the share of areas covered by the birds directive dominates, which is a consequence of Poland's diversified physical-geographical conditions (natural rivers, forest complexes etc.) and high share of extensively used agricultural areas.

Poland belongs to the countries with a high share of protected areas, which proves that preservation and a high value of nature are derived from the centuries-old conservation tradition of nature protection (28.1% according to IUCN classification). In Poland there are 23 national parks, which take up 1% of Poland's total surface. All of them meet the requirements of the Assembly of International Union for Conservation of Nature and Natural Resources (IUCN) for national parks, and fifteen of them are included in the II category of protected areas. Six of the youngest parks (Biebrzański, Bory Tucholskie, Gór Stołowych, Narwiański, Magurski and Ujście Warty) have not been classified yet by the IUCN, and two parks are included in the V category.

European Union states are characterized by a high diversification in their surfaces of protected areas and a high share of protected areas of one of the lowest categories, which proves the relatively low level of natural wildlife conservation and high anthropogenic impact (Table 3).

**Table 3. Protected areas in selected EU states according to IUCN classification**

State	% share of the most important protected areas in the country's total surface	Share of protected areas according to the International Union for Conservation of Nature (IUCN) category in protected areas total (%)					
		I	II	III	IV	V	VI
Czech Republic	15.8	0.9	6	0.2	6	87	-
France	11.8	-	4	-	6	90	-
Germany	55.7	-	5	-	6	89	-
Greece	2.8	-	45	2	19	5	-
Hungary	8.9	-	27	-	3	69	-
Italy	12.5	-	4	8	-	6	16
<b>Poland</b>	<b>28.1</b>	-	<b>2</b>	-	<b>2</b>	<b>27</b>	-
Slovakia	25.2	8	20	0.3	0.6	1	-
Spain	7.7	0.1	5	-	36	47	-

Source: own work based on OECD Environmental Data. Compendium 2008, <http://www.oecd.org/env/41069197.pdf>, access 21.08.2014.

A different kind of protection from that described above is species protection, which encompasses a set of undertakings and activities as a part of nature conservation aimed at preserving wild plants and fungus, and animals together with their habitats. It concerns mainly the following species: endemic, relict, occurring in the borderlands of their ranges, prone to threats and extinction, and enumerated in international conventions and agreements. The essence of species protection is to provide protection for particular species and the legal prohibition of their devastation, acquisition or trade (both in living state as well as in dried state).

In the modern world, the main danger that threatens wild plants and animals are quality changes in the environment and demolition of their living space by the cities, roads, canals and the like. This is why the species protection is supported by the other established nature conservation forms (nature reserves, Natura 2000 areas and other). A separate issue of species protection is made up of crop plants or humanitarian animal protection, and plants and animals protection against genetic interference.

The species' extinction rate in Poland, assessed according to the IUCN classification, it is not large in comparison to other EU states (Table 4). However, due to the occurrence of a great number of rare species of flora and fauna (e.g. vacuole, bear, bison, tatra chamois, and many plants that are rare on the European scale) within the country's areas, Poland has a particular responsibility for the protection of natural heritage, particularly when there is a bad condition (e.g. the snake Esculap) or a suddenly deterioration (e.g. vacuole) (*Environment conditions in Poland...2011*, p. 30).

**Table 4. Flora and fauna threats according to species (% of species total)**

State	Mammals	Birds	Freshwaterfish	Amphibians	Reptiles	Vascularplants
Czech Republic	18.7	52.4	41.5	51.9	61.5	41.7
France	8.2	13.3	11.8	16.3	16.3	bd
Germany	33.4	35.6	30.1	36.4	61.5	27.4
Greece	25.2	14.1	31.8	26.1	13.6	4.4
Hungary	37.8	14.5	43.2	27.8	33.3	4.1
Italy	40.7	18.4	35.1	41.0	35.0	2.8
<b>Poland</b>	<b>12.4</b>	<b>7.6</b>	<b>28.6</b>	<b>bd</b>	<b>27.3</b>	<b>11</b>
Slovakia	21.7	14.0	18.1	44.4	38.5	30.3
Spain	13.3	26.9	51.4	30.6	25.7	13.7

Source: own work based on OECD StatExtracts, <http://stats.oecd.org/>, accessed on 21.08.2014.

Protective forests are a particular category of forests, because they act as non-productive, which has a significant impact on biological processes and the health and safety of a human being. Their importance is connected with the protection of lands, water, climate (microclimate), infrastructure and areas inhabited by human beings and endangered by the results of possible disasters, such as floods. These forests have also recreation, spa and climatic functions. In the EU-28 they constitute 20.5% of the total forest area. Among the EU countries, one can clearly indicate those states which have considerable shares of protective forests (Italy, Romania, Poland) and those in which these forests constitute a small percent. This situation is a consequence of the established forest policy, and hence specific forest management, which apart from the economic aspects on different levels takes into consideration ecological and social aspects (Table 5).

**Table 5. Features distinguishing Poland among the European states with respect to biodiversity**

Features	Poland	EU states
Forest area with a protective function (2010)*	29.6 %	Italy 87.4%; Romania 47 %; Czech Republic 19.9%; Hungary 9.6%; France 6%.
Tree crown defoliation, defoliation class 2–4 (2012)**	23.4%	Czech Republic 50.3%; France 41.1%; Slovakia 37.9 %; Germany 24.6%.
Population trends of Farmland bird (This indicator is an aggregated index of population trend estimates of a selected group of breeding bird species dependent on agricultural land for nesting or feeding. (2008)***)	99.3%	Hungary 105.3%; Czech Republic 97.3%; France 96.2%; Spain 84.2%; Germany 75.7%.
Number of aquatic and wetland facilities (2008)****	13 facilities	Germany 33, Hungary 28, France 21, Slovakia 14, Czech Republic 10

\*Protective functions of forests Eurostat's Database, <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do?dvsc=3>, accessed on 03.08.2014.

\*\*Forest Condition in Europe 2013, Technical Report of ICP Forests, [http://www.ti.bund.de/fileadmin/dam\\_uploads/vTI/Publikationen/Thuenen\\_Working\\_Paper/Thuenen\\_Working\\_Paper\\_19\\_Gesamt.pdf](http://www.ti.bund.de/fileadmin/dam_uploads/vTI/Publikationen/Thuenen_Working_Paper/Thuenen_Working_Paper_19_Gesamt.pdf), accessed on 05.07.2014.

\*\*\*Common farmland bird index, Eurostat's Database [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_bio2&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_bio2&lang=en), accessed on 05.07.2014.

\*\*\*\* OECD Environmental Data. Compendium 2008, <http://www.oecd.org/env/41069197.pdf>, access 05.07.2014.

Source: own work.



Forest conditions have a significant impact on biodiversity. In Europe in 2012, 22.8% of treestand was made up of trees with defoliation which was medium and strong and dead trees.<sup>9</sup> A slightly higher share of these classes was observable for the European Union area – 25.4%. However, the ratio between the classes is unfavourable (nearly 50% of the forests were classified as Class I), and the fact of their low share of dead trees (3%) is favourable.<sup>10</sup>

The condition of forests in the European Union is very diversified (see Table 7). One can observe both positive and negative trends. The situation in the Czech Republic, Germany and Poland improved in comparison to 2011; one can observe a decrease in the defoliation index accordingly of -2.4 percentage points, -3.4 percentage points and -0.6 percentage point. Negative trends are observed in Bulgaria, where the deforestation index increased in classes 2-4 by 10.7 percentage points, Spain (5.7 percentage points, and Italy 4.4 percentage points). The ensuing situation is impacted by both natural conditions (genetic composition of forests, condition of habitats, climatic and hydrological conditions) and also strongly by the anthropogenic impact (industry, automotive industry etc.).

Important indexes in confirming biodiversity are those concerning common, water, and wetland birds. The systematic research undertaken in this area allows for constant monitoring of the population size and indicating the effects of transformations. Since 2000, the index for the number of common farmland bird populations (FBI – Farmland Bird Index) has been calculated.<sup>11</sup> It is an aggregated index of the population number of a selected group of common breeding birds characteristic for the farmland, which enables obtainment of the picture of trends in changes of farmland bird grouping, and at the same time reflects the multi-scale changes in the agricultural landscape. This index for the 27 countries of the European Union in 2008 reached the level of 93.3% and undergoes constant

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<sup>9</sup> Bioindicative methods are used for assessment of the degree of forest damage; the main criterion of loss (defoliation) and decolorization of assimilation apparatus of tree crowns. The criteria meet the methodology adopted within the international UN programme (UNEP/EKG) for examination of the influence of air pollution on forests. 0 - no damage class 1 - Alert class 2 - Small and medium damage class 3 - Serious damage class 4 – Deadwood; Estimates of defoliation and decolorisation are grouped by species, whereas all species in total by classes: class 0 – from 0 to 10%, class 1 – from 11 to 25%, class 2 – from 26 to 60%, class 3 – above 60%, class 4 – deadwood.

<sup>10</sup> Forest Condition in Europe 2013, Technical Report of ICP Forests, [http://www.ti.bund.de/fileadmin/dam\\_uploads/vTI/Publikationen/Thuenen\\_Working\\_Paper/Thuenen\\_Working\\_Paper\\_19\\_Gesamt.pdf](http://www.ti.bund.de/fileadmin/dam_uploads/vTI/Publikationen/Thuenen_Working_Paper/Thuenen_Working_Paper_19_Gesamt.pdf), access 05.07.2014.

<sup>11</sup> The indicator is elaborated through compilation of information on indices of populations of 23 bird species. Data on species are aggregated on the national and international levels, thus providing information on changes within the whole of Europe and in particular within the EU. They are presented by the Statistical Office of the European Union (Eurostat). The value of index in 2000 has been set as 1.00 (or, equivalently 100%).

fluctuation. A much higher value of the common farmland birds population index is characteristic for the newer member countries e.g. Hungary, Poland, Czech Republic, which proves a well-preserved agricultural landscape and a still extensive form of agriculture (Table 5.) The development of a large-area intensive agriculture and monoculture farms may lead to the impoverishment of farmland biological diversity, because intensification of agricultural production is accompanied by an increased use of chemicals. Investment pressure, in particular of multidimensional facilities but also of urbanization and suburbanization, significantly - both directly and indirectly - negatively influences biodiversity on agricultural areas, including water and wetland bird habitats. In Poland, there were appointed only 13 aquatic and wetland areas<sup>12</sup> of transnational importance. However, the natural potential of these areas is not to be underestimated because of the occurring diversity and number of rare species, not only with respect to Europe but to the whole world.

## 6. Conclusions

The challenge for contemporary nature conservation, and not only in the European Union, is the protection of living natural resources in order to preserve biodiversity and retain basic ecological processes which provide for sustainable usage of these resources. The significance of biodiversity is very often underestimated and is lost in the pursuit of other forms of usage of the Earth which ensure the direct and instant benefits. Despite many initiatives undertaken for the sake of biodiversity protection, the condition of the majority of species and natural habitats which are endangered on the European scale is defined as unsatisfactory, with almost ¼ of all wild species in Europe endangered. A lot of factors of anthropogenic origin have an impact, both directly and indirectly, on the impoverishment of flora and fauna and its degree of diversity.

The Eastern Bloc countries that have the shortest length of membership in the European Union have a long tradition of nature conservation and can offer significant and unique natural values. They are covered by national nature conservation forms, and above all they constitute a basis for the designation of Natura 2000 areas. The countries that have the highest share of Natura 2000 areas, that is above the EU average, include the newest Member States (Slovakia, Slovenia, Poland, Hungary, Bulgaria, Romania, Estonia). Regardless of the situation, in the face of local investment pressure and global issues (such as climate change and circulation of the hydrological cycle) nature and its diversity

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<sup>12</sup> Convention about aquatic and wetland areas of international importance, especially as a habitat for waterfowl; compiled in Ramsar on 2 February 1971, called the Ramsar Convention.

in all EU countries faces a threat. Therefore, there is a real need for comprehensive actions across the EU in accordance with the provisions of the New Strategy of the EU biodiversity protection.

A New Strategy of biological diversity protection in the EU until 2020 was accepted by the European Commission in 2011 and constitutes a framework for a long-term policy (until 2050), and also designates some current activities (until 2020), as its aims, indicating the following:

- Full implementation of the birds and habitats directive.
- Preservation and restoration of ecosystems and their services.
- Increase of the contribution of agriculture and forestry in retaining and reinforcing biological diversity.
- Providing for the sustainable use of fish resources.
- Eliminating invasive foreign species.
- Support for the sake of the world biological diversity loss prevention.<sup>13</sup>

At the present time issues of biodiversity protection should be considered in a much broader perspective than ever before, because they are not only a matter of “protection” but an issue of a long-term socio-economic strategy. These expectations are met by the Europe Strategy 2020, which talks about resource-efficient resource management. EU policy in the area of biodiversity protection, however, will not substitute national solutions in this field. Because of the large differences in the level of biological diversity between the EU states, national solutions are necessary in the areas of agricultural policy, forest policy and economic policy, stimulating an active protection of nature’s potential.

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<sup>13</sup> EU strategy of biological diversity protection for 2020, December 2011, [http://ec.europa.eu/environment/pubs/pdf/factsheets/biodiversity\\_2020/2020%20Biodiversity%20Factsheet\\_PL.pdf](http://ec.europa.eu/environment/pubs/pdf/factsheets/biodiversity_2020/2020%20Biodiversity%20Factsheet_PL.pdf), accessed on 10.02.2014.

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## Streszczenie

### **RÓŻNORODNOŚĆ BIOLOGICZNA JAKO WARUNEK BEZPIECZEŃSTWA EKOLOGICZNEGO. WYMIAR EUROPEJSKI**

*Współczesne badania nad świadczeniami (usługami) ekosystemów (środowiska) potwierdzają rangę i znaczenie środowiska przyrodniczego i jego zasobów dla kształtowania dobrobytu człowieka. Szczególnie mocno akcentują ochronę żywych zasobów przyrody dla zachowania bioróżnorodności, która jest niezbędna dla utrzymania podstawowych procesów ekologicznych oraz zapewnienie trwałości użytkowania tychże zasobów. W efekcie ochrona bioróżnorodności to nie tylko problem przyrodniczy, ale również problem ekonomiczny i społeczny, dobrobytu i jakości życia. Zatem różnorodność biologiczna jest niezbędnym warunkiem zapewnienia bezpieczeństwa ekologicznego zachowania ciągłości procesów przyrodniczych, warunków i jakości życia oraz potencjału gospodarczego.*

*Głównym celem artykułu jest wskazanie teoretycznych podstaw ochrony bioróżnorodności z perspektywy nauk przyrodniczych i ekonomicznych oraz identyfikacja zróżnicowań poziomu ochrony bioróżnorodności w krajach Unii Europejskiej. Celem szczegółowym jest wskazanie form ochrony przyrody jako instrumentu ochrony bioróżnorodności oraz dokonanie przeglądu ustanawianych form ochrony przyrody w wybranych krajach UE. Dla realizacji tak założonego celu dokonano przeglądu literatury z zakresu nauk przyrodniczych, ekonomicznych i prawnych oraz aktualnych czasopism z zakresu nauk przyrodniczych prezentujących badania naukowe w obszarze bioróżnorodności. Analiza porównawcza została przygotowana w oparciu o dane statystyczne pochodzących z różnorodnych zasobów statystyki międzynarodowej (OECD, EUROSTAT, EEA).*

**Słowa kluczowe:** *bioróżnorodność, ochrona bioróżnorodności, formy ochrony przyrody, Natura 2000, stan bezpieczeństwa ekologicznego*