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REVIEW

Mankind and biodiversity interactions; preserving and improving biodiversity in Romania

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Stoica Preda GODEANU
„Ovidius" University, Constanta, Romania, Full member of the Academy of Romanian Scientists, Splaiul Independenţei street, no. 54, Bucharest, Romania, 050094, e-mail: stoica@bucura.ro

Abstract.
The paper presents the relationship between humanity and biodiversity. In order to understand the importance, and current/future role played by the biodiversity, we have highlighted the variety of goods and services which it could provide. It is also mentioned in the paper the economic value of biodiversity, which is the fundament for the sustainable development of humanity, being a high top component of the natural capital, on which is based the economic development in the case of the only future option of humanity: the sustainable development. There are also mentioned the long term management and use methods of biodiversity, and it's preserving necessity: preserving strategies, methods and tools of protecting biological and ecological biodiversity in Romania.

Keywords: Biodiversity, sustainable development, long term management, benefits of biodiversity

Twenty years ago, at the Summit organized by the United Nations Organization in Rio de Janeiro there were adopted some very important documents which guide the future of the Mankind: Agenda 21 (which traced the headlines of the sustainable development, the unique way of future development of the Mankind), the Convention on Climatic Changes (a problem more and more taken into consideration in present), Convention on Desertification (a more and more evident process, which affects an increasing part of the land) and the Convention referring to the Biological Diversity (which emphasizes the fact that affecting the life under all its forms, we undermine the natural resources and even our future (Bavaru et al., 2007). In this paper we shall refer to the last of these documents. Prior to approach the problems of the biodiversity, is necessary to emphasize that each economy is based on resources (see Figure 1). From all the types of resources, the renewable ones are very important, because they provide for unlimited time existence of the Mankind. Renewable resources are of two categories: unconditioned renewable – referring to several energy resources, and that conditioned renewable – concerning especially the life and the environments in which it occurs. These renewable resources are based mainly on living organisms and on the diversity of forms existing in nature.

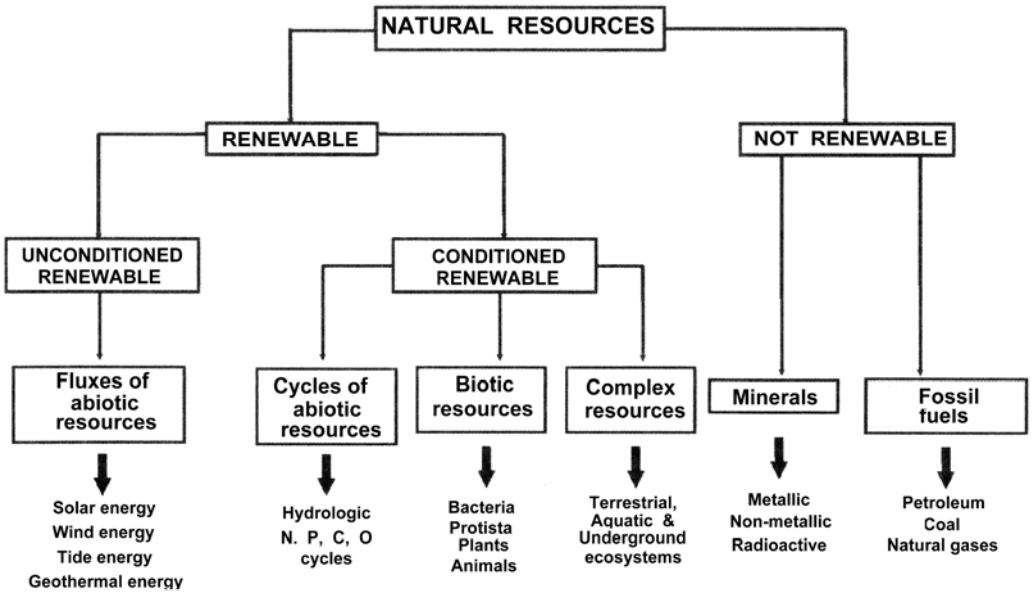

Figure 1. Natural resources on which all the human activity depends (Cogălniceanu, 1999, modified)

Our point is that *„Biodiversity refers to all the forms through which the life is diversified at the different levels of organization of living matter, i.e. at molecular. biochemical, symbiotic, ethologic and ecologic levels”*. It is different of the ecological diversity, because this joins the biological diversity (biodiversity) with the diversity of the abiotic environmental conditions, constituting new entities, the ecological ones (Godeanu, 2008). This definition was elaborated as result of a critical analysis of various definitions proposed for biodiversity by more than 30 different authors (Bavaru et al., 2007, Cogălniceanu, 1999, Botnariuc, 2005, 2006, Godeanu 2008, 2011, Barbault et al., 1995, Hawksworth, 1995).

It is very important to emphasize that the analysis of the role, the place and the situation of diversity cannot be done independently by the analysis of the ecological diversity. The living organisms must be regarded as the living constituent of all the ecological systems, the constituent that, in spite of its dependence of non living component, changes and modifies continuously the structure of our planet.

In Figure 2 there are presented the levels of organization of the living and the types of biodiversity determined by their variability. From this figure it may be observed that the biodiversity covers a large variety of forms.

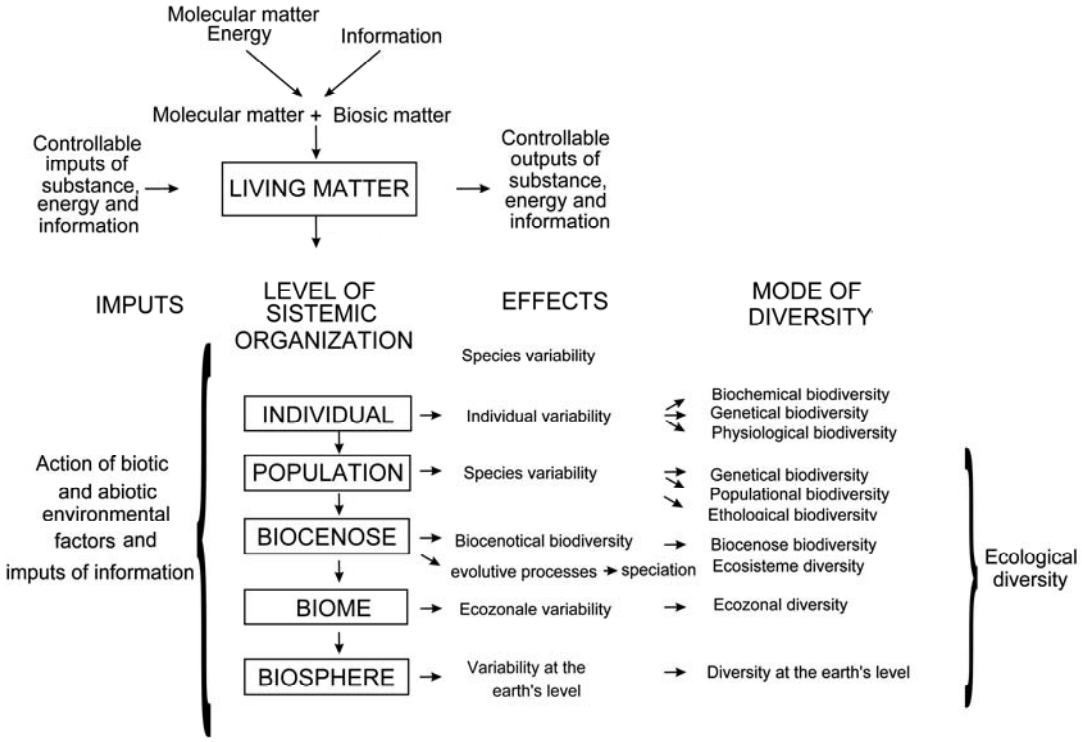

Figure 2 – Relationships between the diversity of living systems and the diversity of ecological systems, the last being determined by the different forms of variability of organisms (Bavaru a.o., 2007)

Examined from the point of view of human interests, the biodiversity fulfils the following functions (Cogălniceanu, 1999):

- the function of protection source – i.e. source of raw materials for the very different human activities;

- the function of regulating of life processes – i.e. source of oxygen, natural uptake of the carbon dioxyde produced by humans through different industrial activities, source of freshwater that sustains the life, participation in the climatic regulation mechanism etc;

- the function of support for the life of humans – as the base of food production, of clothing, often for lodging, spaces around the houses, spaces for resting and recreation etc;

- informative function – the possibility that, through a better knowledge of different living organisms (from viruses to mammals), to identify new sources of food, drugs, to create new organisms having substances or properties useful for men, to realize an aesthetical, artistic environment etc.

In order to a better evidence of the role of biodiversity in achieving these functions, some details are shown in Table 1.

Table 1. – The importance of biodiversity for the main fields of interest for Mankind

Environment	Biodiversity plays the main role within different functions of the environment (water regulation, soil protection etc), the species may be indicators of environment quality, they offer applications which include biological techniques of self-purifying.
Agriculture	Offers genetic material for creation of new varieties, biotechnologies, biological control of diseases/harmful organisms, water regulation, preserving of moisture, regeneration, prevention of soil erosion and its protection, prevention of wind determined erosion, protection against excess solar light.
Forestry	Genetic material, habitat for a large variety of plants and animals potentially exploitable, forest products etc.
Zootechny	Genetic material, pasture fields.
Fishing and Aquaculture	Littoral waters, rivers and mangrove areas as food resources, protection and refuge for fish, crustaceans and molluscs. Coral reefs as habitats for a huge diversity of plants and animals.
Natural areas	Abundance of plants and animals utilized by man for hunting, but also for products that may be obtained from them.
Energy	Water regulation, prevention of silting, reservoir, source of products with energetic value, wood biomass.
Water management	Through prevention of polluting and silting, water reservoirs remain clean and have longer periods of functioning for power generation.
Industry	Providing of clean water reserve, source of primary genetic and biological products for industry, destruction of industrial wastes.
Public health	Clean waters, medicinal products, prevention of some maladies through regulation of physiological processes, the regulation of ecological processes, resistance.
Tourism and recreation	Aesthetical attractions determined by wild life and the beauty of natural environments.
Education and Research	Nature in whole, biological diversity.
Art	Aesthetical forms
Culture and Religion	Locations and utilization of rituals, artifacts, places and religious entities.

The access to the goods and services offered by biodiversity is not free and unlimited, as people considered for too many time. It is determined by

- their degree of accessibility reachable by humans (directly, after some processing, or indirectly),

- the limits to what they may be exploited (especially at the most up to their minimal capacity of natural regeneration),

- the attention which must be paid to the stability of the systems which provide resources, the preserving of their self-regulating potential, their long-term occurring, and

- the capacity of Mankind to straighten or recovery of the ecological systems which are damaged under the action of different human impacts (as erosion, desertification, poisoning and the diminishing of soil quality, fields salting, eutrophication of water bodies etc).

If we want to put in evidence the benefits brought by biodiversity to Mankind, we have to observe (Cogălniceanu, 1999, Heywood et al., 1995) that it:

1) Offers services through achieving of stability of natural and anthropogenic ecosystems. The forests offer for free clean and rich oxygenated air, they regulate the planetary hydrologic system, varieties of cultivated plants offer food and make our immunitary system stronger to face easier the diseases. Biodiversity of the organisms and ecosystems supports a large variety of negative processes, for which the Mankind should be obliged to pay for being neutralized on other ways. In the United States of America it was calculated that the services provided by 17 ecosystems from an ecozone results in an annual benefit of 16 – 24 trillion dollars!

2) It ensures the security of food. It offers the genetic biodiversity for farming products which make bigger productions, with more varied substance content and which are often in higher concentrations. The security of nourishment is ensured to a great extent by the occurring in the habitats near farm crops of some natural ecosystems in which there are organisms resistant to diseases and harmful organisms; there are also living natural predators of harmful organisms from farm crops etc.

3) It facilitates traditional medicine, as well as the creation of new high-tech pharmaceutical products. Humans use the plants for thousands of years. Extinction now of one or more species apparently without value, insignificant, may determine the mitigation of chances to find in future new medicaments. In order to emphasize the importance of medicinal plants it may be mentioned that in 1997 ten of the best seller pharmaceutical products originated in processing of some plants or wild animals (for instance aspirin, hirundinin, products used

against malaria). From selling of these products the producers gained 75-150 billion dollars. And it had not to be forgotten that in present about 75 % of the world people is curing treating using only the products of traditional medicine. More recently, pharmaceutical products started to be extracted from different terrestrial or aquatic animals (insects, mollusks, worms, coelenterates).

4) It brings economic benefits through tourism and recreative activities. These benefits are most evident in the countries which have a large diversity of the ecosystems and a huge biodiversity, but also due to large diversity and beauty of their landscapes. There are much money resulted from tax management of protected areas, through the revaluation of the local specific characteristics (for instance in Costa Rica, in Australia – at the Great Coral Barrier, in Belize, in Tanzania), but also in other countries as USA (in parks as Yellowstone, Yosemite, Grand Canyon), Canada, Kenya etc. Through a rigorous and well organized tourism, the biodiversity becomes an important source of incomes and permits the economic development of some third-world states, or of the states deprived of other valuable economic resources. In last time, the ecological tourism and the agro tourism are increasing in public interest, especially in Europe, Australia, New Zealand.

5) It brings back the people to natural valuables. It denotes an unconscious connection of human being to the rest of living forms of this planet. This explains the love of man for flowers, birds, dogs, cats etc.

6) It educates us on a natural way. In order to know and to make a correct management of protected areas, it is necessary that these to be protected. Parks and nature reserves are really true open-air schools; here the education of people may me performed in the best manner. Here could made „live" lessons in biology, ecology, history, geography, chemistry, and also, may be realized practical recreational-educative activities as writing, picture, photography or filming.

7) Mankind has a great ethical responsibility for preventing of species extinction. People can't live without nature. The judgments of native populations in this field are much more advanced than that of the industrialized states, where all is analyzed only through the economic criteria requested by market, and where more conscious education is needed in order to change the human mentality.

Following the value of biological diversity from economic point of view, it may be observed that it shows a various range of aspects (see Figure 3) (Cogălniceanu, 1999, Perrings, 1995). Let's see them in brief.

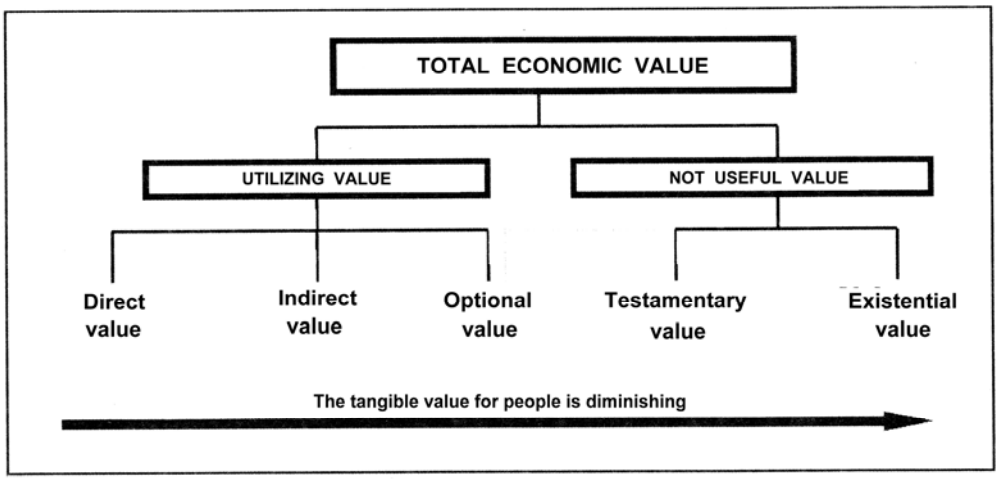

Figure 3. Forms of economic value of biodiversity (Cogălniceanu, 1999, modified)

Direct value of biological diversity includes:

- the organisms used for human food and clothing as well as that used as energy source (for heating);

- the organisms used in recreational activities – as hunting, fishing, flower cultivation, arrangement of yards, parks and gardens with nice plants, creation of mini zoological gardens, decorative fish-aquaria, also aquaria with turtles and exotic water weeds, raising of foreign species of birds (canaries, parrots, peacocks, guinea fowls) etc;

- organisms used for medical goals;

- organisms from which only certain parts are used (agricultural plants, vegetables and textile plan<ts, animals from which are used the fur , hair or bones etc);

- the visiting of institutions where there are raised organisms different from local flora and fauna (botanical gardens and zoological gardens);

- organisms used in certain sports : horses, dogs, cocks etc;

- transport of living animals : either wild, for collections, or domestic, with commercial value.

Indirect value includes the actions determined by organisms or by certain ecosystems, as:

- production of vegetal biomass through photosynthesis;

- production of oxygen and uptake of carbon dioxide resulted from the respiration of organisms, but also that resulted from very different human activities;

- control by plants of the physical and chemical of atmosphere, through screening of certain light radiations, of an important part of the caloric energy reaching the planet, reduction of velocity of air currents, holding back of a lot of gaseous pollutants;

- creation of microclimates;

- natural depolluting of waters (so-called self-purifying);

- partial control of hydrologic planetary cycle;

- genesis and protection of soils;

- degrading of organic wastes;

- control of harmful species using predators, parasites or of cumulated biological factors;

- storage and recycling of nutrients within bio-geochemical cycles.

Optional value includes genetic characteristics typical for each species, either wild, or raised by Man. It must consider not only their present value, but also the potential value, for eventual future utilizations. It may be considered a true „gene bank" which must be well and carefully managed. In this case information or the value of scientific option is called „value of quasi-option".

Testamentary value refers to the opportunity offered to next generations to dispose of a specific genetic inheritance or of an ecological one, which they could utilize in various purposes, not defined yet.

Existential value refers to the to-day availability of Mankind to pay for conservation of the most various resources of biodiversity, not considering their present utility.

Utilization value through substitution refers to that people are ready to pay in order that other members of present generation to have access to certain specific component of biodiversity.

We hope that the elements presented above will permit us the understanding of the fact that biodiversity needs a special attention. Unfortunately, its importance is yet too little understood and accepted; this situation determined, especially during last 2-3 centuries the apparition of a lot of impacts which determined a more and more marked reduction of the services which are offered – and could be offered in future – by biodiversity to the Mankind (Miller et al., 1995, Mooney et al., 1996).

If considering the biodiversity in Romania, it is not useful to wail about what important are the damages done and how much negative changes occurred, but we have to ask „What must we do now?"

In April 2011 European Community published a new strategy for stopping the decline of biodiversity at European level for the next decade.

Considering the facts presented above and the trends established by EU in 2011, we think it is necessary to act on the following directions:

1) It is indispensable to pass in Romanian agriculture from the system of industrial agriculture toward biological agriculture. After many years of deficient „transition", Romania has a lot of agricultural fields on which treatments with chemical fertilizers and pesticides were stopped or significantly reduced. This represents a chance for rapid and conscious pass to the biologic agriculture. We consider this is our unique opportunity to develop quickly Romanian agriculture, so it catch up with the agriculture of the other countries of European Community. To sustain this idea we emphasize that it is a growing demand of ecological products both on European and world wide markets, and the potential of Romania is huge from this point of view!

2) Zootechny should develop mainly to the pastoral regime, similar to that widely practiced in Switzerland and in Austria, this system enhances excellently the value of lawns and pastures, especially that from mountain areas. This zootechny may provide a special quality of animal Romanian production, offering an important competitively on world market.

3) Vegetable and animal products obtained this way must be processed at highest standards, here, in Romania, and not exported as raw materials for processing industries from other countries. If this activity is fully awarded and well managed, Romanian alimentary products would be able to access the markets of the other European countries.

4) In forestry there are to be stopped the massive, uncontrolled, deforestations, which affect dramatically the type and the quality of our forests. It is urgent necessarily to start massive re-forestations and to harden the laws concerning forest management. We have not to forget that deforestation is one of the factors leading to increasing of agricultural soil erosion, determine desertification processes and, finally, determine the acceleration of global warming.

5) The products taken by Man from the aquatic environment – fish and other organisms utilized for food, have to be managed more carefully. In this sense it is necessary to develop the aquaculture under various forms, both in freshwater and in brackish and marine waters, as well as the mitigation of industrial fishing in natural waters.

6) European Community obliges us to pay much more attention of the reduction of air, water and soil pollution. Important communitary funds allocated for this objective must be controlled and utilized with higher efficiency.

7) There is required the apparition of concerns at scientific, administrative and legislative levels in order to apply several much more restrictive measures for immigrant species, which could endanger autochthonous organisms. When at European level there are taken more and more drastic measures for prevention of penetration of immigrant species, we cannot admit that, not considering European Union recommendations, our country could became a gate of their penetrating in European space.

8) It is necessary to amplify the actions of ecological recovering and reconstruction of the ecological systems affected by different human impacts, both natural ecosystems and that modified or created by Man.

9) It is required hardening of the legislation referring to nature protection and of that concerning the management of the natural parks and reserves, as well that lied to the sites „Nature 2000". Romanian Carpathians represent an extraordinary richness through the forests, pastures, through huge variety of plants and animals, a rich resource insufficiently utilized in pharmacology, flower culture, horticulture or biotechnology.

Protected areas of Romania represent the most positive standard concerning the biodiversity of this region, they represent an unexpected resource of organisms potentially useful for Man, standards for the actions aiming the recovery of environment in areas heavily affected by Mankind, the best and the most efficient mode of education for children and young's, for the change of mentality of people face to Nature, for applying the principles of sustainable development.

10) The areas of touristic interest must be revalued and developed, because they represent a special interest for national and international tourism. If we cannot boast with very special human sites (although several of these are extremely valuable – as Sarmisegetuza, Sighişoara, Biertan, Braşov, Suceava), the natural ones could attract a huge number of tourists from Romania and from abroad – if we shall be able to turn to good account and to manage them properly.

11) Utilization of autochthonous flora and vegetation must participate more actively to the „greening" of free spaces in urban localities. Using them may represent the premises of creating resting spaces, spaces tor refreshing, recreation, areas where the air of towns is re-oxygenated and a certain improvement of urban microclimate occurs.

R e f e r e n c e s

Bavaru A., Godeanu S., Butnaru G., Bogdan Al. (2007) – Biodiversitatea şi ocrotirea naturii. Ed. Academiei Române, Bucureşti.

Barbault R., Sastrapradja S.D. (1995) - Generation, maintenance and loss of biodiversity. În Heywood W.H. (ed.) – Global Biodiversity Assessment. Cambridge Univ. Press, 193-273.

Botnariuc N. (2005) – Evoluţia sistemelor biologice supraindividuale. Ed. Academiei Române, Bucureşti.

Botnariuc N. (2005) – The Role of Symbiosis in the evolution of biological systems. Trav. Mus. "Gr. Antipa", XLIX, 523-530.

Cogălniceanu D. (1999) – Managementul capitalului natural. Ars Docenti, Bucureşti.

Godeanu S. (2008) – Diversity in Aquatic Environment. New Classification Proposal. Transylvanian Rev. System. Ecol. Res., 6, 199-215.

Godeanu S., Bavaru A., Godeanu M. (2011) – Main Stages of the Process of Diversification of Living World. Transylvanian Rev. System. Ecol. Res., 10: in press.

Hawksworth D.L. (1995) – Magnitude and distribution of biodiversity. In: Heywood W.H. (ed.) –Global Biodiversity Assessment. Cambridge Univ. Press, 545-605.

Heywood W.H. (ed.) (1995) – Global Biodiversity Assessment. Cambridge Univ. Press

Miller K., Allegretti M.H., Johnson N., Jonsson B., (1995) – Measures for conservation of biodiversity and sustainable use of its components. In: Heywood W.H. (ed.) –Global Biodiversity Assessment. Cambridge Univ. Press.

Mooney H.A., Cushman J.H., Medina E., Sola O.E., Schulze E.D., (1996) – Functional Roles of Biodiversity. A Global Perspective. John Wiley, Chikester.

Perrings C., (1995) – Economic values of biodiversity. In: Heywood W.H. (ed.) – Global Biodiversity Assessment. Cambridge Univ. Press.

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