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**BIODIVERSITY OF THE NATURAL MOUNTAINS
HERITAGE – PRESENT CHALLENGES AND
SUSTAINABLE PERSPECTIVES**

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BIODIVERSITY OF THE NATURAL MOUNTAINS HERITAGE – PRESENT CHALLENGES AND SUSTAINABLE PERSPECTIVES

Abstract: *Between mountain regions and biodiversity exists a direct and indissoluble link: the mountain areas represent, perhaps, the most important source of eco-systems at global level, true scientific laboratories for researching and learning about the evolution and distribution of species and live bodies, about the relationships between these and about their adjustment to various environments and about the crucial influences of human actions, that led to the current climate changes. The mountains operate as true refuge for endemic species affected by uncontrolled human actions, while alpine meadows are exposed to losses of traditional pasture practices. The diverse and complex mountainous regions are the core elements of the environmental and sustainable development policies, the difficulties and problems encountered by these areas in adjusting to the new climate changes requiring adequate, swift and especially permanent (continuously supported) measures. The mountains belong, as a rule, to environmental geography but, just the same, they may be analysed also from the economic, social, cultural viewpoint, etc. as their multi-disciplinary nature is acknowledged both in the academic milieu but also by the decision factors involved in territorial development policy. Recently, the New Economic Geography, promoted intensively at global level, considers economic and social development of mountain regions of particular importance: mountain areas are important sources for raw materials and materials necessary for basic output and consumption (agriculture, industry, services) an aspect which affects under the present circumstances, both biodiversity and the living standard of local communities. The economic perspective is of particular importance both at the level of regional groups of interest, but the more so at the local level for the communities depending directly and permanently on the resources and conditions provided by the mountain. The negative impact on the mountain area of economic activities is increasingly more visible both at high and low altitude and therefore it should lead to a common vision and sustainable approach regarding the state of the biodiversity for this area because affecting a habitat might attract also the destruction of the entire ecologic balance which is already very fragile nowadays. Having as starting point the above considerations, the present paper provides a broad image of the relationship between the biodiversity of the mountain area and the implications of its economic and social development by resorting foremost to national and international documentary sources, to statistic data and information which attempt to complete the global image about the evolution of the relationship in time and space.*

Key-words: *biodiversity, mountain area, natural heritage, sustainable development, local communities*

JEL Classification: *051; 056, 057; 058*

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INTRODUCTION

It is well-known that mountain areas cover about 22% of the Earth's surface (32 million km²), and sustain directly about 13% of the world population (915 million inhabitants) and 70% of the rural population providing for 60-80% of the water resources of the earth. Due to the unique natural exquisiteness they host, many mountain regions are declared *Protected Areas* and enjoy special attention. Thus, approximately 25% from total land surfaces covered by mountains are framed within this category, as they represent the permanent dwelling of some rare species of fauna and flora, either relict or in peril¹ (Blyth et al., 2002) or shaping unique habitats and ecologic shelter corridors for forest species, etc. (Körner & Ohsawa, 2005). The mountain regions hold 60% from the biosphere's reserves and contribute by 15-20% to tourism activities at global level and are covered in a share by 23% with forests.

From the viewpoint of their relevance, mountain areas play a key-role in the economic, social, environmental development, and in culture and traditions etc., as they provide for essential eco-systemic goods and services. In dynamics, the mountain regions present a partial development even political and economic marginalisation and, in some cases, they are subjected to some territorial conflicts or reminiscences of the past.

The mountains shape a living, captivating sometimes dangerous and relatively populated life-environment that is continuously and aggressively subjected to severe economic pressures (unemployment, migration, change of land use models, habitat fragmentations, deforestation, industrialisation, mining pressure, pollution and uncontrolled exploitation of natural resources, and environmental degradation, water deficit, etc.) all these contributing to decreasing their intrinsic value as *natural owners of unique and non-replicable beauty*.

Mountain regions are found on all continents, at all latitudes and types of large ecosystems (from the arid desert and tropical rainforests to the polar zones) and they are in the permanent attention of all those who love or manage them.

Irrespective of the nature of the attachment and involvement degree, mountains should benefit from sustainable management that would pursue:

- preventing the degradation of biodiversity, protecting rare species, diminishing the impact of climate changes, etc.;
- maintaining and supporting local communities developed only in agreement with the principles of preserving biodiversity and their identity;
- promoting some trading conditions to the advantage of these communities, protecting them from global competition and the fierce fight for obtaining and controlling mountainous natural resources; and,
- efficient management of local mountainous resources by maintaining the balance between the unlimited needs and increasingly scarce resources.

From the perspective of sustainable management, the products and services provided by mountain ecosystems have vital importance for local communities as they are an important source of raw materials for:

1. *The agricultural sector.* The heterogeneous conditions contributed to the evolution of a significant variety of agricultural cultures adapted to the environmental conditions and human needs: many agricultural cultures (corn, potatoes, barley, sorghum, tomatoes, apples, etc.) and part of the domestic mammals

¹ HOLDEN A., FENNELL D. A. (2013), *The Routledge Handbook of Tourism and the Environment*, ISBN 978-0-415-58207-0.

(sheep, goats, etc.) originate from the mountainous region. Over time, the genetic diversity of the plants and animals from the mountain region knew an increase, being frequently associated with the cultural diversity and with the extreme variations of the environmental conditions. Currently, the mountainous biodiversity is threatened by the continuing modernisation processes of agricultural production, aspect that leads to the pauperisation of the ecosystem by using few sorts and lacking genetic variation. The expansion of agricultural production on untilled land triggers the diminishment of habitats for some species and the deterioration of ecosystems, especially where the lands are not adequate to practicing agriculture. The mountainous agricultural ecosystems may bear invasions of some alien habitats, this aspect affecting local species and, implicitly, the local biodiversity as they are separated by valleys and mountain peaks.

2. *Forestry sector.* The vast majority of the mountainous area is made out of forestry ecosystems of low and medium altitude. Under certain conditions, the mountain forests provide basic produce and services to local communities. The forest ecosystems from the mountain areas are threatened by the expansion of agriculture and by the unsustainable methods of wood-cutting (uncontrolled, abusive wood-cutting, setting-up forest mono-cultures, etc.)².

3. *Tourism.* During the last years, tourist activities in the mountain region had an important dynamic (winter sports, outdoor activities, etc.), fact which led to extending the tourist infrastructure and tourism services. This affected rapidly and in an uncontrollable manner the fragile ecosystems and the mountainous biodiversity. Just the same, the remodelling of mountain slopes for ski and other winter sports had a strong impact on the integrity of the mountain ecosystems (sometimes even their total deterioration), and the building of tourist infrastructures resulted in the urbanisation of some mountain areas and (total or partial) biodiversity loss.

4. *Mining.* Ore, metal and other resources' exploitation has a negative impact on the habitats of mountain regions leading to severe water pollution and disturbs the downstream areas. Moreover, the elimination of trees, plants and soil in the areas where mining is practiced, or where opencast mining exist determined the destruction of landscapes, habitats, soil erosion and destruction of agricultural lands. At the same time, rains washed away the land of open strip mining and the removed sediments have polluted groundwater, poisoned fish and plants downstream, disfigured rivers and rivulets, generated flooding and landslides, etc.³ In this context, we refrain from mentioning the increased risk, as well, of chemical contamination of underground waters in case that the ores from sediments and rocks reach the mining sterile and infiltrate underground waters.

5. *Hydropower Plants.* The mountains and mountain lakes are frequently used in building power plants for generating electricity. Even if they represent an important source of renewable (green) energy, their design has negative impact on rivers and ecosystems in the vicinity and, hence, they generate sometimes

² We might mention here tropical mountain cloud forests (TMCF) characterised by the presence of ferns and the abundance of moss, orchids and other plants that grow trunks and branches (epiphytes) and that play an important role at global level (for instance, in Mexico TMCF cover less than one percentage of the country but is home to 3000 species or 12% of the country's flora, from which up to 30% are endemic).

³ <http://www.greenpeace.org/romania/ro/campanii/rosiamontana/descriere/>

more wicked than good outcomes. The creation of artificial lakes and the alteration of water management determined also a negative change in the habitats, ecosystems and valleys in the immediate proximity.

6. *Climate changes.* The global warming affects negatively mountain ecosystems by the retraction and sometimes vanishing of some life forms from the alpine area. Endemic mountainous species pulled back at high elevations and some perished on the background of habitat loss. The changes in the precipitation periods and the increase in temperatures triggered the meltdown of glaciers and decline of snow covered mountain areas, thus reducing the capacity of preserving water. By a process of non-compliant water household management process for the mountain areas, both low altitude and vicinity areas were subjected to ecosystem changes.

7. *Air pollution.* In the mountain areas, the high rates of precipitations led to the depositing pollutants' from the atmosphere in soils and/or their accumulation in the snow layers affecting on long-term ecosystems and vulnerable species. Acid rain triggered the destruction of trees while some negative effects are not visible yet (it involves intensive research and careful monitoring activities of pollutants and main sources).

In brief, the biodiversity of mountainous areas is affected by:

- obtaining basic resources: *water, raw materials for food industry, wood, iron, fuel, etc.*
- delivering mountain services: *tourism and leisure, aesthetic experience, cognitive development, spiritual/religious relaxing and reflection, etc.*

The inclusion of a mountain area in one category or the other as *Protected Area* puts pressure on the local community by imposing certain limits to the economic and social development process, by affecting the living standard and welfare of local communities. Therefore, a certain balance is necessary between preserving biodiversity in the mountain areas and unfolding economic and social processes, a fact which presupposes a series of adequate policies and strategies which are politically and financially supported, very often subsidised so as to prevent the emergence of those negative phenomena (for instance, depopulation, over-exploitation of resources, illegal deforestation, etc.) which might influence on long-term the entire natural system and the already very fragile balance nowadays inside it.

BIODIVERSITY IN THE MOUNTAIN AREAS OF EUROPE

Irrespective of their localisation, the mountain chains are characterised by a relatively cold and harsh climate, high elevations, complex and varied topography (low slopes covered with forests and natural and semi-natural grasslands, high slopes without trees, alpine meadows, arid, wetland or shrubby areas, etc.). To their vast majority, at different elevations, similar areas might be observed from the viewpoint of the vegetation covering them, while on steep slopes concentrated habitats can be seen which are differentiated by altitude.

In Europe, the mountain area covers 40% from the total surface and hosts 20% of the population⁴. On the continent, are found seven of the longest and highest mountain chains of the globe: the *Alps* (localized in the central area of Europe), the *Apennines* (Italy), the *Pyrenees* (at the border between Spain and France), the *Scandinavian Mountains* (in Sweden, Finland and Norway), the *Carpathians* (with the shape of an ark from Slovakia to Romania), the *Balkan Mountains* and the *Rhodope Mountains* (Bulgaria). The main mountain regions from Europe and its countries are presented in Table 1.

⁴ <http://www.turismulresponsabil.ro/wp-content/uploads/2017/01/2.-Danut-Ungureanu-Zona-montana.pdf>

Table 1

Mountain areas and the countries involved

<i>Countries involved</i>	<i>% of the EU territory</i>	<i>Regions</i>
Belgium, Germany, Denmark, Spain, France, Ireland, Portugal, the Netherlands, the United Kingdom	18,4	Atlantic
Estonia, Finland, Latvia, Lithuania, Sweden	18,8	Boreal
Austria, Belgium, Bulgaria, Czech Republic, Germany, Denmark, France, Italy, Luxemburg, Poland, Romania, Sweden, Slovenia	29,3	Continental
Austria, Bulgaria, Germany, Spain, Finland, France, Italy, Poland, Romania, Sweden, Slovenia, Slovakia	8,6	Alpine
Czech Republic, Hungary, Romania, Slovakia	3,0	Pannonian
Romania	0,9	Steppic
Bulgaria, Romania	0,3	Black Sea
Cyprus, Spain, France, Greece, Italy, Malta, Portugal	20,6	Mediterranean
Spain, Portugal	0,2	Macaronesian

Sursa:

http://ec.europa.eu/environment/nature/info/pubs/docs/biogeos/Steppic%20Region/KH7809607ROC_002.pdf

The extremely complex topography (south-oriented sheltered slopes, snow pockets, wind-blasted crags and rugged land covered by debris) explain the particularly rich biodiversity of the alpine areas (two-thirds of the plants are found in the mountain area) (Table 2).

Table 2

Mountain chains in the alpine biogeographic region of Europe

<i>Mountains</i>	<i>Characteristics of the mountain biodiversity</i>	<i>Socio-economic characteristics</i>
The Pyrenees (430 km.)	60 types of habitat are present (Habitat Directive). The mountains are characterised by numerous torrents, cascades and lakes and at elevations over 1000 m there are over 1500 lakes. The diversity of the flora is exceptionally high: 3000 species of plants, from among which at least 120 are endemic. The vast diversity of birds and animals (over 40 species of mammals, including rare endemic species). One of the extinct species is the Pyrenees Ibex ⁵ .	The mountains are relatively low populated, the agricultural sector and sheep breeding being the main activities. In the past, the Pyrenees underwent an intensive deforestation process (and with visible traces mainly on the mountainsides). The beech was intensively used as firewood and in feeding the furnaces for ore extraction. Tourism is another economic activity of high intensity next to winter sports.

⁵ In January 2000, the Pyrenean Ibex was completely extinct. Nevertheless, scientists have attempted to clone this species by using DNA from one of the last females; such a clone died seven minutes after birth. Other sub-species survived: the Spanish western Ibex, or the Ibex Gredos, and the Ibex from the south-eastern part of Spain, while the Portuguese Ibex is extinct. The last Ibex from the Pyrenees disappeared before scientists could analyse the species accordingly, the taxonomy of this sub-species being controversial.

The Alps (1200 km.)	<p>The forests are in relatively natural state as at high elevations they are true refuge and ecological corridor for many large species (bears, birds of prey).</p> <p>The grasslands and alpine meadows make up 25% of the mountain vegetation (the majority semi-natural, affected over time by moderate agricultural practices) and many of them are threatened by farmstead abandon. 84 types of habitat are listed, from among which 47 species of plants. The Alps have over 40% of the European flora but also 200 species of birds (which lay their eggs here) and other 200 migrant birds. The Alps represent one of the most biodiversity richest mountain chains from European, but also one which is heavily exploited.</p>	<p>In the Alps live over 11 million inhabitants mainly in the urbanised valleys. To them are added 100 million tourists visiting the Alps with tourist or recreational purposes. These phenomena exert an important pressure on the mountainous environment which has a particular fragility.</p>
The Apennines (1350 km.)	<p>. In the Apennines on the Italian side, during the last Ice Age the ice sheets advanced and after their meltdown the populations began their separate evolution.</p> <p>One of the species running the risk of extinction is the Abruzzo chamois (<i>Rupicapra pyrenaica ornata</i>) the reason being excessive hunting (450 individuals that are vulnerable to diseases and consanguinity).</p>	<p>The inhabitants are in small numbers and on a decreasing trend. Consequently, the traditional agricultural systems of cattle breeding are vanishing; however, efforts are made for repopulating the area due to the fact that these mountains are included in a network of interconnected national parks.</p>
The Scandes (1400 km.)	<p>The diversity of the species in the area of the Scandes is relatively low. Nevertheless, they represent an essential component of the European biodiversity due to their considerable size and the unaltered character. They are counted among the few locations in Europe where we might discover authentic wilderness. 44 types of habitat are represented, 29 species of plants and 18 species of animals (Habitats Directive).</p>	<p>The low presence of humans in the Scandes is not surprising. Some of the activities, such as river damming for generating hydroelectric power, reindeer herding, or the disappearance of summer grazing had negative impact at local level. However, the majority of the mountainous lands remain unperturbed by human presence, and therefore this remains one of the largest intact natural areas in Europe.</p>
The Carpathians (1450 km.)	<p>The habitats have a long tradition regarding the exploitation of lands but also sheep and cattle breeding. The Carpathians host many species, with a high level of biodiversity: over 3500 species of plants from among which 481 endemic species. Here we find large carnivores, a varied selection of small mammals, many endemic species from among which the Tatra pine vole and the Carpathian marmot. Over 300 species of birds (the Ural owl, the white-backed woodpecker, the black stork, etc.).</p>	<p>In the Carpathians live about 18 million individuals, who are exerting pressure on maintaining and preserving the biodiversity</p>
The Balkans ⁶	<p>These mountains display a typical alpine character and have a strong Mediterranean influence regarding the make-up of the species. Over 60 types of habitat (Habitats Directive) with a considerable forests'</p>	<p>The population density is extremely low. The mountains are in remote areas and still unexplored.</p>

⁶ They are constituted from three distinct mountain formations: the Rila Mountains, the Pirin Mountains and the Rhodope Mountains.

(550 km.)	component, with many endemic species of trees (the Balkan pine, King Boris fir, and the black (Bosnian) pine. The area contains a huge variety of plant species and numerous large carnivore populations, and species of birds of prey (in Rhodope is found the largest agglomeration of day birds of prey from Europe).	
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Source: processing after

http://ec.europa.eu/environment/nature/info/pubs/docs/biogeos/Alpine/KH7809637ROC_002.pdf.

In the mountain areas of Europe, the extensive agricultural practices, the transhumance, forestry, etc. have contributed to creating an important diversity of landscapes and cultures. Nowadays, this biodiversity is subjected to phenomena correlated directly to the activity of the local communities (and not only): abandoning the area, tourism and winter sports development, infrastructure development, urbanization, soil compaction, etc.

The development of mountain tourism expanded practically over the entire continent, in parallel with the intensification of traffic and the building of the transport infrastructure (which turns into an important barrier for species migration⁷).

Damming the main rivers in the mountains for the electric power sectors or for agriculture has modified considerably the natural mountain environment.

These activities influenced the biodiversity of the mountain areas, a fact mentioned in various reports and analyses at EU-level. As might be seen, most mountain areas from Europe are in an unfavourable preservation state (60.68%) from among which 32.57% are in a very bad situation, a fact which should impose the implementation of swift and drastic measures required for rebuilding the state of the affected habitats.

Table 3
Numbers of habitat types in each massif classified by conservation status (no.)

<i>Massif</i>	<i>Favourable</i>	<i>Unfavourable (inadequate)</i>	<i>Unfavourable (bad)</i>	<i>Unknown</i>	<i>Total</i>
Apennines	47	26	3	8	84
Balkans/South-east Europe	32	27	23	1	83
Atlantic islands	11	12	7	1	31
Nordic mountains	22	13	27	2	64
Central European middle mountains (Belgium and Germany)	16	18	12	2	48
Eastern Mediterranean islands	13	18	6	8	45
Carpathians	10	21	18	2	51
Alps	14	37	35	7	93
French/Swiss middle mountains	11	22	37	7 77	7 77
Western Mediterranean islands	7	17	14	15	53
Central European middle mountains (Czech Republic, Austria, Germany)	4	15	32		51
Pyrenees	3	19	30	36	88
British Isles	1	7	52	4	64
Iberian mountains		6	3	77	86
<i>Total mountains (no.)</i>	<i>191</i>	<i>258</i>	<i>299</i>	<i>170</i>	<i>918</i>
<i>Total mountains (%)</i>	<i>20,81</i>	<i>28,10</i>	<i>32,57</i>	<i>18,52</i>	<i>100</i>

Source: <https://www.eea.europa.eu/publications/europes-ecological-backbone>

⁷ Yearly, about 150 million individuals travel in the Alps, from among which 83% travel on paved roads.

The negative effects of climate changes led in time to promoting some actions that would counteract them and contribute to reinstating the natural balance. Some actions had as basis the specific legislation, promoted as of 1970 but also various cooperation agreements regarding the mountain regions from the Alps and Carpathians.

Furthermore, as of 1975 the European Commission by the *Directive on mountain and hill farming and farming in less-favoured areas no. 75/268*⁸, acknowledges the necessity of supporting agriculture from mountain areas. The European Union launches the first projects for sustaining Less Favoured Areas. Thus, in the mountain areas were determined areas with the statutes of less favoured area, as these cover about 69% from the mountainous area.

In the year 1978, at the Conference of the EU Council of Ministers responsible with regional planning (CEMAT) is launched the official paper "*Pressures and regional planning problems in mountain regions*"⁹, which is the point of reference for all future development and regional planning strategies.

After 2000, the mountain areas are an important component of the cohesion and regional development policy of the European Union being included in the thematic of the regions called 'permanent natural handicaps'.

From the biodiversity perspective, mountain regions are areas with high natural value requiring special attention. This attention consists in determining some areas where human actions of economic nature cannot take place and called Protected Areas. At EU-level, these protected areas represent up to 33%¹⁰. Many of the mountain areas were declared as *Protected Areas* and they are the object of some Community or international programmes.

For instance, *Natura 2000*¹¹ is the European network of natural protected areas comprising a representative sample of wild species and natural habitats of community interest. It was constituted not only with the purpose of protecting nature, but also for preserving these natural riches on long-term and for ensuring the resources required for the socio-economic development¹². The reach degree of *Protected Areas* included in Natura 2000 differs from one country to another: Cyprus - 95 %, Slovenia - 83 %, Greece 82 %, Italy - 81 %, Slovakia - 79 %, Austria - 78 %, Spain - 73 %, Czech Republic 71 %, Romania – 65%.

In total, in the alpine region are 1.496 habitats of community importance (SCI) (Directive Habitats) and 365 areas of special protection (ASP) (Directive Birds)¹³, as these areas with special protection statutes cover about 40% from the total surface of the alpine region (Figure 1).

⁸ <https://www.sciencedirect.com/science/article/pii/0264837786900621>

⁹ http://www.bbsr.bund.de/BBSR/EN/Publications/lzR/2003/7DejeantPons.pdf?__blob=publicationFile&v=3

¹⁰ Only 5 % from the areas with high natural value are not included also in the category of less-favoured areas.

¹¹ Natura 2000, the widest world network of natural protected areas. In order to fight against the loss of natural areas, Europe drafted two important laws: the Directive Birds (1979) and Habitats (1992). These laws are the founding milestones for the environmental protection policy and led to setting up Natura 2000 the largest network of protected natural areas in the world covering - 1 million square kilometres of land, (over 18% from the EU land surface) - 250.000 square kilometres of marine habitats (almost 4% of the EU marine habitats), respectively 27.000 habitats and 1.000 species are under special protection.

¹² <https://natura2000.ro/ce-este-reteaua-natura-2000/>

¹³ European Topic Centre for Biodiversity (European Environment Agency) <http://biodiversity.eionet.europa.eu/October2008>.

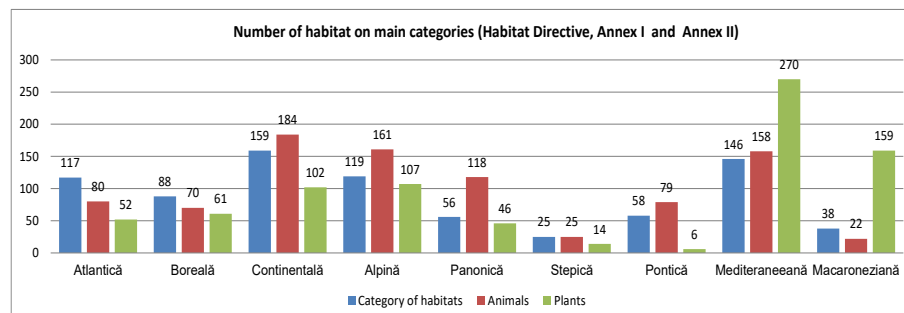


Fig. 1: Categories of habitats from the mountain regions, in Europe (Habitats Directive, Annex I and Annex II)

Source: European Topic Centre on Biodiversity (European Environment Agency)
<http://biodiversity.eionet.europa.eu>

Most of community importance (SCI) are found in the continental area (7475), followed by the Mediterranean (2928) and the Atlantic (2747) ones. Regarding the special protection areas (SPA) the most numerous are designated in the Continental region (1478) followed by the Boreal (1165). Nevertheless, the widest surfaces covered by habitats of community importance are found in the Black Sea region (71.8%) and those of special protection in the Pannonian region (31.3%) (Table 4).

Table 4:
Main characteristics of the habitats of community importance (SCI) and of special protection areas (SPA)

Region	No. SCI	Total covered surface (km ²)	Earth surface (km ²)	% of total Earth surface	No. SPA	Total covered surface (km ²)	Covered Earth surface (km ²)	% of total Earth surface
Atlantic	2747	109 684	68 794	8,7	882	76 572	50 572	6,8
Boreal	6266	11 1278	96 549	12	1165	70 341	54 904	6,8
Continental	7475	150 014	135 120	10,8	1478	147 559	128 432	12,4
Alpine	1496	145 643	145 643	39,7	365	93 397	93 397	31,1
Pannonian	756	15 858	15 858	12,3	100	19965	19965	31,3
Steppic	34	7 210	7 210	19,4	40	8 628	8 628	24,4
Black Sea	40	10 243	8 298	71,8	27	4 100	3561	30,8
Mediterranean	2928	188 580	174 930	19,8	999	147 358	142 350	16
Macaronesian ¹⁴	211	5385	3516	33,5	65	3448	3388	32,3

Source: European Topic Centre for Biodiversity (European Environment Agency)
<http://biodiversity.eionet.europa.eu> October 2008.

The statistics cannot be aggregated because numerous species and habitats emerge in two or more biogeographic regions. Birds from Annex I of the Directive Birds are not enumerated because they are not classified depending on the biogeographic region.

In order to maintain in good conditions the biodiversity of mountainous areas, at the European Union level was established in the *Network of Protected Areas for the Carpathians*¹⁵, with the purpose of facilitating technical and institutional exchanges between the protected areas in the Carpathians, and to increase the awareness of the stakeholders regarding the frailty

¹⁴ The Macaronesian biogeographic region comprises the archipelagos Azores and Madeira (Portugal) and the Canary Islands (Spain) located in the Atlantic Ocean (Article 1, Directive 92/43/EEC).

¹⁵ http://www.carpathianparks.org/index.php?option=com_content&task=view&id=121&Itemid=204&lang=ro

of mountainous ecosystems. In the same year was founded the *Carpathian Eco-Region Initiative* with the purpose of “conserving on long-term the unique nature of the Carpathian Mountains by supporting economy and culture for the sustainable benefit of people and by means of international partnership aid. This aspect aims to protect biodiversity both inside and outside the protected areas (forests, pastures, drinkable water systems, etc.). Romania holds 40% of the Carpathian Chain which covers almost one third of the country’s surface.

The initiative called the *Carpathian Convention*¹⁶ was passed by the seven Carpathian countries: the Czech Republic, Hungary, Poland, Romania, Serbia, Slovakia and Ukraine), the main decision body being represented by the Conference of the Parties. *The Convention* has as general objective to create a general framework of cooperation between signatory states in various fields: biodiversity conservation, territorial arrangement, water resources management, agriculture and forestry, transport, tourism, industry and energy.

As of 2006, the Network of Protected Areas for the Carpathians has become operational, which by joint implementation of some projects facilitates the cooperation and good practices’ exchange between the protected mountain areas. In the Carpathians, the Protected Areas are represented by 38 national parks, 52 natural parks or landscape protection areas, 20 biosphere reservations, and about 200 other types of protected areas of smaller sizes. The Network of Protected Areas from the Carpathians was supported officially by the Alpine Network of Protected Areas (ALPARC).

In this framework of Protected Areas Network are realised and implemented policies that pursue the conservation, sustainable use, biological diversity and landscape recovery in the Carpathians. Main support is provided for actions dedicated to protecting threatened species, endemic species and large carnivores, as well as to supporting adequately semi-natural habitats, the restoration of degraded habitats, along with the development and implementation of relevant management plans. At the same time, adequate measures are promoted for integrating the conservation objectives and sustainable use of the biological diversity and landscapes within the sectorial policies such as mountainous agriculture, forestry, water household management, tourism, transport and energy, industry and mining activities.

THE ROLE OF FORESTS IN PROTECTING MOUNTAIN BIODIVERSITY IN EUROPE

The forests contribute decisively to maintaining the biodiversity of mountain areas.

Within the European Union, forests cover about 161 mill. Hectares, representing 4% from the earth’s surface and 38% of the Community’s entire territory distributed unevenly between the member-states: from 60% in Finland, Sweden and Slovenia and down to 11% in the Netherlands and the United Kingdom.

In the period 1990-2015, as result of natural expansion and of sustained efforts of reforestation inside the European Union, the surface covered with forests increased from 1,479.24 ths.sq.km to 1,610.81 ths.sq.km (+4.1%), comparatively with global level, where tendency were to reduce the surface (-1.4%) (Figure 2 and Figure 3).

¹⁶ Romania ratified the Carpathian Convention by passing Law no. 389/2006 regarding the ratification of the Framework-Convention for the protection and sustainable development of the Carpathians adopted in Kiev on 22 May 2003, and published in the Official Bulletin of Romania 879/2006.

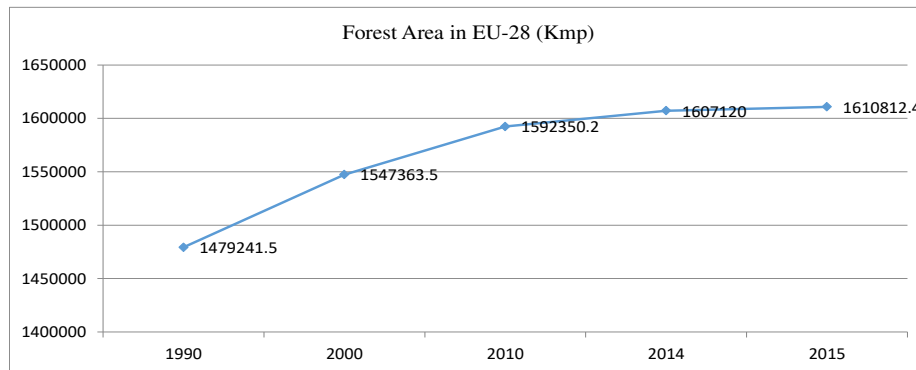


Fig. 2: Evolution of forest areas within the EU
 Source: <https://data.worldbank.org/indicator/AG.LND.FRST.K2?view=chart>

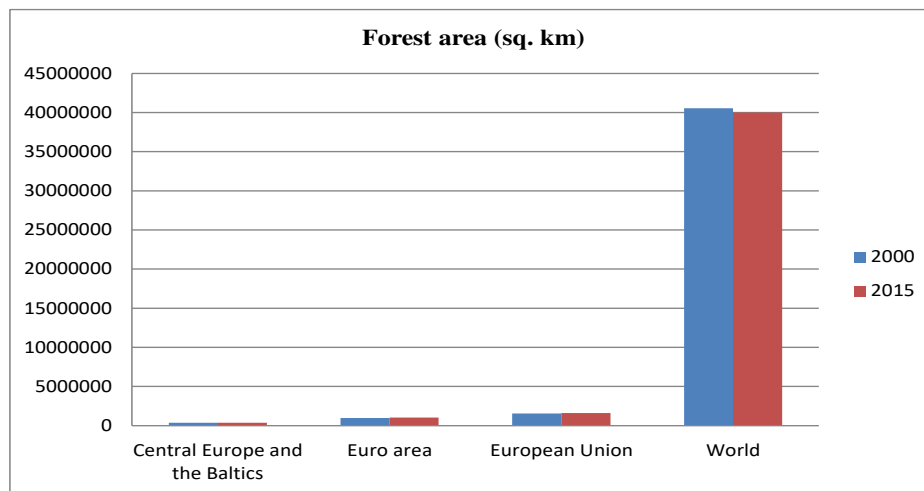


Fig. 3: Forest areas inside the EU, 1990 and 2015
 Source: <https://data.worldbank.org/indicator/AG.LND.FRST.K2?view=chart>

The structure of the surfaces covered with forests inside the European Union is determined firstly by the geo-climatic diversity (climate, soil, elevation and topography) but also by well-controlled human actions. By relating to the total forest surface, a share of 4% of mountain forests is not influenced by human action, about 8% are plantations and the rest pertain to the category of ‘semi-natural’ forests. The majority of European forests are currently under private property (60% of the forest surface).

From the ecologic point of view, forests supply numerous ecosystem services: contribute to soils’ protection (against erosion), participate to the circuit of water in nature and balance the climate system and, perhaps most important aspect: they *protect biodiversity* (it is an important environment for numerous endemic species).

From the socio-economic viewpoint, the exploitation of forests generates resources, mainly wood as from the 161 million hectares of forest about 134 million hectares are available for this type of exploitation. In a one year interval, the surfaces allocated for wood-cutting represent two-thirds of the increases in wood-stock volumes.

The main uses for wood are in energy generation, as this type of use is responsible for 42% out of the total volume of wood-cutting, but other uses are for timber manufacturing (24%), in the paper industry (17%), or for building panels (12%). About half of the renewable energy consumed at EU level is realised with the help of wood.

At the same time, the woods supply a series of produce such as mushrooms, berries, cork, raisins, oils, etc. and provide the framework for certain services (hunting, tourism, etc.). Forests represent an important economic source by supplying jobs, mainly in the rural areas, and the forest sector (forestry, wood and paper industry) holding 1% of the European Union GDP (this value reaching for some of the member-states, for instance Finland, up to 5% of the GDP) and ensuring yearly 3 million jobs¹⁷. At the same time, woods play an important role in the European Union culture and in preserving local traditions.

At present, forests are affected to an equal extent by climate changes that influence differently the growth speed of forests and their area of expansion, but also by uncontrolled¹⁸ human actions that affect negatively the forest surfaces and biodiversity. Generating multiple expectations, sometimes unrealistic and dangerous, forests might trigger important tensions in their exploitation and/or valorisation process, but also in the one dedicated to their protection. An important role in reconciling these tensions is played by governments, based on their sustainable development policies and strategies for the mountain areas, or by those specific addressed directly to forests.

Within the EU, explicit policies addressing directly the forest covered surfaces are non-existent as these actions remain in the competence of the governments from the member-states. Nevertheless, in 2013, the European Commission promoted a new community strategy regarding forests (COM(2013)0659)¹⁹ entitled *A new EU Forest Strategy: for forests and the forest-based sector*, by which a reference framework is established for developing sectorial policies with impact on forests. This strategy is substantiated by a series of guiding principles for the sustainable management of forest surfaces, and for supporting their multifunctional role and for promoting the efficient use of provided resources. As of 2015 a multiannual plan is adopted for implementing the *Forest Strategy* which comprises the guidelines' scheme, specific actions, and measures to meet the new challenges regarding wood use.

Regarding the financing of the plans targeted on the forests, the Common Agricultural Policy (CAP) is the main source that might support from the financial viewpoint certain projects destined to forest areas. About 90% of the EU funds for forests originate from the European Agricultural Fund for Rural Development.

In the programming period 2007-2013 were allocated about 5.4 billion Euros from the EAFDR for co-financing the specific measures in the forest sector.

For the current programming period is provided for one single specific measure from which are financed a series of expenditures meant as investments for reforestation and the creation of forest surfaces, for supporting the agroforestry systems, for preventing and

17

http://www.eib.org/attachments/general/events/20150323_brussels_agriculture_rural_development_financing_a_growing_forest_sector_en.pdf

¹⁸ Among the abiotic factors threatening the forests, we might enumerate: arsons (especially in the Mediterranean area), draughts, tempests (in average during the last sixty years two tempests generated annually considerable damages to European forests) and atmospheric pollution (emissions from road traffic). Regarding biological factors, animals (insects, deer) and diseases contribute to wood deterioration. In total, about 6% of the surface is affected by at least one of these factors.

¹⁹ http://eur-lex.europa.eu/resource.html?uri=cellar:21b27c38-21fb-11e3-8d1c-01aa75ed71a1.0022.01/DOC_1&format=PDF

repairing the damages triggered by arsons, natural catastrophes, as well as investments for increasing the resilience and ecologic value of the forest ecosystems, investments in modern forestry techniques, and in processing, collection and trade of wood products, etc. Forestry, environmental and climate services are financed as well, just like those related to wood conservation (various payments within the programme *Natura 2000* and based on the Framework-Directive regarding water).

Due to the *Natura 2000* Directives, Europe has currently the widest network of natural protected areas from the world, which cover almost one quarter of the European Union territory. At the same time, the analyses show that the *Natura 2000* network generates various benefits with a value of about 200-300 billion Euros/year. Each Euro invested in the *Natura 2000* network generates about 7 times more jobs than each Euro invested in the Common Agricultural Policy²⁰.

Scientific studies have shown that the directives contribute significantly to protecting some vulnerable species and habitats and, at the same time, to the socio-economic development of the local communities and of the regions where these species and habitats they are found.

Member States must choose certain measures for the forestry sector to enforce as well as the corresponding amounts allotted by their programmes for rural development. About 8.2 billion Euros out of the public expenditures were programmed for the period 2015-2020 (27 % for reforestation, 18 % for improving their resilience and 18% for preventing disasters).

The trading of the reproductive forest material is regulated at European level by Directive 1999/105/EC. UE grants funds for research in the forestry field especially within the programme Horizon 2020. In its turn, the energy policy set as compulsory objective from the legal viewpoint the increase of the energy share from renewable resources to 20% out of the total energy consumption up to 2020 a fact that would increase the demand for forest biomass (Directive 2009/28/EC).

The new European framework regarding climate and energy at the time-horizon 2030 provides the increase of the renewable (green) energy share from 20% to 27%. A series of forestry projects may be co-financed in the framework of the cohesion policy by the European Regional Development Fund (preventing arsons, energy generation from renewable sources, preparing for climate change, etc.)²¹.

Based on the network *Natura 2000*, about 37.5 million hectares of forest are declared as *Protected Areas* and their rational use is one of the thematic priorities of the Community's environment and climate policies programme.

Furthermore, the EU strategy regarding biodiversity envisages the enforcement of some sustainable management plans of the forests in public ownership up to the year 2020. In the framework of these plans, an important role is held by public acquisitions and the rigorous control of wood demand. To this end was created a European *ecologic label* for parquet, furniture and paper and "voluntary agreements of partnership" were concluded between wood producing countries for prohibiting the market retail of illegally harvested wood.

At Pan-European level, the initiative *Forest Europe* remains the main policy action in the forestry field next to a series of integrative measures having as purpose the protection of woods and the increase of reforestation surfaces. At international level, EU is involved in putting a halt to deforestation (by at least 50% up to 2020 in the framework of the REDD+ programme²²), by concluding partnerships and promoting a policy for supporting sustainable development.

²⁰ <https://natura2000.ro/?s=muntii>

²¹ LIFE 2014-2020, Regulation (EU) no. 1293/2013.

²² <http://www.un-redd.org/>

BIODIVERSITY OF MOUNTAIN AREAS IN ROMANIA

The status of *Protected Area* presupposes a mix of actions regarding the strengthening of conservation, restoration and sustainable valorisation of biodiversity and landscape based on efficient management by harmonising the natural capital with its habitats and species, by preserving and promoting natural values.

The establishment by law of some protected natural areas was initiated with the purpose of obtaining a more efficient control over maintaining and protecting biodiversity. Thus, at the *Earth Summit from 1992* (Rio de Janeiro) was adopted the Convention for Biologic Diversity. Romania ratifies the Convention in the year 1994, and the Government promulgates the Law 58/1994²³ regarding the biologic diversity by which the following major objectives were set: conservation of biologic diversity, sustainable use of biodiversity's resources and equitable distribution of benefits resulting from the use of genetic resources.

In Romania, the main categories of Protected Areas are established by Law no. 5/2000 regarding the National Plan for Territorial Arrangement (PATN) in Section III (Protected Areas)²⁴. In accordance with the law, Romania holds 845 protected areas classified in 5 out of the 6 IUCN categories (Table 5).

Table 5

Romania's Protected Area System			
<i>Type</i>	<i>Similar to IUCN Category/International Designation</i>	<i>Number of Protected areas</i>	<i>Total area</i>
Scientific Reserve		53	101,288 ha
National Park	II	11	300,819 ha
Natural Monument	III	231	2,177 ha
Natural Reserve	IV	542	117,265 ha
Natural Park	V	6	326,305 ha
Biosphere Reserve Danube Delta	Biosphere Reserve	Retezat (II) Rodnei (II)	576,216 ha. 38,138 ha 47,227 ha
Wetlands of International Importance	Ramsar Site	Danube Delta Small Island of Braila	576,216 ha 20,455 ha
Natural Sites for Universal Natural Heritage	Word Heritage Site	Danube Delta	
Special Areas for Conservation	SAC	None	
Areas for Special Protection of Bird	SPA	None	

Source: APPLETON M., 2012, *Protected Area Management Planning, A Manual and Toolkit*

²³http://biodiversitate.mmediu.ro/implementation/legislaie/legislaie-naional/legislatie-biodiversitate/Legea_nr_58-1994.rtf

²⁴<http://mdrap.ro/dezvoltare-teritoriala/amenajarea-teritoriului/amenajarea-teritoriului-in-context-national/-4697>

After Romania's accession to EU, the Emergency Ordinance no. 57 of June 20, 2007 is promulgated regarding the regime of protected natural areas²⁵, the conservation of natural habitats, of the wild flora and fauna (updated in 2016) by which are determined the areas considered of major public interest and which are included in the *National Strategy for Sustainable Development Horizons 2013-2020-2030*²⁶. In this Strategy is shown that Romania displays a relative variety and proportionality of landscapes, with unique characteristics in Europe and rare on the globe: 29.94% mountain massifs (elevations over 1.000 meters), 42% hills and plateaus (elevations between 300 and 1.000 meters) and 30% flatlands/plains (elevation under 300 m). The total surface of the mountain area is of 71.381,48 square kilometres (29.94% from total surface).

The special biodiversity of the mountain area from Romania determined the inclusion of a share of 57% from its surface in the ecologic network Natura 2000. In the mountain area are found 197 Natura 2000 sites (habitats), respectively 37% from the number of national sites and 67% from the protected area at national level. Romania holds also 54% from the Carpathian Mountain Chain, mountains of mid-elevation (with an average of 1.136 metres) and only few peaks over 2.500 m.

In Romania the mountains represent the least anthropic changed part, with a low density of the inhabitant population and small localities which are almost depopulated as effect of internal and external migration because of the disappearance of some traditional practices. This explains as well the location in the mountain region of 12 out of the 13 national parks and of 10 out of the 14 natural parks (NSSD):

a. **12 National Parks**, four in the Oriental Carpathians (NP Rodnei Mountains, NP Călimani Mountains, NP in the Ceahlău Massif, NP Cheile Bicazului – Lacul Roșu (Red Lake) –Hășmaș Mountains), six in the Mid-Carpathians (NP Piatra Craiului, NP in the Coziei Mountains, NP Buila – Vânturarița, NP in the Jiului Gorge, NP Retezat, NP Domogled – Valea Cernei) and two in the Occidental Carpathians (NP Cheile Nerei – Beușnița, NP Semenic Mountains – Cheile Carașului).

b. **10 Natural Parks**, from which four in the Oriental Carpathians (NP Maramureșului Mountains, NP Mureșului Superior Gorge, NP Vânători Neamț which breaks through also in the Neamtului Sub-Carpathians, NP Putna-Vrancea), four in the Mid-Carpathians (NP Bucegi, NP Grădiștea Muncelului-Cioclovina, Geoparcul Dinosaurilor (Dinosaurs' Geo-park) –Hațegului Country, Geo-park Mehedinți Plateau which overlapps partially also with the areal of the Mehedinti Mountains) and two in the Occidental Carpathians (NP Apuseni Mountains, NP Cazanele Dunării-Porțile de Fier (Danube Cauldrons – Iron Gates) (Figure 4).

²⁵ According to law, the way of building up the protected natural areas must take into account the interests of local communities, by encouraging them to maintain local traditional practices and knowledge, with the purpose of valorising these resources for the benefit of local communities. The protected natural areas are managed by managers (curators) based on a methodology which is drafted and approved (by Order) by the central public authority for the protection of environment and forests.

²⁶ <http://www.anpm.ro/documents/22999/2468722/sndd-final-ro.pdf/11d3b926-9482-4f62-bc61-79067a1b567f>

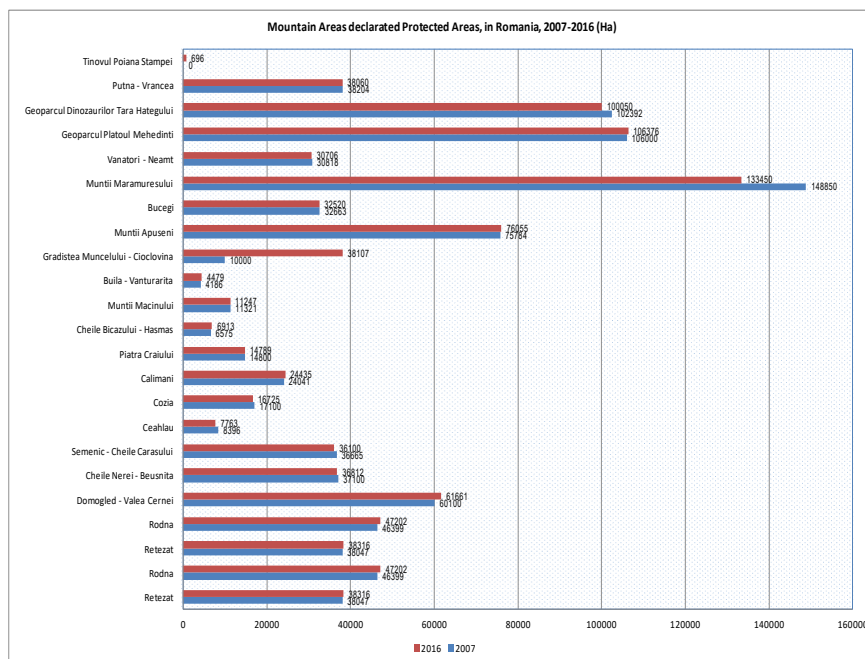


Fig. 4: Evolution of the mountain areas declared as Protected Areas (hectares)
Source: Tempo-online database – own processing (Annex 1)

In the period 2007-2016 a series of changes were recorded regarding the surface of the protected mountain areas (increases or diminshments of the included surfaces) (Figure 5).

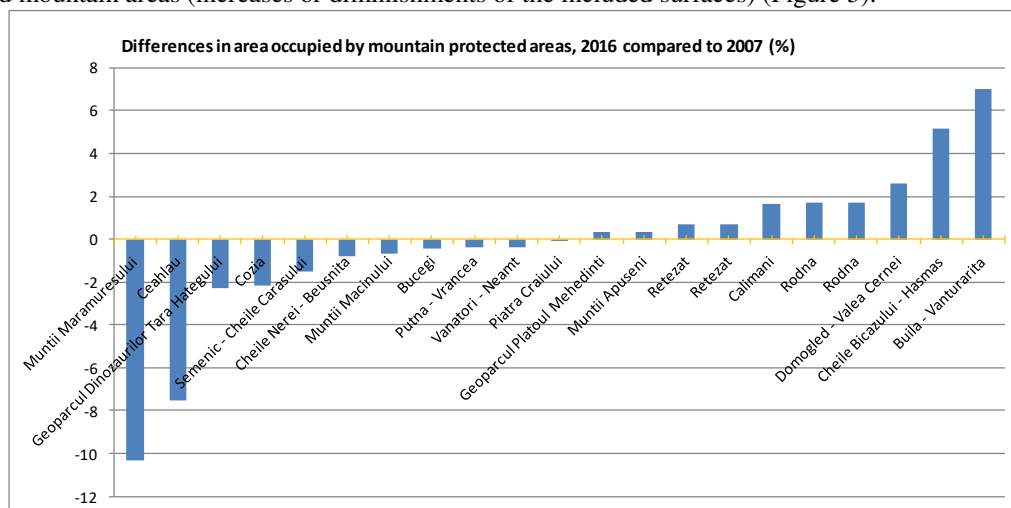


Fig. 5: Differences in the surfaces included in the Protected Mountain Areas (%)
Source: Tempo-online data – own processing

The forests from the mountain areas display increased biodiversity as here are found 150 types of forest ecosystems differentiated depending on the species or the group of dominant species of trees represented in the vegetal carpet, the type and quantity of humus in the soil, the

water and ionic stress of the soil, etc., 227 types of forest which were classified into 42 types of vegetal layers and sub-shrubberies and 364 stations²⁷.

The forests shape one of the most important wood sources and other non-wood produce (berries, mushrooms, game, etc.). The surface covered by forests in the mountain area is of 4.4 million hectares, from which about 40% are in private property, the rest being in public ownership of the state or of the territorial administrative units (the National Autonomous Administration of Forests, local councils, etc.). In view of protecting biodiversity of the mountain areas, Romania ratified the *Framework Convention regarding the protection and sustainable development of the Carpathians* (Law no.389/2006²⁸). The law stipulates that the Carpathian mountains represent a *unique natural wealth of impressive beauty and ecological value, an important reservoir of biodiversity, the area from which main rivers flow, an essential habitat and refuge for numerous species endangered of plants and animals, and the widest area covered by virgin woods from Europe*.

In the mountain area are 658²⁹ local administrative units (20% from the country's surface, most of them in the counties Harghita (9.38%), Hunedoara (6.92%), Maramures (6.77%), Alba (6.15%), Suceava (5.85%), Covasna (5.38%), and Brasov (5.1%). In the mountain area live about 3.354.041 inhabitants (24.92 % from total population) (Figure 6).

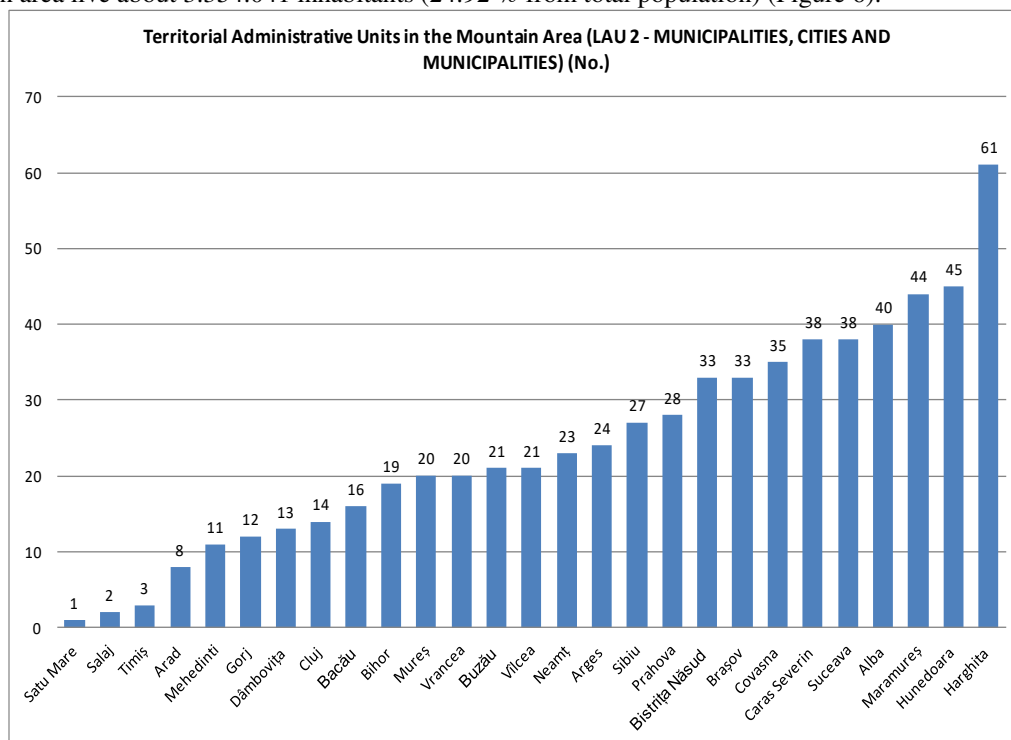


Fig. 6: Mountain Local Units, distributed on counties (%)

Source: http://www.gal-mt.ro/masuri/masura19.2/Anexa_12_Lista_localitati_din_Zona_Montana.pdf

²⁷ THE TERRITORIAL DEVELOPMENT STRATEGY OF ROMANIA – SUBSTANTIATION STUDIES, Services for drafting studies in view of implementing the activities of the project “Developing instruments and models of territorial strategic planning for supporting the future programming period past 2013”.

²⁸ http://biodiversitate.mmediu.ro/romanian-biodiversity/conventia-carpatica/LEGE_Nr_389_2006.doc

²⁹ UNGUREANU D. (2017), *Dezvoltarea durabilă a zonei montane din România. Realități și perspective*, <http://www.turismulresponsabil.ro/wp-content/uploads/2017/01/2.-Danut-Ungureanu-Zona-montana.pdf>

The communities from mountain areas must face harsh living and working conditions: precarious infrastructure, limited access to markets, improper conditions for agriculture, all these restrictions affecting their wealth and development dynamics. Moreover, the mountain communities are dependent decisively and directly on the forests, on assimilated eco-systems and on the products and services that they provide (water, timber, berries, medicinal plants, energy, recreational services, etc.). From this perspective, many of the mountain areas are regarded as less-favoured regions as they *show considerable limitations regarding the possibilities of land-use and the costs for their exploitation* (European Commission). The classification into the category of less-favoured areas is realised in accordance with the Regulation (EC) no. 1257/1999 about subventions granted by the European Agricultural Guidance and Guarantee Funds (EAGGF) for rural development. In Romania, about 51.55% from the mountain population lives in less-favoured areas, and 52.57% lives in the rural area (Table 6).

Table 6

Main characteristics of the local communities from the mountain area, 2016

<p>Number of counties with mountain area =27 counties Number of mountain localities =658 localities Mountain population (inhabitants) =3.354.041 inhabitants Rural population in the mountain area = 52.47% from total population in the mountain area (Romania's rural population =44.94% from total) Rural mountain population in less-favoured areas =51.55% Number of mountain households = 954.922 households Mountain lands' fund =6.911.600 ha Mountain agricultural surface (ha.) = 2.900.000 (18,71% from total) Out of which: Arable-ha. = 600.000 (5.84%); Pastures and meadows-ha =2.200.000; Orchards-ha.=50.700 (21%); Vineyards-ha.=3.800 (1,17%). Animal stock out of which: Cattle total (cap.) =749.973, from which, milk cows (cap.) =415.861; Sheep total (cap.) = 2.234.767, from which, milk sheep (cap.) = 1.506.004; Goats total (cap.) = 177.059; Forest and forest vegetation surface = 59% from total</p>

Source: UNGUREANU D. (2017), *Dezvoltarea durabilă a zonei montane din România. Realități și perspective* (Sustainable Development of the mountain region of Romania - Realities and perspectives, in Romanian)

Nowadays, the mountain local communities from Romania are faced with a series of difficulties from which we mention:

- The abandon of villages and hamlets (depopulation), especially in the case of the young population;
- Massive job losses, especially in the rural area;
- Low access to vocational training of young mountain farmers;
- The absence of specific vocational schools for mountain activities and very low numbers of profile school groups;
- Scant information of farmers about the ways of accessing Community and national funds;
- Relative modest modernisation of the majority of mountain farmsteads;
- Dramatic decreases of the animal stocks, both cattle and sheep (decreases by 60-80%);
- Marginalization of mountain agro-zoo-technical economy under the pressure of large-scale farmers;
- Major degradation of the natural flora of pastures and meadows;
- Intensifying massive deforestation of large areas of forest;

- Excessive protection of large carnivores (bears, wolves) detrimental to people's needs and mountain economy;
- Derisory prices for raw materials (milk, meat, etc.);
- Drastic decreases in the animal stock in a share by 60-80%;
- Severe downfall of the chances for the complex and sustainable valorisation of the numerous energy resources, including the renewable (agro-foodstuff; medicinal, forestry, labour force, transport, services, etc.);
- Constant and marked marginalisation of the agro-zoo technical mountain economy;
- The increasingly higher outspread of poverty in the mountain villages; the discrimination of over 150 villages that were not included into the Less-favoured Mountain Area (due to bureaucracy); the intensified massive deforestation of large forest surfaces;
- Failure in adopting some measures for discontinuing regressive economic and social processes that are damaging to the economy of Romania;
- The deep and irreversible deterioration of the socio-cultural fund and of the cultural identity of the mountain communities.

All these real issues existing in the mountain areas from Romania call for a specific multidimensional policy that would take into account the principles of sustainable development and that would contribute to diminishing the imbalance between the mountain regions and the other regions. The mountain policy is the link that would ensure better inter-community, and interregional cooperation, and the partnerships at national and international level, as well.

MEASURES AND ACTIONS FOR SUPPORTING THE BIODIVERSITY OF THE MOUNTAIN AREAS IN ROMANIA

According to the Strategy of the Romanian Academy for the next 20 years³⁰, the general objective of evolution and development for the sector *Protected Areas is represented by the protection, valorisation and recovery of the biodiversity, including here eco-systemic services that it provides (natural capital), by taking into account the intrinsic value it represents and the essential contribution to economic and social development*. Thus, the general action framework aims both at biodiversity conservation practices and at economic and social activities that would provide to local communities the possibility of achieving their own desiderates.

Romania ranks on the first position in Europe from the viewpoint of biodiversity and owns the last 100% natural ecosystems of the continent. Even though the national legislation translating the Directives Natura 2000 in Romania does not provide for complete protection, and the implementation issues are identified frequently, a first measure would be the one of continuing with the implementation of these directives and compliance with the statutes of *Protected Area* in the mountain areas where these are set up.

Due to the important impact of the agricultural sector on the biodiversity from the mountain areas, a first action that might be supported financially is accessing the funds allocated for the mountain biodiversity by the Common Agricultural Policy (CAP).

Regarding the mountain area, after 2007, began the implementation of the following measures of CAP: Measure 211 – the less-favoured mountain area; Measure 212 – less-favoured areas (others than the mountain area) and Measure 214 – agro-environment. The measures are financed by CAP and support the users of agricultural lands in areas characterised

³⁰ <http://www.acad.ro/bdar/strategiaAR/doc12/StrategiaII.pdf>

by unfavourable natural conditions, including here the compensation of income losses, and additional expenditures resulting from practicing extensive and ecologic agriculture (by protecting biodiversity, water protection, soil protection, diminishing polluting emissions and adjusting to the effects of climate changes).

In the period 2008-2015, the amounts received for the three measures had the value of about 3.47 billion Euros representing approximately 42% from the entire allocation of the NRDP 2007-2013. These payments contributed to: maintaining biodiversity on 6.073 million hectares, to increasing the soil quality (864 thousand hectares), water quality (2.186 million hectares), to avoiding land isolation and abandon (6.014 million hectares) and to reducing climate changes (1.431 million hectares).

In the current programming period are supported measures for promoting efficient use of resources and smart, sustainable growth favourable to inclusion in agriculture and in the rural areas, in accordance with the Strategy Europe 2020. The measures package for the current programming period addresses both the objectives of agro-environment and climate (Measure 10), to ecologic agriculture (Measure 11), and to areas faced with natural constraints (Measure 13). Farmers will benefit from funds of about 2.66 billion Euro (Measure 10 – 1.071 billion Euro, Measure 11 – 236.42 million Euro, Measure 13 – 1.355 billion Euro).

These actions might contribute to maintaining the mountain biodiversity and which might be financed from community funds: keeping the youths in these areas, in parallel with encouraging increased birth-rates, professional training and adjusting vocational school curricula in accordance with the demand on the labour market, supporting businesses started-up by youths, promoting education-learning centres in the mountain areas for setting up didactic farms (these would provide learning material for the students and would contribute to the integrated valorisation of resources, from the perspective of the concepts of pluri-activity and sustainable development) etc.

For the mountain areas faced with natural or specific constraints have been determined by the NRDP a series of compensation payments that are granted to users of agricultural lands placed in areas defined as eligible after concluding some yearly/multi-annual voluntary commitments, and the compensation is aimed at:

- additional costs and income losses resulting from the enforcement of some extensive management measures on agricultural lands targeted on achieving some environmental objectives (biodiversity conservation, water and soil protection);
- additional costs and income losses resulting from the enforcement of practices specific to ecologic agriculture;
- additional costs and income losses born by farmers because of natural and specific constraints which are present in areas with influence on agricultural production.

In 2017, the compensation sums granted were as follows: compensation pays 62 €/ha/year, compensation payments for areas faced with specific constraints 75 €/ha/year, compensation payments in the mountain area 97 €/ha/an.

A MODEL REGARDING THE BIODIVERSITY OF MOUNTAIN AREAS

The issue of biodiversity loss and the one about ensuring the sustainable development of local communities in areas declared as *Protected Areas* is very complex, both from the theoretic and practical viewpoint.

If at theoretical level nowadays take place significant debates about the methods and techniques for evaluating and interpreting the existing issues of the area, from the practical viewpoint not enough data and statistic information is supplied in order to support certain specific measures and actions of political, economic and social nature, etc.

The acknowledged complexity of these issues and aspects regarding *Protected Areas* imposes currently a multi- and trans-disciplinary approach. At the same time, practitioners in the field of development resort frequently to holistic-type approaches. Their requirements are supported by the modern social sciences that consider that over time the localisation of economic activities and the environment are relevant categories for analyses and research³¹.

The interdisciplinary approach appears as necessary when environmental changes are evaluated, while the living conditions for humans are aimed in particular, along with the ones regarding the economic situation, etc. The combination of knowledge from several fields brings its contribution to identifying the best measures leading to improving the living standard for the inhabitants of the mountain areas, being at the same time a challenge for all those involved.

Any model should focus the attention an object of study, which in our case is represented by the mountain area declared as *Protected Area*. The definition of the concept bears, in its turn, a multidimensional approach: well-delineated geographic areas, with specific characteristics (economic, social, infrastructural, etc.), of high biodiversity and particular issues for which specific actions/policies are required with the purpose of attaining a certain living standard.

From the viewpoint of mountain research, the analysis of the pressure on the environment might be realised by a general, comparative analysis of the mountain regions based on demand, and by disaggregation at household level of some indicators specific to the mountain area.

The global models of analysis for the households' welfare in the mountain area resort, as a rule, to indicators regarding quality of live which assumes the idea that development is based on universal values and not on localised experiences and different value systems. These indicators might reflect the basic elements of the subsistence means and the quality of institutions involved in promoting change. Because human activities (economic, social, cultural, etc.) cannot be omitted in this equation, we consider that the basic principle of any model should be: ***a conservation framework for development*** in which the conservation practices for the mountain biodiversity maintain both services of economic and social nature and the ones of protection for ecosystems and biodiversity.

In order to maintain biodiversity, services linked to the ecosystem and the ones for stimulating economic activities should coexist, based on the causality relationship between biodiversity and economic development. Thus, development should meet the protection requirements of the environment as in a contrary situation, the biodiversity would undergo negative changes that are sometimes irreversible, caused by the loss of habitats as result of converting agricultural lands into urban areas, of the emergence of invasive alien species, and

³¹ Stern și colab., 1997; D'Antonio et al 1994; Goudie 1994; Wilbanks 1994; Kasperson et al 1995; Petschel-Held et al 1995, Schellnhuber 1997, Turner 1997, Vitousk 1997, Liverman 1998, Reusswig și Schellnhuber 1998, Meyer și Turner 1999, Pret 1999.

by the overexploitation of natural resources, etc. Overexploitation of services/products supplied by biodiversity leads to influencing with negative impact on the natural balance on long-term, the human welfare, and on the process of economic growth (Figure 7).

BASIC ASSETS PROVIDED BY THE ENVIRONMENT

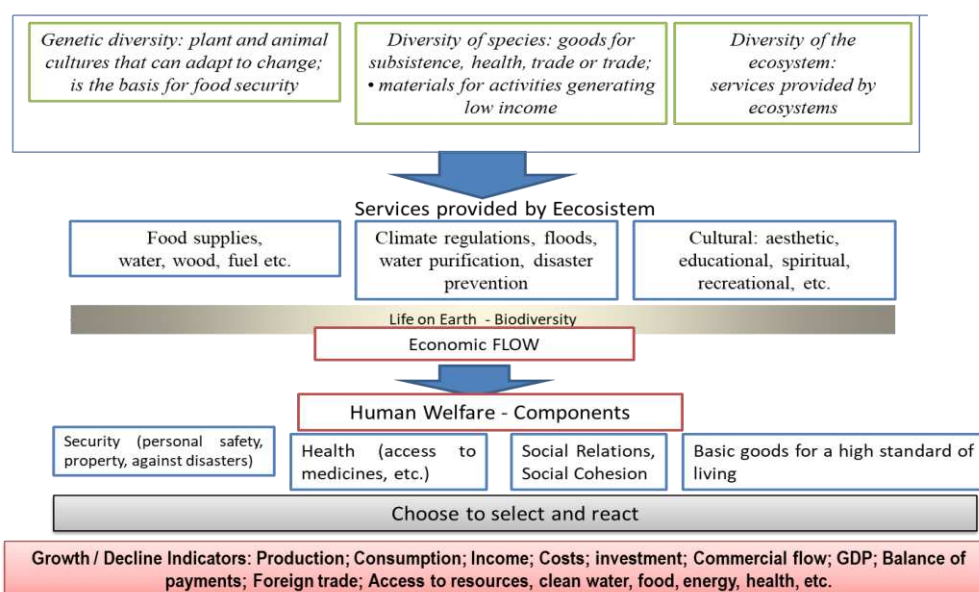


Fig. 7: The relationship Biodiversity - Economic welfare

Source: Processing after Biodiversity, Development and Poverty Alleviation, Recognizing the Role of Biodiversity for Human Well-being, UNDP, 2010

Biodiversity is considered as strategic priority on long-term at Community level *that must be achieved especially by diminishing the degradation and fragmentation of lands (reducing the biodiversity losses, including maintaining the genetic diversity)*. The fragmentation of habitat, its degradation and de-structuring, constitute the effects of changing the land-use models (consumption models), of climate change felt at global level as these are regarded as main factors for biodiversity loss at European Union level. In the above-mentioned Report is highlighted, as well, the vital importance of the involvement of the political factor at the highest level in the process of halting biodiversity loss by:

1. Enforcement of the legislation in force;
2. Integrating mountain biodiversity protection measures in the energy, transport, and non-renewable resources exploitation policies and strategies,
3. Involvement of national, regional and local authorities in providing information regarding the damage degree of the biodiversity;
4. Identifying some specific indicators that would ensure the scientific evaluation of the state of the biodiversity based on the rational and sustainable use of the resources from mountain areas.

Considering the relationship between the mountain biodiversity and the local communities' welfare, the following categories of sustainable development models might be taken into account:

(1) *The model based on territorial approach and on habitat and demographic changes strategies.* Thus, demographic processes from the mountain regions are always influenced by mobility and transition. The expansion of settlements and the marginal use of resources are correlated directly with migration and the new opportunities (Skeldon 1985; Kreutzmann 1994, 1995a; Ehlers 1995; Uhlig 1995, Hewitt 1997, Libiszewski și Bächler 1997, Sökefeld 1997). The manoeuvring room in these areas determines conflicts, while the issues of some small-sized communities might gain higher political importance.

(2) *The model based on entrepreneurship and habitat strategies:* Resources represent an important element of demand. Ensuring resources corresponding to a sustainable development process represents the component of a local development strategy next to other elements.

(3) *The model based on resources' management and energy supply:* Under the conditions of increasing demand, the continuing supply of energy resources cannot be sustained only by the use of traditional sources and resources. The new solutions and exploitation forms of unused resources play a very important role in all mountain economies. The availability of natural resources and their distribution between communities and households might trigger important conflicts. For instance, water and wood resources always were targeted by various external groups of interest (Kreutzmann 2000; Price, Butt 2000). In this context, the ownership rights impose special attention (Lynch and Maggio 2000). In the competition for mountain resources and without a substantial intervention from the state (legislation, etc.), local communities might be easily marginalised.

These trans-disciplinary approaches were introduced relatively recently and applied in research programmes, the cooperation necessity being an important lever in eliminating constraints of any type. Some mountain development models, as well, might resort to certain general concepts applied by regional or national development strategies. Comparable indicators might contribute to improved understanding of certain categories of disparities and to identifying some functions within less-favoured local mountain communities. The advantage of some common models is that they can be applied at the level of all mountain or non-mountain regions providing a global and comparative image between advantages and disadvantages to each.

CONCLUSIONS

The importance of mountain areas is given jointly by the quantitative but especially by the qualitative size. Thus, the mountain areas cover important surfaces both at world level (22%) and at national level (30% of Romania's surface).

In Romania, the mountain area is found in 27 out of the total 42 counties and the rural population of this area is represented by a share of 52.47%, and is covered in a share of 59% by forests (Figure 8).

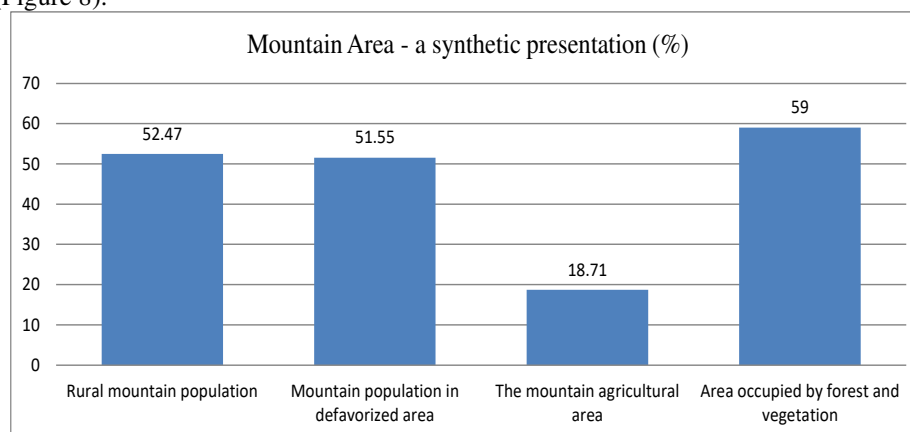


Fig. 8: Mountain Area – a synthetic presentation

Source: own computations based on the Tempo-online database

Next to the quantitative size presented above, the mountain area is characterised by high biodiversity this representing the qualitative side which requires increased attention and heightened interest for maintaining in good state the species of plants and animals, and all habitats which are in an easily to disturb balance.

The mountain areas characterised by high biodiversity are declared as Protected Areas and these are representing currently a surface of 25% at world level, of 33% within the European Union, and of 24% in Romania. The particular biodiversity of the mountain area from Romania determined the attribution of a share of 57% from its surface within the ecological network Natura 2000. In the mountain area are found 197 Natura 2000 sites (habitats), respectively 37% from the number of national sites and 67% from the protected surface at national level. The mountain areas are considered as important sources of biodiversity but, at the same time, they are faced with significant adjustment issues to new climate changes.

In Romania, the mountain areas should play a strategic role in the economic and social development constituting conducive environment, over time, for maintaining the continuity and durability of the Romanian people. It is imperative that the development vision in the field of *Protected Areas –mountain areas* pursues the protection, valorisation and recovery of the mountains' biodiversity, including eco-systemic services they provide (natural capital) by taking into account the intrinsic value that they display and their essential contribution to economic and social development. Because human activities (economic, social, cultural, etc.) cannot be omitted from this model, I consider that the basic principle of this evolution should be in a conservation framework for development, where the practices should aim both services of economic and social nature, and those of protecting ecosystems and biodiversity. Thus, development should meet the protection requirements of the mountain environment as in a

contrary situation, biodiversity might undergo negative, sometimes irreversible changes caused by the loss of habitats, as result of converting agricultural lands to urban areas, by the emergence of some invasive alien species, and by the overexploitation of natural resources, etc. Overexploitation of services/products provided by biodiversity leads to influencing the natural balance with negative impact on human welfare and on the entire process of economic growth.

These mountain areas with high biodiversity should benefit from specific, multidimensional policy that would take into account the principles of sustainable development and would contribute to diminishing ecologic and economic imbalances. *The mountain policy might be considered as a true link that would ensure the good intercommunity and interregional cooperation, as well as partnerships at national and international level.*

ANNEXES

Annex 1: Mountain areas declared as Natural Protected Areas, in the period 2007-2016

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Retezat	38047	38047	38047	38047	38047	38047	38047	38047	38316	38316
Rodna	46399	46399	46399	46399	46399	46399	46399	46399	47202	47202
Domogled - Valea Cernei	60100	60100	61190	61190	61190	61190	61190	61190	61661	61661
Cheile Nerei – Beusnita	37100	37100	36707	36707	36707	36707	36707	36707	36812	36812
Semenic/Cheile Carasului	36665	36665	36220	36220	36219	36219	36219	36219	36100	36100
Ceahlau	8396	8396	7739	7739	7739	7739	7739	7739	7763	7763
Cozia	17100	17100	16721	16721	16721	16721	16721	16721	16725	16725
Calimani	24041	24041	23915	23915	24519	24519	24519	24519	24435	24435
Piatra Craiului	14800	14800	14781	14781	14781	14781	14781	14781	14789	14789
Cheile Bicazului - Hasmas	6575	6575	6933	6933	6933	6933	6933	6933	6913	6913
Macinului Mountains	11321	11321	11114	11114	11114	11114	11114	11114	11247	11247
Buila - Vanturarita	4186	4186	4491	4491	4491	4491	4491	4491	4479	4479
Gradistea Muncelului - Cioclovina	10000	10000	38116	38116	38116	38116	38116	38116	38107	38107
Mountains Apuseni	75784	75784	76022	76022	76022	76022	76022	76022	76055	76055
Bucegi	32663	32663	32598	32598	32497	32497	32497	32497	32520	32520
Maramuresului Mountains	148850	148850	133419	133419	133419	133419	133419	133419	133450	133450
Vanatori - Neamt	30818	30818	30841	30841	30841	30841	30841	30841	30706	30706
Geo-park Mehedinti Plateau	106000	106000	106492	106492	106492	106492	106492	106492	106376	106376
Dinosaurs Geo- park Hategului Country	102392	102392	100487	100487	100487	100487	100487	100487	100050	100050
Putna - Vrancea	38204	38204	38190	38190	38190	38190	38190	38190	38060	38060
Tinovul Poiana Stampeii	:	:	:	:	:	640	640	640	696	696

Source: Date Temp-Online, INS, <http://statistici.insse.ro/shop/?lang=ro>

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