

# OPORTUNITIES FOR SUSTAINABLE DEVELOPMENT. THE VEGETATION IN THE MOLDOVA WATERSHED ON THE TERRITORY OF THE SUCEAVA COUNTY

**PETRE SPÂNU**

Doctoral School „Simion Mehedinti”, Faculty of Geography  
University of Bucharest  
ROMANIA

petre\_spanu@yahoo.com

**MONICA FLUTĂR**

Doctoral School „Simion Mehedinti”, Faculty of Geography  
University of Bucharest  
ROMANIA

flutar.monica@gmail.com

**CONSTANTIN COCERHAN**

Doctoral School „Simion Mehedinti”, Faculty of Geography  
University of Bucharest  
ROMANIA

constantincocerhan@yahoo.com

*Abstract:*— The study seeks to understand and analyze the biogeographical components of the natural ecosystems within the Moldova watershed, on the territory of the Suceava County. Its scientific, biological, ecological, educational and tourist importance aims at revaluing the biogeographical potential of the area, based on our research and observations undertaken in the field, as well as on our interpretation and comparative analysis conducted in collaboration with the specialists from the Suceava Environmental Protection Agency. By this study, which relies on thorough documentation, we intend to reveal the opportunities of the area from a biogeographical standpoint for the long-term development of ecological tourism, which is the main occupation of the local people.

*Keywords:*— sustainable development, natural capital, biodiversity, vegetation, ecological tourism.

## 1 Introduction

The emergence and spreading of sustainable development concept has brought about a new vision on natural ecosystems, due to the changes that have occurred within them and to the middle and long-term consequences: the increase of vulnerability degree, the reduction of connectivity or the isolation of various components of the natural capital. The continuous sprawl of the settlements, especially of the urban ones, has led to a total or partial substitution of the natural and semi-natural ecological network, as well as to its alteration through simplification, fragmentation and connectivity restriction.

A more pragmatic definition of sustainable development shows that it equally requires the

following: “*the capitalization of natural resources within the limits of the endurance capacity of the ecological systems, the preservation of biological diversity within the confines of protected areas, the ecological reconstruction of the ecosystems degraded by human impact, and protection measures integrated in the sectoral development strategies interested in internalizing the environmental costs and in assessing the impact of anthropogenic activities on the ecological systems*” [1].

Our approach seeks to understand and analyze some of the components and natural ecosystems within the area of the Moldova valley, on the territory of the Suceava County, by emphasizing their scientific, biological, educational, and tourist

importance [2]. Biological diversity is extremely important, especially due to its ecological, genetic, scientific [4], educational, recreation and aesthetic value. By the on-site conservation of the ecosystems and natural habitats and by maintaining and restoring the viable populations in their natural environment, we may ensure the preservation of biological diversity. So, the diversity of biological systems is indirectly the support for the development of the ecological and semi-natural systems.

The role of vegetal cover is vital for keeping the natural balance. This is a protection buffer, which mitigates many of the negative impacts induced by human activities on the environment.

The role and functions of the biological resources in triggering and supporting the tourist phenomena cannot be fully assessed if they are analyzed in the general context given by the ensemble of natural and anthropogenic factors. And this is true even more as the vegetation is a decisive control in the creation of landscape (with an indisputable aesthetic function), while the fauna positively influences certain areas.

## 2 Problem formulation

**Location and limits.** The part of the Moldova watershed lying on the territory of the Suceava County overlaps three distinct terrain units: the Carpathians, the Sub-Carpathians, and the Moldova Plateau. The study area may be delimited from three standpoints, as follows: a boundary of the watershed given by the water divide, an administrative boundary (of the various administrative units that lie totally or partly in the Moldova watershed) and a tourist boundary [2], rather unclear, given by the main and secondary tourist axes. From reasons pertaining to the complexity of tourist phenomenon and to the necessity of quantitative analyses, it is easy to understand that, sometimes, the exact physico-geographical boundaries and even the administrative ones are less important.

The water divide that separates on the southwest the Moldova and Bistrița watersheds following the Obcina Mestecănis connects the maximum elevations belonging to an eastern, lower ridge: Alunis peak (1294 m), Lucina peak (1588 m), Chitcău peak (1430 m), Orata peak (1379 m) and Mestecănis pass (1096 m). The water divide continues then with the highest altitudes: Giurnalău

peak (1857 m), Rarău peak (1651 m), Bâtca Oblânc peak (1474 m) and Poiana Brazilor. To the north, northeast and east, the limit is given by the water divide separating the study area from the Suceava and Somuzul Mare watersheds, along the following summits: Veju Mare peak (1494 m), Obcina peak (1270 m), Sihloaia peak, Hotarul peak (1137 m), Ciurmârna Pass (1100 m), Poiana Prislor (1180 m), Cacica peak (803 m). In the plateau area, the elevations are less than 500 m. The southern boundary of the county overlaps most of the watershed, with slight deviations, following the maximum altitudes: Chitziagaia peak (1194 m), Ceardac (911 m), and Dadesh peak (459 m), to the south, crossing then a tributary of the Târzia creek.

In the mountain realm, the Moldova watershed completely or partly overlaps the territories of fifteen administrative units and about the same happens in the Sub-Carpathian and the plateau areas.

In order to establish the key coordinates of the sustainable development pattern it is necessary to assess the quality of the historical data and information regarding the operation of the natural capital's components [5], in order to answer the following questions: What is the fragmentation degree of the habitats? and What are the vulnerable components of the natural capital? An immediate answer starting from the field realities is given by the most vulnerable component, i.e. the vegetation, but problem statement requires correlations with previous studies.

At the same time, the development of future solutions in managing the problem on a local scale must necessarily be correlated with the regional, national and European policies and strategies [6]. An opportunity in this respect is the Strategic Concept of Territorial Development Romania 2030 (SCTDR), which relies on a vision of territorial development capable to bring forth solutions derived from the needs and features of the various areas, which can contribute to a balanced development of Romania and all the fields of activity. It is worth noting that special emphasis is placed on the sustainable development of tourism [5], [7], [8]. Vădineanu (2004) [9], estimated that the optimal level of the economic activities corresponding to the productive and support capacity of the local natural capital could be reached only around the year 2030.

## 2.1. Previous research

The early investigations of the study area and the adjacent territories focused on the flora and fauna. As early as 1859, Fr. Herbich published a work referring to the flora of the Bucovina, which appeared in Leipzig (F. Volkmar Publishing House). But brief mentions on the Moldavia's flora and fauna were made very early by some foreign travelers, as well as by Dimitrie Cantemir in his *Descriptio Moldaviae*, a work commissioned by the Berlin Academy.

As we approach the present, the number of studies grows. V. Panait (1969) investigates the vegetation in the Moldovița watershed, focusing on the improvement of natural grasslands. The grasslands were also studied by Popovici et al. (1996). Several studies were accomplished for the territories lying in the neighborhood of our investigated area: Th. Chifu, N. Ștefan, D. Florea (1973), M. Răvăruț, E. Turenschi D. Mititelu, (1961) (*The Vegetation in the Suceava Watershed*). The topic was also approached by N. Barbu (1976), in a synthesis study focusing on the Obcinele Bucovinei [10], as well as by V. Tufescu (1970), C. Brânduș & C. Grasu (1991), in some works dealing with the Moldova Valley [2].

The natural reserves were studied by T. Ștefureac (1967) and T. G. Seghedin (1983), while the relic and endemic flora of the Bucovina was analyzed by T. Ștefureac (1967, 1970). The forest vegetation was also approached both from the point of view of its relationship with the disasters (M. Marcian – 2002) and from the standpoint of the ownership rights (C. G. Leon, 1999). The spread of sustainable development concept and the tourism boom raised the problem of the better management of the protected areas (J. S. Smaranda – 2008), [10].

## 2.2. Zonal and intrazonal vegetation on the Suceava County's territory

The study area belongs to the Dacian Province, the Realm of the Eastern Carpathians. It is characterized by a great diversity of Central-European vegetal formations with Dacian endemic species. These are vertically arranged from the hilly area to the subalpine one. A specific feature of the study area is the indisputable prevalence of the forest. It covers 133,097 ha, i.e. 68.56% of the total area of the administrative units. Otherwise, almost the entire territory is included in the historical Bucovina area, which explains both the name (buc = oak) and the many toponyms derived from

wooded areas. The forest is specific especially for the mountain realm, while to the Sub-Carpathians and the plateau its percentage gradually drops. The western part is occupied by conifers, the center by mixed forests, while to the east, in the area of the Obcinele Bucovinei, the oak is prevalent. In the contact area, there are oak forests mixed with beech and hornbeam.

Vegetation closely matches the climatic altitudinal zones. The topography is not just a support for the vegetation, but also an element that influences the spatial distribution of vegetal cover. The influence of topography (especially the indirect one) is well known, inasmuch as the altitude is responsible for the presence of the altitudinal zones, which are different depending on the slope aspect. But the topography also influences directly the vegetation through the slope gradient.

### 2.2.1. Vegetation zones and subzones

The vegetation in the Moldova watershed lying on the territory of the Suceava County vertically unfolds from the minimum elevation (286 m), which is found where the river leaves the county, to the Giumalău peak (1857 m). The altitudinal zones and subzones show the following floristic structure and composition:

**The broadleaf forest zone.** The Moldova Valley, from where emerges the mountains and as far as Păltinoasa, is included by many geographers into the Moldavian Plateau. C. Martiniuc considers this territory a geographical unit with distinct features, which he calls the “Piedmontane plateau” [2]. The forest vegetation is made up of oak and beech, mixed with other broadleaf species like cherry, hornbeam and maple. The beech-conifers subzone (*Picea excelsa* and *Abies Alba*) develops in the piedmontane area of the Ciungi Massif and in the Mălini – Rasca Sub-Carpathian area. It also includes other broadleaf species, such as *Carpinus betulus*, *Tilia tomentosa*, *Quercus petraea* and *Quercus robur*. The beech subzone is prevalent in the eastern part of the Obcine, on the slopes of the Obcina Mare (N. Barbu, 1976, pp 200-201) [11] and in the Stânișoara Mountains, where “the mixed forests (beech-fir-spruce) cover almost entirely the mountain range, descending as low as the eastern marginal depressions” (Al. Rosu, 1973, p. 213), [12]. Sometimes, the beech forms pure stands, but more often than not, it is mixed in different amounts with fir or spruce.

**The spruce-beech subzone** is a transitional one and it shelters a wide range of floristic

elements. The basic components of these forests are spruce, beech and fir, the prevalence of which depends on the local conditions. For instance, in the southern part of the Obcina Feredeiu and partly in the Obcina Mare the spruce prevails. Elsewhere, there are mixed forests composed of spruce, fir and beech, spruce and fir, or spruce and beech, which make up forest stands with irregular distribution. If usually, this altitudinal zone stretches from 750 to 1150 m, sometimes, due to the cold air masses that linger on the bottom of the depressions (thermal inversions), it climbs as high as 1400 m (the Tomnatic area in the Obcina Feredeiu and the Plaiul Todirescu in the Rarău Mts.).

The spruce zone covers especially the western slope of the Obcina Feredeiu, the eastern slope of the Obcina Mestecăniș and the ridges of the Giupalău and Rarău massifs. Fir appears as secondary element, while pine is a common feature of the watersheds of the right-hand tributaries of the Moldova River as far as Pojorâta.

**The subalpine zone** of the Eastern Carpathians generally develops starting from 1650 m altitude. In the Rarău massif, however, this altitudinal zone starts at 1550 m and climbs as high as the maximum elevation in the area (Giupalău peak, 1857 m). The dominant species is mugo pine (*Pinus mugo*) mixed with juniper (*Juniperus communis*), blueberry bushes (*Vaccinium myrtillus*), lingonberry (*Vaccinium vitis-idaea*) and dwarf willow (*Salix*).

The herbaceous vegetation forms grasslands with diverse composition, which suffers the pedoclimatic influence of the previously mentioned forest vegetation zones.

**The grasslands in the beech zone.** These grasslands are mainly composed of *Agrostis tenuis*, *Festuca rubra*, *Festuca pratensis*, *Dactylis glomerata*, *Lolium perennis* and *Poa pratensis*, which also spread on the low terraces of the Humor Valley and along the Moldova watercourse. The prevalence of leguminous plants ensures a high nutritive value to the forage mass.

**The grasslands in the beech-conifer zone.** These are secondary vegetal associations, which generally appear in the aftermath of deforestations. They can be spotted mainly in the Moldovița Depression, along the Moldova Valley between Vama and Molid, as well as in the Obcina Mare, in the form of glades. The most common species that make up these grasslands are *Festuca rubra*, occupying the areas of the former beech woods, and *Agrostis tenuis*, which has replaced the forests

consisting of beech and fir. Less widespread are *Nardus stricta* and *Arrhenaterium elatius*, which thrive on the areas formerly covered by beech or mixed forests (N. Barbu, 1976, p.212) [11].

**The grasslands in the spruce zone.** This type of vegetal association is specific for the Moldova-Sadova depressionary corridor, more exactly for the alignment Izvoarele Moldovei-Moldova-Sulita-Benia-Breaza-Măgura-Sadova-Câmpulung Moldovenesc. At the same time, it is also found in the Lucina and Botus depressions, as well as in the Răchitiș-Muncel-Pojorâta depressionary corridor (N. Barbu, p. 211), [11]. The grasslands are made up of *Festuca pratensis*, *Festuca rubra*, *Nardus stricta* and frequently of blueberry bushes (*Vaccinium myrtillus*), juniper (*Juniperus communis*) and birch tree (*Betula verrucosa*). The grassland quality depends on the soils, which are favorable for certain vegetal species. For instance, the skeletal rendzina soils offer good conditions for the development of *Poa nemoralis* and *Carex Montana*, vegetal associations with low nutritive value (N. Barbu, 1976, p.212) [11].

### 2.2.2. Intrazonal vegetation

Intrazonal vegetation does not comply with the latitudinal and altitudinal zonation, but it is found in areas with different local conditions, having an insular or linear appearance. In this category, we may include the floodplain vegetation (making up linear formations along the rivers), the swamp associations, the saxicolous associations, found in the rocky perimeters, and the halophytic vegetation developing on the salt-affected soils, which appears on confined areas.

**The floodplain vegetation.** The woody vegetation consists of floodplain forests. Upstream Molid village, the Grey Alder (*Alnus incana*) prevails, while downstream of it, the dominant species are the willows (*Salix alba*, *Salix purpurea* and *Salix viminalis*) in association with white poplar (*Populus alba*), and, less frequent, with black poplar (*Populus nigra*). In some areas lying along the Moldova and Moldovița valleys, *Myricaria germanica* is common. The herbaceous vegetation makes up grasslands, the productivity of which is influenced by soil fertility and drainage. On the higher floodplain areas, where soils have good drainage, one can see grasslands with *Festuca pratensis* and *Lolium perennis*.

**The swamp vegetation.** Generally, the swampy areas are small, because the lithological

formations are pervious. Most of them are found in the mountain area.

### 2.3 The role of vegetation and its importance for the natural ecosystems

On the whole, the vegetation role is manifold: food source, fuel and especially raw material. However, its most important role is that of turning the atmospheric carbon dioxide into organic matter. By this process, the solar energy is converted and stored, while the air is purified and enriched in oxygen. Air purification is done by carbon dioxide consumption, while oxygen enrichment is the natural result of the photosynthesis process, which takes place after the formula:  $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{solar energy} = \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$ .

By this process, the solar energy is stored in an organic substance resulting from the chemical reaction between the water absorbed from the soil and the carbon dioxide taken from the air, while the oxygen is returned to the atmosphere. The process has a twofold importance for the animal life, to which it ensures food and oxygen. For the anthropogenic activities, the associations with high vegetal mass create special availabilities, as follows: exceptional aesthetic environment, clean air, raw materials and various possibilities for tourist activities, with strong emphasis on ecotourism [13]. The association of ecotourism with the imperatives of sustainable development and nature conservation must comply with the following criteria: preserving the biological and cultural diversity; supporting the sustainable development by ensuring jobs to local population; sharing the benefits of the social-economic activities with the local communities, securing their support and participation in the management process [6], [14].

The forest distribution and composition is the result of a bunch of conditions generated by the geospheres, but in their turn, these suffer the influences of the forest. The forest biosphere, which is influenced and even controlled by the features of the other geospheres, has in its turn manifold positive influences on the first ones (i.e. on air, water, soil, lithology etc.). At the same time, it is a valuable resource and a favorable environment for its flora and fauna [15]. Forest influences are felt not only within its confines, “but also outside its perimeter, no matter if the adjacent areas are natural or humanized” [15].

### 2.4. Hesychasm –local specific form of forest sustainable conservation.

“Hesychia” means silence, inner stillness. Hesychasm means to reach the inner peace by an incessant prayer in which one mentions repeatedly the name of the Savior. However, in order to reach the peace of mind the hermits looked for the physical silence, retiring themselves in the middle of nature, away from the turmoil of the secular world.

The Romanian monks were fond of the quiet woods and the simple life lived in the mountain wilderness, as was recorded by the Romanian religious literature. For instance, St. Daniil Sihastrul, who is considered “a great teacher of the wilderness and a counselor of the monks”, after moving from hermitage to hermitage, finally retreated in 1470, when the Putna Monastery was consecrated, to the Voreneț area, „where he carved a cell into the stone, beneath the Hawk Rock. Here, he lived a humble life for another twenty years in the love of God (...) [15]. About the devout Iov the Hermit is said: Iov the Hermit repented at the Bogdănești Monastery – Suceava, where he lived humbly for a few years at the end of the 14th century. Then, wishing to pray the Lord incessantly, he retreated in the secular forests beneath Mount Pleșu (...) [15]. Gathering around him more than fifteen monks, he established in the woods a small seclusion place, which was long known as the Iov’s hermitage, before changing the name into the “Iova Glade”. This was the hermitage of the monks belonging to the Bogdănești-Râșca Monastery. For centuries on end, until today, watchful hermits have forced themselves here to a humble life [15]. Another argument for the hesychasm emerges from the Arhim’s writings. Ioanichie Balan: “... Around the Moldovița Monastery (before 1402), as everywhere else, hermits fallen into oblivion had been living a humble life since the 13th and 14th centuries. Some would remain unknown until their death; others were living for a while as hermits in the forest glades and then returned to the monastery”. For instance, the devout Isaia the Hermit from Moldovița [15], after he lived a humble life in different monasteries, “craving the life of the old-time hermits, retreated in peace in the forests around the monastery. There, he made himself a hut and continued to lead a humble existence in prayer and self-remembering” [15].

The entire life of the Romanian people was strongly connected with the forest: the lodge, the mill, the church, the furniture and the tools, all were

made of wood, before other materials take prevalence. So, we may speak above all of “a Romanian civilization of wood, with specific forms, for about fifteen hundred years (...)” [15]. The wood was the material used for the building of the first churches and hermitages on the Moldova valley. In the Suceava land, the wood architecture is a remarkable chapter of technical civilization and artistic expression; by its distinctive features, it is part of the national and European cultural patrimony” [15]. Nearly every time when a stone building was erected, the remnants of older wood edifices were unearthed. Otherwise, the architecture of the wood churches was at the origin of the Moldavian architectural style.

The woods played a special role in the life of the Romanian people in general and in the monastic life in particular. The forests where the hermits used to retreat in order to be away from the world and close to God provided them shelter, food and tranquility. In the study area, there are humble places of worship made of wood. Although they have a modest appearance, they have a great historical and artistic value (Table 1).

### 3 CONCLUSIONS

Ensuring the sustainable development of a territory is a line of action established by the policies and strategies worked out at European, national and regional levels. The sustainable development of a county or a region must rely on the local resources and the development strategies established and promoted with the purpose of enhancing the life quality of the community [16]. In order to be viable, this approach requires a realistic perception of the natural capital and its importance for the life of society.

The correlation between the natural potential and the cultural anthropogenic one is set up as an opportunity that may be successfully turned to account in the Suceava region. The sustainable

development of the local community is always a priority, because the present development necessarily influences the future evolutions. The sustainable development of the Moldova watershed and the Suceava County may rely on the valuable tourist resources [14], [17]. A similar planning and capitalization of other touristic regions in the world may ensure a long-term development through sustainable tourism, to the benefit of the present and future generations.

The arguments for tourism development in the area are the following: a rich natural setting, the existence of a particular ethno-folkloric fund, exquisite cultural-historical sights, the hospitality of the natives, the Bucovina specific cuisine, the existence of higher education institutions in the field of tourism, and the willingness of the inhabitants to engage in rural tourism activities.

At present, the Bucovina area is included in the conventional tourist itineraries, especially addressing to the adult population. From the sustainable development perspective, this territory must be considered as an area with a high potential for the development of numerous forms of tourism: ecological, rural, cultural, spa, entertainment, and religious [14], [17].

Although some of these forms are already present, the tourist potential is not satisfactorily capitalized and the tourist activities still seriously harm the environment.

**Table 1 Wooden churches in the Moldova watershed on the territory of the Suceava County**

S.No	THE NAME OF THE ADMINISTRATIVE UNIT	SETTLEMENT	DEDICATION OF THE CHURCH	YEAR OF FOUNDATION
1.	BOGDĂNEȘTI	BOGDĂNEȘTI	Sts. Voievozi wooden	1805

	Commune		church	
2.	BOROAIA Commune	BOROAIA	The Dormition of the Virgin Mary wooden church	1808
3.	CÂMPULUNG MOLDOVENESC City	CÂMPULUNG MOLDOVENESC	The Fire Squad wooden church	2005
4.	CORNU LUNCII Commune	BĂIȘEȘTI (sept.1499)	Sts. Voievozi wooden church	1778
5.	DRĂGUȘENI Commune	DRĂGUȘENI	The Dormition of the Virgin Mary wooden church and St. Spiridon church	1780
6.	FORĂȘTI Commune	FORĂȘTI	St. Nicholas wooden church	1764
7.	FUNDU MOLDOVEI Commune	COLACU	St. Nicholas wooden church	1800
8.	GURA HUMORULUI City	VORONEȚ	The Hermitage church	ant.1472*
9.	VAMA Commune	VAMA	Ascension of Jesus wooden church	1783
10.		MOLID	St. Anne Hermitage –old style (2000-under construction )	2000

- Ant. = anterior

### Acknowledgements

This work for pHd. Fluțar Monica and pHd. Cocerhan Constantin was supported by project: POSDRU/88/1.5/S/61150 „*Doctoral Studies in the field of life and earth sciences*”, project co-financed through Sectorial Operational Program for the Development of Human Resources 2007-2013 from European Social Fund.

### References

- [1]. Petrișor A., I., *Theory and practice of biodiversity conservation in Urban and regional planning, zoning and town planning*, year IX, no. 3-4, p 15-24, 2009.
- [2]. Cocerhan C., *The Natural Reseravaion within Suceava Area and their importance*", in the Book „Recent Researches in Tourism and Economic Development”, Included in ISI/SCI Web of Science and Web of Knowledge, Drobeta Tr. Severin, Romania pp. 486-490, 2009.
- [3]. Martiniuc ,C., *Cercetări geomorfologice regiunea Baia-Suceava*, The annals of Univ. „Al. I. Cuza” Iași, Secț/. II, t.II, f.II, Iași, p. 112, 1956.
- [4]. P. Cocean, G. Vlăsceanu, B. Negoescu, „*Geography of tourism*”, Editura Meteor Press, 2005, București.
- [5]. Mazilu M. E., *Il ya compatibilité entre le Tourisme, le Developpement Durable et l'Environnement*, in The annals of University Eftimie Murgu of Reșița, Fasc.2, vol.2, , Eftimie Murgu Publishing House, Reșița, pp.63-67, 2009.
- [6]. Mazilu, M., “Key elements of a Model for Sustainable Tourism”, in *NAUN Journal of Energy and Environment*, Issue 2, Vol. 4, pp. 45-54, 2010.
- [7]. Mazilu M. E., Marinescu R., *Sustainable Tourism in Protected Areas, Case Study of the Iron Gates Natural Park*, Rural Futures Conference, organized by the University of Plymouth and School of Geography, Plymouth, U.K., 2008.

- [8]. Mazilu M. E., Iancu A., Marinescu R., *Un Tourisme fait pour durer*, in Colloque international: Services, innovation et developpement durable, Poitiers, France, 2008 <http://www.ruralfuturesconference.org/accesat/20.10.2011>.
- [9]. Vădineanu, A, *Sustainable Development - Theory and Practice*, Vol, University of Bucharest, 2004.
- [10]. J. S. Smaranda, *Managementul of tourism in protected areas*, Editura RISOPRINT (acreditată CNCISIS), Cluj Napoca, pp. 52-87, 2008.
- [11]. Barbu, N., *Bukovina, Scientific and Encyclopedic Publishing House, Bucharest, pp. 194-227, 1976*.
- [12]. Roșu, Al, *Physical geography of Romania*, Didactic and Pedagogic, Bucharest, 1980.
- [13]. Cocerhan, C., Spânu, P., *Eco-tourism – future tourism*, în vol. „Picturesque Romania. Promote the region where you live”, Publishing house „Septentrion”, Rădăuți, pp. 15-20, 2009.
- [14.] Cocerhan C, *Protected areas from the region of Suceava and its touristic valorization*, în NAUN International Journal of Energy and Environment, Issue 2, Volume 6, pp.153-163, 2012.
- [15]. Chiriță, C., *The forests of Romania. Monographic study*, Ed Socialist Republic of Romania, Bucharest p.61-184, 1981.
- [16]. Cocerhan C., *Sustainable development – a priority of life quality*, în vol. „Education and the European Culture”, Annual session of scientific paper presentations of teachers, Casa Corpului Didactic Suceava, Publishing house „G. Tofan”, Suceava, pp. 216-220, 2010.
- [17]. Cocerhan C, Carmen Năstase, *Sustainable development in Bucovina region – analysis of touristic potential in Suceava*, The annals of the „Ștefan cel Mare” University of Suceava; Fascicle of the Faculty of Economics and public Administration; Vol. 11, NO. 2(14), 2011.